INSECT TRAP DEVICE AND METHOD OF USING

TECHNICAL FIELD

[01] The present disclosure is related generally to an insect trap, more particularly, to a removable insect trap having a minimal footprint and an aesthetically pleasing design.

CROSS-REFERENCE TO RELATED APPLICATIONS

[02] The present application is related to PCT/US2014/019175, entitled "Insect Trap Device and Method of Using" filed February 28, 2014, which is incorporated herein by reference in its entirety. The present application is related to PCT/US2014/067196, entitled "Insect Trap Device and Method of Using" filed November 24, 2014, which is incorporated herein by reference in its entirety. The present application is related to PCT/US2015/027684, entitled "Insect Trap Device and Method of Using" filed April 26, 2015, which is incorporated herein by reference in its entirety.

[03] The present application claims the benefit of U.S. provisional patent application no. 62/102,583, entitled "Insect Trap Device and Method of Using" filed January 12, 2015, which is incorporated herein by reference in its entirety.

BACKGROUND

[04] Flying insect pests have long been a nuisance and a health hazard. Since ancient times, insect traps have been used to eliminate flying insects, and hundreds of different traps have been proposed and developed over the centuries. There has always been a need to eliminate flies and mosquitos that inevitably find their way into homes. Recent US outbreaks of Eastern Equine Encephalitis, West Nile virus and harmful *E. Coli* infections, public health threats that can be spread by flying insects, have only increased this need. Because insects may see and be attracted to a combination of ultraviolet (UV) and visible light, an indoor insect trap may have its own UV and visible light sources. Insect traps commonly have a fluorescent tube that emits both UV and visible light to attract insects and a glue board to trap them. However, insect traps incorporating fluorescent tubes and the transformers that power them may be too large to fit wherever they're needed and too expensive to afford one for every room in the house. In addition, insects may

contact the fluorescent tube and over time it may accumulate dust and insect debris, blocking the light and reducing the trap's effectiveness. Furthermore, the glue board may be difficult to remove and replace without touching trapped insects and adhesive.

SUMMARY

[05] An insect trap device and methods of using the device are described herein. The insect trap may effectively attract and trap insects indoors and may be manufactured and sold at a lower cost than commercially available traps. The insect trap device may be smaller than competing indoor insect traps, and may be conveniently movable from one location to another. The insect trap device may be easier to clean and maintain without contacting trapped insects.

[06] In a first aspect, an insect trap is disclosed including: a trap portion including a frame and a membrane having an adhesive surface, wherein the membrane is at least partially contained within the frame and is configured to adhere to an insect; and a base portion including a lighting element and a housing portion, wherein the housing portion is configured to receive and retain the trap portion when engaged therewith. In an embodiment of the first aspect, the housing portion of the base portion includes one or more alignment guides for receiving the trap portion. In an embodiment of the first aspect, the alignment guides include side channels, slots, flanges, or recesses. In an embodiment of the first aspect, the frame of the trap portion includes a border that substantially surrounds the periphery of the membrane. In an embodiment of the first aspect, the border of the trap portion surrounds one, two, or three sides of the membrane. In an embodiment of the first aspect, the border of the trap portion includes side flanges and is configured to be received into one or more alignment guides on the housing portion of the base portion. In an embodiment of the first aspect, the frame further includes a tab that is configured to allow a user to insert and remove the trap portion from base portion. In an embodiment of the first aspect, the trap portion is configured to removably engage with the base portion via the tab. In an embodiment of the first aspect, the base portion further includes an enclosure, the enclosure at least partially surrounding the trap portion and including a first opening that configured to allow an insect to enter into the enclosure. In an embodiment of the first aspect, the lighting element is located in front of the trap portion. In an embodiment of

the first aspect, the enclosure includes a second opening configured to allow light to emit from the enclosure. In an embodiment of the first aspect, the enclosure is configured to distribute the light in a predetermined pattern. In an embodiment of the first aspect, the base portion further includes a mounting portion configured to communicate with and receive power from a power source. In an embodiment of the first aspect, the trap portion further includes a cover configured to cover at least a portion of the membrane of the trap portion when the trap portion is not engaged with the base portion. In an embodiment of the first aspect, the trap portion further includes a hinge, the hinge configured to allow the cover to swing into an open position and a closed position. In an embodiment of the first aspect, when the cover is in an open position, the cover is located behind the membrane, thereby exposing the adhesive surface. In an embodiment of the first aspect, when the cover is in a closed position, the cover is located in front of the membrane, thereby covering at least a portion of the adhesive surface. In an embodiment of the first aspect, the cover includes one or more engagement features for securing the cover to the frame. In an embodiment of the first aspect, the frame includes one or more receiving features for securing the cover to the frame. In an embodiment of the first aspect, the engagement features include: ribs, bumps, lips, protrusions, and recesses. In an embodiment of the first aspect, the receiving features include: ribs, bumps, lips, protrusions, and recesses. In an embodiment of the first aspect, the cover includes: a tambour, a roller blind, a solid plate, a shutter, or one or more slats. In an embodiment of the first aspect, the cover is configured to automatically cover at least a portion of the membrane of the trap portion upon removal of the trap portion from the base portion. In an embodiment of the first aspect, the cover is configured to automatically uncover the membrane of the trap portion upon engagement of the trap portion with the base portion. In an embodiment of the first aspect, the lighting element includes a light emitting diode (LED). In an embodiment of the first aspect, the lighting element includes an ultraviolet (UV) LED and a blue LED. In an embodiment of the first aspect, the trap portion includes an insect attractant. In an embodiment of the first aspect, the insect attractant is selected from the group consisting of: sorbitol, coleopteran attractants, dipteran attractants, homopteran attractants, lepidopteran, straight chain lepidopteran pheromones, eugenol, methyl eugenol, and siglure. In an embodiment of the first aspect, the trap portion further includes a reflective

surface. In an embodiment of the first aspect, the membrane includes a reflective surface.

[07] In a second aspect, an insect trap is disclosed including: a trap portion including: an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect, the enclosure further including a visual indicator integral to the enclosure, the visual indicator providing an indication of trap life remaining; and one or more insect-attracting substances, and a base portion configured to removably engage the trap portion. In an embodiment of the second aspect, the trap portion further including a removable tab covering the one or more insect-attracting substances, wherein upon removal of the tab, the one or more insect-attracting substances is released from the trap. In an embodiment of the second aspect, the visual indicator includes a visible level of the one or more insect-attracting substances in the trap portion. In an embodiment of the second aspect, the one or more insect-attracting substances includes an insect attractant and a carrier material. In an embodiment of the second aspect, the carrier material is configured to change color when the insect attractant is depleted. In an embodiment of the second aspect, the base portion further includes: a mounting portion configured to communicate with and receive power from a power source; and a heating element configured to receive power from the power source and heat the one or more insect-attracting substances in the trap portion. In an embodiment of the second aspect, the base portion further includes: a circuit board having a programmable processor for executing commands related to the operating settings of the insect trap, wherein the circuit board is in communication with the heating element and is configured to monitor an electrical property of the one or more insect-attracting substances. In an embodiment of the second aspect, the circuit board is configured to provide the visual indicator when an electrical property of the one or more insect-attracting substances exceeds or drops below a threshold value. In an embodiment of the second aspect, the trap further includes a lighting element in communication with the circuit board, the circuit board configured to cause the lighting element to flash or change color as the visual indicator when the one or more insect-attracting substances is depleted. In an embodiment of the second aspect, the trap further includes a speaker in communication with the circuit board, the circuit board configured to cause the

speaker to make an audible noise when the one or more insect-attracting substances is depleted. In an embodiment of the second aspect, the heating element includes: an electrical contact, an electrical resistance coil, one or more resistors, one or more infrared LEDs, one or more Peltier or Thompson effect devices, a metal-oxide film, or a printed conductive ink. In an embodiment of the second aspect, the processor is configured to receive commands wirelessly from a user and execute said commands related to the operating settings of the insect trap. In an embodiment of the second aspect, the commands from the user can be sent via a mobile device. In an embodiment of the second aspect, the base portion further includes: a mounting portion configured to communicate with and receive power from a power source; and a sensor configured to receive power from the power source and monitor an electrical property of the one or more insect-attracting substances. In an embodiment of the second aspect, the base portion further includes: a circuit board having a programmable processor for executing commands related to the operating settings of the insect trap; wherein the circuit board is in communication with the sensor. In an embodiment of the second aspect, the circuit board is configured to provide the visual indicator when an electrical property of the one or more insect-attracting substances exceeds or drops below a threshold value. In an embodiment of the second aspect, the trap further includes a lighting element in communication with the circuit board, the circuit board configured to cause the lighting element to flash or change color as the visual indicator when the one or more insect-attracting substances is depleted. In an embodiment of the second aspect, the trap further includes a speaker in communication with the circuit board, the circuit board configured to cause the speaker to make an audible noise when the one or more insect-attracting substances is depleted. In an embodiment of the second aspect, the sensor includes: a voltage detector, a current detector, an impedance detector, a pH sensor, or a moisture detector.

[08] In a third aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; a base portion configured to removably engage the trap portion; and a removable insect attractant cartridge configured to be received in the trap portion or base portion. In an embodiment of the third aspect, the base

portion includes an opening configured to receive the insect attractant cartridge. In an embodiment of the third aspect, the trap further includes a heating element in communication with the removable insect attractant cartridge, the heating element configured to increase the rate at which the insect attractant is released. In an embodiment of the third aspect, the insect attractant cartridge includes: a scent cartridge, a double scent cartridge, a single chamber container, or a double chamber container. In an embodiment of the third aspect, the insect attractant cartridge includes a single or double chamber container and wick, the insect attractant including an evaporable liquid attractant. In an embodiment of the third aspect, the single or double chamber is transparent or translucent, allowing a user to view the level of the evaporable liquid attractant. In an embodiment of the third aspect, the evaporable liquid attractant includes a colored or dyed liquid. In an embodiment of the third aspect, the single or double chamber includes a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of liquid attractant in the chamber. In an embodiment of the third aspect, the insect attractant cartridge further includes an attachment portion configured to attach to the insect trap. In an embodiment of the third aspect, the insect trap further includes a heating element in communication with the wick, wherein the heating element heats the insect attractant by radiation, conduction, or convection. In an embodiment of the third aspect, the insect attractant cartridge includes a double chamber container and wicks, and wherein the double chamber is configured to hold two different insect attractants, one part each of a two-part insect attractant, or an insect attractant and neutralizer. In an embodiment of the third aspect, the double chamber releases a first insect attractant at a first time and a second insect attractant at a second time. In an embodiment of the third aspect, the first and second insect attractants are released at intermittent time intervals. In an embodiment of the third aspect, the base portion further includes: a protrusion configured to puncture the removable insect attractant cartridge.

[09] In a fourth aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion configured to removably engage the trap portion with a plurality of engagement features. In an embodiment of the fourth aspect, the engagement features include a snap and a

hook located on the base portion of the trap. In an embodiment of the fourth aspect, the engagement features further include a snap recess and a hook recess located on the trap portion of the trap. In an embodiment of the fourth aspect, the trap further includes grip features on the trap portion and/or base portion. In an embodiment of the fourth aspect, the grip features include: side recesses for fingers, grooves, ribs, bumps, or waves. In an embodiment of the fourth aspect, the base portion further includes: a mounting portion configured to communicate with and receive power from a power source, wherein the base portion includes a recessed area proximate to the mounting portion, which allows the insect trap to be flush with a wall when mounted thereto. In an embodiment of the fourth aspect, the enclosure further includes a second opening, the first opening located on a front surface of the enclosure and the second opening located on a side surface of the enclosure.

[10] In a fifth aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect and wherein the enclosure includes: a front housing portion; a rear housing portion; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion; a base portion configured to removably engage the trap portion; and an evaporable insect attractant located in the enclosure. In an embodiment of the fifth aspect, the evaporable attractant includes a solid, a liquid, a gel, or a suspension. In an embodiment of the fifth aspect, the evaporable insect attractant is located in the rear enclosure portion of the trap portion. In an embodiment of the fifth aspect, trap portion further includes a protective cap over the rear enclosure portion to prevent the evaporable insect attractant from escaping the trap when not engaged. In an embodiment of the fifth aspect, the rear enclosure portion further includes a wick for evaporating the evaporable insect attractant. In an embodiment of the fifth aspect, the base portion further includes: a heating element in communication with the wick, the heating element heats the insect attractant by radiation, conduction, or convection. In an embodiment of the fifth aspect, the base portion further includes: a mounting portion configured to communicate with and receive power from a power source, wherein the heating element is

configured to receive power from the power source and heat at least a portion of the wick. In an embodiment of the fifth aspect, the front enclosure portion of the trap portion includes a plurality of openings in communication with the base portion, the openings configured to allow for evaporated insect attractant to move from the base portion into the trap portion. In an embodiment of the fifth aspect, the evaporated insect attractant is emitted from the first opening in the trap portion. In an embodiment of the fifth aspect, the divider portion includes a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of insect attractant in the trap. In an embodiment of the fifth aspect, the insect attractant includes a colored or dyed liquid. In an embodiment of the fifth aspect, the divider portion includes a first membrane and a protrusion configured to puncture the first membrane. In an embodiment of the fifth aspect, the divider portion includes a second membrane. In an embodiment of the fifth aspect, the first membrane includes a barrier membrane and wherein the second membrane includes an absorbable membrane. In an embodiment of the fifth aspect, the absorbable membrane is proximate to the rear enclosure portion and wherein the rear enclosure portion holds the evaporable insect attractant. In an embodiment of the fifth aspect, the absorbable membrane is configured to absorb the evaporable insect attractant when the protrusion punctures the barrier membrane. In an embodiment of the fifth aspect, the divider portion includes a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of insect attractant in the trap. In an embodiment of the fifth aspect, the base portion includes a lighting element configured to provide light to the enclosure and wherein the lighting element is configured to communicate with and receive power from a power source.

[11] In a sixth aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; a base portion configured to removably engage the trap portion; a reservoir assembly configured to be received in the trap portion or base portion; and a punch configured to puncture reservoir assembly and activate the contents of reservoir assembly. In an embodiment of the sixth aspect, the reservoir assembly is located within the trap portion and the punch is located on the base portion. In an embodiment of the sixth aspect, the punch has a plurality

of grooves that extend a portion of the length of the punch. In an embodiment of the sixth aspect, the punch is configured to act as a seal against the reservoir assembly when the reservoir assembly is punctured. In an embodiment of the sixth aspect, the reservoir assembly includes a first chamber and a second chamber. In an embodiment of the sixth aspect, the first chamber includes a water and sugar solution and the second chamber includes a yeast culture. In an embodiment of the sixth aspect, the punch is configured to puncture a passageway from the first chamber into the second chamber. In an embodiment of the sixth aspect, the activated contents of the reservoir assembly produce carbon dioxide. In an embodiment of the sixth aspect, the carbon dioxide is emitted from the first opening in the trap portion.

[12] In a seventh aspect, an insect trap is disclosed including: a trap portion including a housing having an adhesive surface, wherein the adhesive surface is at least partially contained within the housing and is configured to adhere to an insect; and a base portion including: a mounting portion configured to communicate with and receive power from a power source, and a heating element configured to receive power from the power source and heat the adhesive surface of the trap portion, wherein the base portion is configured to removably engage the trap portion. In an embodiment of the seventh aspect, the heating element includes one or more heating wires configured to provide the adhesive surface with a predetermined heating profile. In an embodiment of the seventh aspect, the one or more heating wires are arranged in a pattern including a concentric pattern, a vertical pattern, a horizontal pattern, or a labyrinthine pattern. In an embodiment of the seventh aspect, the predetermined heating profile includes a uniform pattern or non-uniform pattern. In an embodiment of the seventh aspect, the one or more heating wires are constructed from conductive polymers, self correcting conductive polymers, metals, or metal oxides. In an embodiment of the seventh aspect, the heating wires are configured to maintain a temperature of the adhesive surface at approximately 30 °C to approximately 45 °C. In an embodiment of the seventh aspect, the heating wires are configured to maintain a temperature of the adhesive surface at approximately 33 °C to approximately 42 °C. In an embodiment of the seventh aspect, the base portion further includes a lighting element configured to illuminate the adhesive surface of the trap portion.

[13] In an eighth aspect, an insect trap is disclosed including: a trap portion including: a housing having an adhesive surface, wherein the adhesive surface is at least partially contained within the housing and is configured to adhere to an insect, a heating element configured to heat the adhesive surface; and a base portion including a mounting portion configured to receive power from a power source and configured to provide the power to the heating element, wherein the base portion is configured to removably engage the trap portion. In an embodiment of the eighth aspect, the heating element includes one or more heating wires configured to provide the adhesive surface with a predetermined heating profile. In an embodiment of the eighth aspect, the one or more heating wires are arranged in a pattern including a concentric pattern, a vertical pattern, a horizontal pattern, or a labyrinthine pattern. In an embodiment of the eighth aspect, the predetermined heating profile includes a uniform pattern or non-uniform pattern. In an embodiment of the eighth aspect, the one or more heating wires are constructed from conductive polymers, self correcting conductive polymers, metals, or metal oxides. In an embodiment of the eighth aspect, the heating wires are configured to maintain a temperature of the adhesive surface at approximately 30 °C to approximately 45 °C. In an embodiment of the eighth aspect, the heating wires are configured to maintain a temperature of the adhesive surface at approximately 33 °C to approximately 42 °C. In an embodiment of the eighth aspect, the base portion further includes a lighting element configured to illuminate the adhesive surface of the trap portion.

[14] Further objects, features, and advantages of the disclosure will be apparent from the following detailed description when taken in conjunction with the following drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[15] While the appended claims set forth the features of the present techniques with particularity, these techniques, together with their objects and advantages, may be best understood from the following detailed description taken in conjunction with the accompanying drawings of which:

[16] Figure **1** is a front perspective view of a first embodiment of an insect trap in accordance with principles of the disclosure;

[17] Figure **2** is a rear perspective view of a base portion of the insect trap of Figure **1**;

[18] Figure **3** is an exploded view of a trap portion of the insect trap of Figure **1**;

[19] Figure **4** is a cross-sectional view of the insect trap of Figure **1**;

[20] Figure **5** is a cross-sectional view of a second embodiment of an insect trap in accordance with principles of the disclosure;

[21] Figure **6** is a front perspective view of a third embodiment of an insect trap in accordance with principles of the disclosure;

[22] Figure **7** is a rear perspective view of a base portion of the insect trap of Figure **6**;

[23] Figure **8** is a front perspective view of a trap portion of the insect trap of Figure **6**;

[24] Figure **9** is a cross-sectional view of the insect trap of Figure **6**;

[25] Figure **10** is a front perspective view of a fourth embodiment of an insect trap in accordance with principles of the disclosure;

[26] Figure **11** is a rear perspective view of the insect trap of Figure **10**;

[27] Figure **12** is a front perspective view of a fifth embodiment of an insect trap in accordance with principles of the disclosure;

[28] Figure **13** is a rear perspective view of the insect trap of Figure **12**;

[29] Figure **14** is a front perspective view of the insect trap of Figure **12**;

[30] Figure **15** is a front perspective view of a trap portion of the insect trap of Figure **12**;

[31] Figure **16** is a cross-sectional view of the insect trap of Figure **12**;

[32] Figure **17** is a front perspective view of a sixth embodiment of an insect trap in accordance with principles of the disclosure;

[33] Figure **18** is a cross-sectional view of the insect trap of Figure **17**;

[34] Figure **19** is a front perspective view of an example of the sixth embodiment of an insect trap in accordance with principles of the disclosure;

[35] Figure **20** is a rear view of a membrane heating configuration of the insect trap of Figure **19**;

[36] Figure **21** is a rear view of a membrane heating configuration of the insect trap of Figure **19**;

[37] Figure **22** is a rear view of a membrane heating configuration of the insect trap of Figure **19**;

[38] Figure **23** is a cross-sectional view of the insect trap of Figure **19**;

[39] Figure **24** is an enlarged view of a portion of Figure **23**;

[40] Figure **25** is a cross-sectional view of a seventh embodiment of an insect trap in accordance with principles of the disclosure;

[41] Figure **26** is an enlarged view of a portion of Figure **25**;

[42] Figure **27** is a front perspective view of an eighth embodiment of an insect trap in accordance with principles of the disclosure;

[43] Figure **28** is a cross sectional view of the insect trap of Figure **27**;

[44] Figure **29** is an enlarged view of a portion of Figure **28**;

[45] Figure **30** is a front perspective view of a ninth embodiment of an insect trap in accordance with principles of the disclosure;

[46] Figure **31** is a cross sectional view of the insect trap of Figure **30**;

[47] Figure **32** is an enlarged view of a portion of Figure **31**;

[48] Figure **33** is a front perspective view of a tenth embodiment of an insect trap in accordance with principles of the disclosure;

[49] Figure **34** is a cross-sectional view of the insect trap of Figure **33**;

[50] Figure **35** is a front perspective view of an eleventh embodiment of an insect trap in accordance with principles of the disclosure;

[51] Figure **36** is a cross-sectional view of the insect trap of Figure **35**;

[52] Figure **37** is a front perspective view of a twelfth embodiment of an insect trap in accordance with principles of the disclosure;

[53] Figure **38** is a cross-sectional view of the insect trap of Figure **37**;

[54] Figure **39** is a front perspective view of a thirteenth embodiment of an insect trap in accordance with principles of the disclosure;

[55] Figure **40** is a cross-sectional view of the insect trap of Figure **39**;

[56] Figure **41** is a front perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[57] Figure **42** is a rear perspective view of the insect trap of Figure **41**;

[58] Figure **43** is a front perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[59] Figure **44** is a rear perspective view of the insect trap of Figure **43**;

[60] Figure **45** is a front perspective view of the trap portion of the insect trap of Figure **43**;

[61] Figure **46** is a front perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[62] Figure **47** is a front perspective view of the trap portion of the insect trap of Figure **46**;

[63] Figure **48** is a cross-sectional view of the insect trap of Figure **46**;

[64] Figure **49** is an enlarged view of a portion of Figure **48**;

[65] Figure **50** is a front perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[66] Figure **51** is an enlarged view of a portion of Figure **50**;

[67] Figure **52** is a cross-sectional view of the insect trap of Figure **50**;

[68] Figure **53** is an enlarged view of a portion of Figure **52**;

[69] Figure **54** is a front perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[70] Figure **55** is rear perspective view of the insect trap of Figure **54**;

[71] Figure **56** is a cross-sectional view of the insect trap of Figure **54**;

[72] Figure **57** is a rear perspective view of an example of the thirteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[73] Figure **58** is a cross-sectional view of the insect trap of Figure **57**:

[74] Figure **59** is an enlarged view of a portion of Figure **58**;

[75] Figure **60** is a front perspective view of a fourteenth embodiment of an insect trap in accordance with principles of the disclosure;

[76] Figure **61** is a cross-sectional view of the insect trap of Figure **60**;

[77] Figure **62** is a front perspective view of a fifteenth embodiment of an insect trap in accordance with principles of the disclosure;

[78] Figure **63** is a front perspective view of the insect trap of Figure **62**;

[79] Figure **64** is a front perspective view of the insect trap of Figure **62**;

[80] Figure **65** is a cross-sectional view of the insect trap of Figure **62**;

[81] Figure **66** is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[82] Figure **67** is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[83] Figure **68** is a cross-sectional view of the insect trap of Figure **67**;

[84] Figure **69** is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[85] Figure 70 is cross-sectional view of the insect trap of Figure 69;

[86] Figure 71 is an enlarged view of a portion of Figure 70;

[87] Figure 72 is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[88] Figure 73 is a cross-sectional view of the insect trap of Figure 72;

[89] Figure 74 is an enlarged view of a portion of Figure 73;

[90] Figure 75 is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[91] Figure 76 is a cross-sectional view of a portion of Figure 75;

[92] Figure 77 is an enlarged view of a portion of Figure 76;

[93] Figure 78 is a front perspective view of an example of the fifteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[94] Figure 79 is a front perspective view of a sixteenth embodiment of an insect trap in accordance with principles of the disclosure;

[95] Figure 80 is a cross-sectional view of the insect trap of Figure 79;

[96] Figure 81 is a rear perspective view of a seventeenth embodiment of an insect trap in accordance with principles of the disclosure;

[97] Figure 82 is a cross-sectional view of the insect trap of Figure 81;

[98] Figure 83 is an enlarged view of a portion of Figure 82;

[99] Figure 84 is a front perspective view of an example of the seventeenth embodiment of an insect trap in accordance with the principles of the disclosure;

[100] Figure 85 is a cross-sectional view of the insect trap of Figure 84;

[101] Figure 86 is an enlarged view of a portion of Figure 85;

[102] Figure 87 is a front perspective view of an eighteenth embodiment of an insect trap in accordance with principles of the disclosure;

[103] Figure 88 is a front perspective view of a nineteenth embodiment of an insect trap in accordance with principles of the disclosure;

[104] Figure 89 is a rear perspective view of the insect trap of Figure 88;

[105] Figure 90 is a front perspective view of an example of the nineteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[106] Figure 91 is a rear perspective view of the insect trap of Figure 90;

[107] Figure 92 is a side view of the insect trap of Figure 90;

[108] Figure 93 is a front perspective view of an example of the nineteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[109] Figure **94** is a front view of an example of the nineteenth embodiment of an insect trap in accordance with the principles of the disclosure;

[110] Figure **95** is a cross-sectional view of the insect of Figure **90**;

[111] Figure **96** is a front perspective view of a twentieth embodiment of an insect trap in accordance with principles of the disclosure;

[112] Figure **97** is a cross-sectional view of the insect trap of Figure **96**;

[113] Figure **98** is a rear perspective view of a twenty-first embodiment of an insect trap in accordance with principles of the disclosure;

[114] Figure **99** is a front perspective view of the insect trap of Figure **98**;

[115] Figure **100** is a cross-sectional view of the insect trap of Figure **98**;

[116] Figure **101** is an enlarged view of a portion of Figure **100**;

[117] Figure **102** is a front perspective view of a twenty-second embodiment of an insect trap in accordance with principles of the disclosure;

[118] Figure **103** is a front perspective view of the insect trap of Figure **102**;

[119] Figure **104** is a front perspective view of the insect trap of Figure **102**;

[120] Figure **105** is a cross-sectional view of the insect trap of Figure **102**;

[121] Figure **106** is a front perspective view of an example of the twenty-second embodiment of an insect trap in accordance with the principles of the disclosure;

[122] Figure **107** is a cross-sectional view of the insect trap of Figure **106**;

[123] Figure **108** is a front perspective view of a twenty-third embodiment of an insect trap in accordance with principles of the disclosure;

[124] Figure **109** is an enlarged view of a portion of Figure **108**;

[125] Figure **110** is a cross-sectional view of the insect trap of Figure **108**;

[126] Figure **111** is an enlarged view of a portion of Figure **110**;

[127] Figure **112** is a cross-sectional view of the insect trap of Figure **108**;

[128] Figure **113** is an enlarged view of a portion of Figure **112**;

[129] Figure **114** is a front perspective view of an example of the twenty-third embodiment of an insect trap in accordance with the principles of the disclosure;

[130] Figure **115** is an enlarged view of a portion of Figure **114**;

[131] Figure **116** is a cross-sectional view of the insect trap of Figure **114**;

[132] Figure **117** is an enlarged view of a portion of Figure **116**;

[133] Figure **118** is a cross-sectional view of the insect trap of Figure **114**;

[134] Figure **119** is an enlarged view of a portion of Figure **118**;

[135] Figure **120** is a front perspective view of an example of the twenty-third embodiment of an insect trap in accordance with the principles of the disclosure;

[136] Figure **121** is an exploded view of a trap portion of the insect trap of Figure **120**:

[137] Figure **122** is a cross-sectional view of the insect trap of Figure **120**;

[138] Figure **123** is an enlarged view of a portion of Figure **122**;

[139] Figure **124** is a cross-sectional view of the insect trap of Figure **120**;

[140] Figure **125** is an enlarged view of a portion of Figure **124**;

[141] Figure **126** is a front perspective view of an example of the twenty-third embodiment of an insect trap in accordance with the principles of the disclosure;

[142] Figure **127** is a cross-sectional view of the insect trap of Figure **126**;

[143] Figure **128** is an enlarged view of a portion of Figure **127**;

[144] Figure **129** is a front perspective view of a twenty-fourth embodiment of an insect trap in accordance with principles of the disclosure;

[145] Figure **130** is a front perspective view of the insect trap of Figure **129**;

[146] Figure **131** is a cross-sectional view of the insect trap of Figure **129**;

[147] Figure **132** is a front perspective view of a twenty-fifth embodiment of an insect trap in accordance with principles of the disclosure;

[148] Figure **133** is a cross-sectional view of the insect trap of Figure **132**;

[149] Figure **134** is a front perspective view of an example of the twenty-fifth embodiment of an insect trap in accordance with the principles of the disclosure;

[150] Figure **135** is a front perspective view of an example of the twenty-fifth embodiment of an insect trap in accordance with the principles of the disclosure;

[151] Figure **136** is a rear perspective view of the insect trap of Figure **135**;

[152] Figure **137** is a front perspective view of a twenty-sixth embodiment of an insect trap in accordance with principles of the disclosure;

[153] Figure **138** is a cross-sectional view of the insect trap of Figure **137**;

[154] Figure **139** is a front perspective view of a twenty-seventh embodiment of an insect trap in accordance with principles of the disclosure;

[155] Figure **140** is a front perspective view of a twenty-eighth embodiment of an insect trap in accordance with the principles of the disclosure; and

[156] Figure **141** is a front perspective view of an example of the twenty-eighth embodiment of an insect trap in accordance with the principles of the disclosure.

DETAILED DESCRIPTION

[157] With reference to the drawings, Figure **1** is a front perspective view of an embodiment of an insect trap, indicated generally at **110**. Insect trap **110** includes a base portion **112** and a removable trap portion **114**. Insect trap **110** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **110** protrudes from the wall, is the smallest of the three overall dimensions. A front surface **160** of base portion **112** may include a switch **116**, configurable to enable insect trap **110** to be turned on or off by closing or opening switch **116** as desired by the user. Alternatively, switch **116** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Switch **116** may be manually operated, although switch **116** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any other method or combination of methods for opening or closing switch **116**. Trap portion **114** includes a front housing **118** with at least one opening **120** in a front surface **168**. Opening **120** in front housing **118** may be configured to admit a wide variety of insects into insect trap **110**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **120** is configured to prevent the user's fingers from penetrating opening **120** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **114**. In some embodiments, opening **120** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **120**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **120**. Opening **120** may be of uniform or of varying width, shape and orientation, and if trap portion **114** has more than one opening **120**, they may be of identical or of differing widths, shapes and orientations. Opening **120** may be configured to attract one or more individual insect species or a variety of insect species.

[158] Figure **2** is a rear perspective view of base portion **112** of insect trap **110** with trap portion **114** removed. Protruding from a rear surface **162** of base portion **112** are a plurality of electrically conductive prongs **122**, adapted to mount insect trap **110** to a wall and provide power to insect trap **110** by inserting conductive prongs

122 into a standard household electrical wall socket. Alternatively, conductive prongs **122** may be adapted to swivel to allow insect trap **110** to remain upright when conductive prongs **122** are inserted into a horizontally-oriented household electrical wall socket. Alternatively, base portion **112** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **112**. While an electrical socket and batteries have been described as providing power to insect trap **110**, any suitable power source may be used. Base portion **112** includes a lighting element such as one or more light emitting diodes (LEDs) **124**. In some embodiments, LEDs **124** include at least one that emits ultraviolet (UV) light and at least one that emits visible light. In some embodiments, LEDs **124** include at least one that emits UV light and at least one that emits blue light, to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **124** include at least one that emits infrared (IR) light, to better attract certain species of insects such as mosquitos. Mounted in a top surface **126** of base portion **112** may be a transparent or translucent window **128**, shown partially cut away to reveal LEDs **124**. Window **128** protects LEDs **124** from dust and insect debris, and allows base portion **112** to be easily cleaned. In top surface **126** may be a slot **130**, and on the perimeter **164** of top surface **126** is a rim or upwardly directed protrusions **132**.

[159] Figure **3** is an exploded view of trap portion **114** of insect trap **110**. Trap portion **114** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **114** is mounted in insect trap **110**, and insect trap **110** is mounted to a wall, the overall depth of trap portion **114**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **114**. Trap portion **114** includes a divider **134** which may have a front surface **138**, and a rear housing **140**. In some embodiments, divider **134** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **136** on front surface **138**. Adhesive **136** is shown partly cut away in this view. In some embodiments, divider **134** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **134** and the material and thickness of

adhesive **136** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **134** and adhesive **136**. In some embodiments, rear housing **140** includes a reflective-coated inside surface **142**. Alternatively, the material and surface finish of rear housing **140** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. Rear housing **140** may include at least one opening **144** on its bottom surface **166**, or alternatively opening **144** may be replaced by a transparent or translucent window (not shown).

[160] In some embodiments, front housing **118** and rear housing **140** are thermoformed from opaque sheet plastic. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **118** and rear housing **140** are constructed by injection molding, casting or by other suitable manufacturing techniques. As shown, divider **134** is substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, divider **134** may have ribs or other features that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[161] In some embodiments, front housing **118** may be coated with transparent, translucent or opaque adhesive on an inside surface **170** to provide additional insect trapping efficiency and capacity. In addition, front housing **118** may also have a reflective coating (not shown) underneath the adhesive coating on inside surface **170** to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[162] In some embodiments, front housing **118**, divider **134** and rear housing **140** are joined together at their perimeters with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **114** may also include one or more insect attractants. For example, trap portion **114** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun,

muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of insect trap **110**. In such embodiments, the insect attractant is integral to trap portion **114**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on inside surface **170** or an outside surface of front housing **118** or through opening **120** in front housing **118** or on front surface **138** of divider **134**. Alternatively, water may be embedded or contained in the separate part in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate part in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from insect trap **110**.

[163] Figure **4** is a cross-sectional view of insect trap **110**. As shown, divider **134** separates trap portion **114** into a front enclosure **146** and a rear enclosure **148**. In some embodiments, base portion **112** includes a circuit board **150** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **122**, only one of which is shown, switch **116** and LEDs **124**, only one of which is shown. For clarity, however, not all of the electrical connections are shown. Circuit board **150** may include electronic circuitry to receive ordinary household current from conductive prongs **122**, respond to the position of switch **116** and provide power to illuminate LEDs **124**. Circuit board **150** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **124** when switch **116** is in the closed position, although it may also provide a varying voltage to LEDs **124** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering

frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **150** may provide power to LEDs **124** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **124** or to only visible light LEDs **124** or to only IR light LEDS **124**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **150** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in the base portion **112** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **110**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **110**. Circuit board **150** may also include one or more electrical heating elements **156** such as one or more resistance heating coils, or one or more resistors, or one or more heat exchanging elements (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and / or move heat, which may transmit through base portion **112** and into trap portion **114**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **124** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **124** may be replaced or augmented by one or

more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **114** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[164] As shown, slot **130** in top surface **126** of base portion **112** and protrusions **132** on top surface **126** of base portion **112** engage with trap portion **114** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **114** to be securely but removably mounted to base portion **112**. A bottom surface **154** of base portion **112** may be substantially flat or concave to allow insect trap **110** to sit upright on a floor, desk, table or shelf when insect trap **110** is unplugged. Alternatively, bottom surface **154** of base portion **112** may have two or more protrusions or legs (not shown) that allow insect trap **110** to sit upright when insect trap **110** is unplugged.

[165] In the operation of insect trap **110**, conductive prongs **122** are inserted into a wall electrical socket, and switch **116** is moved to a closed position. LEDs **124** emit light, represented by arrows, preferably UV and visible light, which is transmitted through window **128** in base portion **112**, through opening **144** in bottom surface **166** of rear housing **140** of trap portion **114**, into rear enclosure **148**, and directly onto inside surface **142** of rear housing **140** and a rear surface **152** of divider **134**. Because light from LEDs **124** enters rear enclosure **148** through opening **144** in bottom surface **166** of rear housing **140** of trap portion **114** (e.g., in a face that is substantially parallel to the overall depth of trap portion **114**), the light from LEDs **124** can travel the entire length of rear enclosure **148** and can diverge over the entire length of rear enclosure **148,** and therefore can be more evenly distributed throughout rear enclosure **148**. In some embodiments, light is not manipulated in base portion **112** and is emitted directly into trap portion **114**. Inside surface **142** of rear housing **140** may include a concave shape and may be configured to reflect and disperse the light from LEDs **124** to distribute the light evenly onto rear surface **152** of divider **134**, although inside surface **142** of rear housing **140** may have a convex or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly

distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **152** of divider **134**, may be mounted to rear housing **140** at or near opening **144** or mounted to base portion **112** at or near window **128**, and may replace or augment the role of inside surface **142** of rear housing **140**. In some embodiments, the light from LEDs **124** directly strikes rear surface **152** of divider **134** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and spreads across divider **134**, and replaces or augments the role of inside surface **142** of rear housing **140** or of the lens or lenses mounted to rear housing **140**.

[166] Thereafter, light transmits through divider **134** and adhesive **136** on front surface **138**, and into front enclosure **146**. Light may be further evenly distributed by the light-diffusing properties of divider **134**, adhesive **136** on front surface **138**, or both. A portion of the light entering front enclosure **146** continues through opening **120** in front housing **118** and is emitted into the surrounding area where the insect trap **110** is installed. Insects are attracted to the light emitted through adhesive coating **136** and through opening **120** in front housing **118**, and fly or crawl into opening **120** and onto adhesive **136**, where they become trapped in the adhesive (e.g., from adhesive **136**). A user may observe trapped insects by looking through opening **120** in front housing **118**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **114** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **114**, and replace it with a new trap portion **114**. New trap portion **114** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **110** will continue to efficiently and effectively attract and trap insects.

[167] In some embodiments, because trap portion **114** mounts on top of, and not in front of, base portion **112**, insect trap **110** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **110** is configured such that when insect trap **110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **110** protrudes from the wall, is smaller than its overall height and its overall width.

[168] It should be appreciated that a benefit of insect trap **110** is the manipulation of light within trap portion **114**. In some embodiments, light manipulation occurs solely within trap portion **114**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **142**, divider **134** and adhesive **136**). In some embodiments, light manipulation produces an even distribution of light on adhesive **136**. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive **136** or within trap portion **114**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[169] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[170] An insect trap **110** of this configuration may accommodate a variety of different trap portions **114** that may be removably mounted to base portion **112**, each trap portion **114** being uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, the overall size and shape of trap portion **114**, and the size, shape, location and orientation of opening **120** in front housing **118** of trap portion **114**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **114** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **114** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **114** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[171] In some embodiments, base portion **112** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **112** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to

80mm deep. In some embodiments, base portion **112** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[172] As provided herein, opening **120** may be a variety of shapes and/or sizes. For example, opening **120** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **120** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **120** is circular, opening **120** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **120** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **120** is approximately 0.5mm to 15mm in diameter. When opening **120** is slot shaped, opening **120** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **120** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **120** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[173] In some embodiments, opening **120** covers all or a portion of front housing **118**. For example, opening **120** may cover a range of approximately 1% to 75% of the surface area of front housing **118**. In some embodiments, opening **120** covers approximately 5% to 50% of the surface area of front housing **118**. In some embodiments, opening **120** covers approximately 10% to 30% of the surface area of front housing **118**.

[174] Figure **5** is a cross-sectional view of a second embodiment of an insect trap, indicated generally at **210**. Insect trap **210** includes a base portion **212** and a removable trap portion **214**. Insect trap **210** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **210** protrudes from the wall, is the smallest of the three overall dimensions. Protruding from a back surface **262** of base portion **212** are a plurality of electrically conductive prongs **216**, only one of which is shown, adapted to mount insect trap **210** to a wall and provide power to insect trap **210** by inserting conductive prongs **216** into a standard household electrical wall socket. Alternatively, conductive prongs **216** may be adapted to swivel to allow insect trap **210** to remain upright when conductive prongs **216** are inserted into a horizontally-oriented household electrical wall socket. Alternatively, base portion **212** may be configured to sit or hang wherever desired and receive power from

batteries (not shown) mounted in base portion **212**. While an electrical socket and batteries have been described as providing power to insect trap **210**, any suitable power source may be used. Base portion **212** includes a lighting element such as one or more LEDs **218**, only one of which is shown. In some embodiments, LEDs **218** include at least one that emits ultraviolet (UV) light and at least one that emits visible light. In some embodiments, LEDs **218** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **218** include at least one that emits infrared (IR) light, to better attract certain species of insects such as mosquitos and fleas.

[175] In some embodiments, mounted in a top surface **220** of base portion **212** is a transparent or translucent window **222**. Window **222** protects LEDs **218** from dust and insect debris, and allows base portion **212** to be easily cleaned. Top surface **220** of base portion **212** may include a slot **224**, and on perimeter **270** of top surface **220** are upwardly directed protrusions **226**. Trap portion **214** includes a front housing **228** with at least one opening **230** and a light-conducting body **238**. Opening **230** in front housing **228** may be configured to admit a wide variety of insects into insect trap **210**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **230** is configured to prevent user's fingers from penetrating opening **230** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **214**. In some embodiments, opening **230** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **230**, and has a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **230**. Opening **230** may be of uniform or of varying width, shape and orientation, and if trap portion **214** has more than one opening **230**, they may be of identical or of differing widths, shapes and orientations. Opening **230** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, light-conducting body **238** includes a front surface **254**, an adhesive coating or an adhesive layer **234** on front surface **254**, and a rear cover **248**. In some embodiments, the material and thickness of adhesive layer **234** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through adhesive

layer **234**. Light-conducting body may be tapered and configured to receive light through a bottom surface **240** from LEDs **218** and deflect and evenly distribute the light (e.g., through front surface **254** and adhesive layer **234**). Rear cover **248** may be configured to prevent light from escaping through a top surface **242**, a back surface **256** and side surfaces (not shown) of light-conducting body **238**. As provided herein, any suitable light-conducting body may be used.

[176] In some embodiments, front housing **228** is thermoformed from opaque plastic sheet, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **228** is constructed by injection molding, casting or by other suitable manufacturing techniques. Front housing **228** may also be coated with transparent, translucent or opaque adhesive on an inside surface **250** to provide additional insect trapping efficiency and capacity. In addition, front housing **228** may also have a reflective coating (not shown) underneath the adhesive coating on inside surface **250** to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **228** and light-conducting body **238** may be joined together where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined by adhesive or by other commonly used packaging assembly techniques or by any other suitable assembly method.

[177] As shown, front housing **228** and light-conducting body **238** together form a front enclosure **246**. Light-conducting body **238** may be tapered (e.g., thicker at bottom surface **240** and thinner at top surface **242**), and may be constructed from any transparent material that conducts UV and/or IR and/or visible light, such as acrylic or polycarbonate plastic. The inside surfaces (not shown) of rear cover **248** may have a reflective coating to reflect light back into light-conducting body **238** and through front surface **254**, thereby increasing its light-transmitting efficiency. Light-conducting body **238** may also have facets or other light-directing features of varying size, depth, and density on front surface **254** to enhance its light-transmitting efficiency. Alternatively, in some embodiments, light-conducting body **238** has facets or other light-directing features on front surface **254** and not be tapered. Light-conducting body **238** with microscopic facets or other features on front surface **254** is commonly referred to as a Light

Guide Plate, although the facets or other features may also be larger and still function effectively.

[178] Alternatively, in some embodiments, light-conducting body **238** may not have an adhesive coating, and light conducting body **238** and rear cover **248** may be part of base portion **212**. In such embodiments, trap portion **214** may include a transparent or translucent back plate (not shown) with an adhesive coating on its front surface, attached at its perimeter to front housing **228**.

[179] The materials of the trap portion **214** may also include one or more insect attractants. For example, trap portion **214** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of insect trap **210**. In such embodiments, the insect attractant is integral to trap portion **214**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on inside surface **250** or on an outside surface of front housing **228** or through opening **230** in front housing **228** or on front surface **254** of light-conducting body **238**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **210**.

[180] In some embodiments, base portion **212** includes a circuit board **252** having a programmable processor or chip (not shown) for executing commands, electrically

connected to conductive prongs **216** and LEDs **218**. For clarity, however, not all of the electrical connections are shown. Circuit board **252** may include electronic circuitry to receive ordinary household current from conductive prongs **216** and provide power to illuminate LEDs **218**. Circuit board **252** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **218**, although it may also provide a varying voltage to LEDs **218** to provide a flickering light, which may mimic movement that some species of insects, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range from 0.05Hz (e.g., to mimic the breathing rate of large mammals), to 270Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **252** may provide power to LEDs **218** to provide UV and/or visible and/or IR light although it may be configured to provide power to only UV LEDs **218**, or to only visible light LEDs **218**, or to only IR LEDs **218**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **252** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **212** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **210**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter distance from insect trap **210**. Circuit board **252** may also include one or more electrical heating

elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **212** and into trap portion **214**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **218** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **218** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **214** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[181] As shown, slot **224** in top surface **220** of base portion **212** and protrusions **226** on top surface **220** of base portion **212** engage with trap portion **214** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **214** to be securely but removably mounted on base portion **212**. A bottom surface **236** of base portion **212** may be substantially flat or concave to allow insect trap **210** to sit upright on a floor, desk, table or shelf when insect trap **210** is unplugged. Alternatively, bottom surface **236** of base portion **212** may have two or more protrusions (not shown) or legs that allow insect trap **210** to sit upright when insect trap **210** is unplugged.

[182] In the operation of the insect trap **210**, conductive prongs **216** are inserted into a wall electrical socket, and LEDs **218** emit light, represented by arrows, preferably UV and visible light. The light from LEDs **218** transmit through window **222**, enter bottom surface **240** of light-conducting body **238** and repeatedly reflect off of front surface **254** and back surface **256**. In some embodiments, light is not manipulated in base portion **212** and is emitted directly into trap portion **214**. A portion of the reflected light transmits through front surface **254** of light-conducting body **238** to provide an evenly-distributed light onto and through adhesive layer **234** and into front enclosure **246**. The light may be further evenly distributed by refractive and light-diffusing properties of

adhesive layer **234** on front surface **254** of light-conducting body **238**. A portion of the light entering front enclosure **246** continues through opening **230** in front housing **228** and is emitted into the surrounding area where insect trap **210** is installed. Insects are attracted to the light transmitted through adhesive layer **234** and through opening **230** in front housing **228**, and fly or crawl through opening **230** and onto adhesive layer **234**, where they become trapped in the adhesive. The user may observe trapped insects by looking through opening **230** in front housing **228**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **214** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **214**, and replace it with a new trap portion **214**. New trap portion **214** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **210** will continue to efficiently and effectively attract and trap insects.

[183] In some embodiments, because trap portion **214** mounts on top of, and not in front of, base portion **212**, insect trap **210** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **210** is configured such that when insect trap **210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **210** protrudes from the wall, is smaller than its overall height and its overall width.

[184] It should be appreciated that a benefit of insect trap **210** is the manipulation of light within trap portion **214**. In some embodiments, light manipulation occurs solely within trap portion **214**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., light-conducting body **238**, front surface **254**, back surface **256**, and adhesive layer **234**). In some embodiments, light manipulation produces an even distribution of light on adhesive layer **234**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive layer **234** or within trap portion **214**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[185] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers,

styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[186] Insect trap **210** of this configuration may accommodate a variety of different trap portions **214** that may be removably mounted to base portion **212**, each trap portion **214** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **214**, and the size, shape, location and orientation of opening **230** in front housing **228** of trap portion **214**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **214** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **214** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **214** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[187] In some embodiments, base portion **212** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **212** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **212** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[188] As provided herein, opening **230** may be a variety of shapes and/or sizes. For example, opening **230** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **230** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **230** is circular, opening **230** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **230** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **230** is approximately 0.5mm to 15mm in diameter. When opening **230** is slot shaped, opening **230** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **230** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **230** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[189] In some embodiments, opening **230** covers all or a portion of front housing **228**. For example, opening **230** may cover a range of approximately 1% to 75% of the surface area of front housing **228**. In some embodiments, opening **230** covers approximately 5% to 50% of the surface area of front housing **228**. In some embodiments, opening **230** covers approximately 10% to 30% of the surface area of front housing **228**.

[190] Figure **6** is a front perspective view of a third embodiment of an insect trap, indicated generally at **310**. Insect trap **310** may include a base portion **312** and a removable trap portion **314**. Insect trap **310** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **310** protrudes from the wall, is the smallest of the three overall dimensions. In some embodiments, front surface **360** of base portion **312** includes a switch **316**, configurable to enable insect trap **310** to be turned on or off by closing or opening switch **316** as desired by the user. Alternatively, switch **316** may be configured to control other features such as light intensity, combinations of light wavelengths, different flickering frequencies or modes, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Switch **316** may be manually operated, although switch **316** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any method for opening or closing switch **316**. Trap portion **314** may include a housing **318** with at least one opening **320**. Opening **320** in housing **318** may be configured to admit a wide variety of insects into insect trap **310**, or alternatively it may be configured to admit one or more specific insect species. Opening **320** may preferably be configured to prevent user's fingers from penetrating opening **320** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **314**. Opening **320** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through opening **320**, and opening **320** may preferably have a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **320**. Opening **320** may be of uniform or of varying width, shape and orientation, and if trap portion **314** has more than one opening **320**, they may be of identical or of differing widths, shapes and orientations.

[191] Figure 7 is a rear perspective view of base portion **312** of insect trap **310**. Protruding from a rear surface **362** of base portion **312** are a plurality of electrically conductive prongs **322**, adapted to mount insect trap **310** to a wall and provide power to insect trap **310** by inserting into a standard household electrical wall socket. Alternatively, conductive prongs **322** may be adapted to swivel to allow insect trap **310** to remain upright when conductive prongs **322** are inserted into a horizontally-oriented household electrical wall socket. Alternatively, base portion **312** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **312**. While an electrical socket and batteries have been described as providing power to insect trap **310**, any suitable power source may be used. Base portion **312** includes a lighting element such as one or more LEDs **324**. In some embodiments, LEDs **324** include one that emits ultraviolet (UV) light and one that emits visible light. In some embodiments, LEDs **324** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **324** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas. Mounted in a top surface **326** of base portion **312** may be a transparent or translucent window **328**, shown partially cut away to reveal LEDs **324**. Window **328** protects LEDs **324** from dust and insect debris, and allows base portion **312** to be easily cleaned. Upwardly directed protrusions or a rim **330** protruding from the perimeter **364** of top surface **326** of base portion **312** may serve to secure trap portion **314** in place during use, although any other form of attachment may be substituted that allows trap portion **314** to be securely but removably mounted to base portion **312**.

[192] Figure **8** is a front perspective view of trap portion **314** of insect trap **310**. Trap portion **314** includes housing **318**, which forms an enclosure, and a transparent or translucent adhesive coating applied to one or more inside surfaces **334**. In some embodiments, the material and thickness of housing **318** and the material and thickness of the adhesive coating are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through housing **318** and the adhesive coating. In some embodiments, housing **318** is thermoformed from opaque plastic

sheet, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, housing **318** is constructed by injection molding or by other suitable manufacturing techniques.

[193] As shown, housing **318** includes ribs **336** or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into an interior **370** of trap portion **314**. A sleeve **338**, configured to reduce the amount of light emitted by an outside surface **368** of housing **318**, covers outside surface **368** of housing **318** except for a bottom surface **366** and at opening **320**. In some embodiments, sleeve **338** is thermoformed from opaque sheet plastic, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, sleeve **338** includes a reflective coating on one or more of its inside surfaces (not shown), allowing sleeve **338** to direct more light through inside surfaces **334** of housing **318** and further enhance the insect attracting and trapping efficiency and effectiveness. In some embodiments, sleeve **338** is replaced by a coating configured to reduce the amount of light emitted by outside surface **368** of housing **318**, or by the coating applied over a reflective coating, applied to outside surface **368** of housing **318**, except for bottom surface **366**.

[194] The materials of the trap portion **314** may also include one or more insect attractants. For example, trap portion **314** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that increases the insect-attracting efficiency of insect trap **310**. In such embodiments, the insect attractant is integral to trap portion **314**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on inside surfaces **334** of housing **318** or through opening **320** in housing **318**. Alternatively, water may be

embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **310**.

[195] Figure **9** is a cross-sectional view of insect trap **310**. In some embodiments, base portion **312** includes a circuit board **340** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **322**, only one of which is shown, switch **316** and LEDs **324**, only one of which is shown. For clarity, however, not all of the electrical connections are shown. Circuit board **340** may include electronic circuitry to receive ordinary household current from conductive prongs **322**, respond to the position of switch **316** and provide power to illuminate LEDs **324**. Circuit board **340** may include an energy stabilizer such as a full wave rectifier filter circuit or any other circuit that provides steady voltage to LEDs **324** when switch **316** is in a closed position, although it may also provide a varying voltage to LEDs **324** to provide a flickering light, which may mimic movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 250Hz (e.g., the highest flicker frequency attracting male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **340** may provide power to LEDs **324** to provide both UV and/or visible and/or IR light, although it could be configured to provide power to only the UV LEDs **324** or to only the visible light LEDs **324** or to only the IR LEDs **324**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **340** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **312** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit

recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from trap **310**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **310**. Circuit board **340** may also include one or more electrical heating elements **342** such as one or more resistors or resistance heating elements, or one or more heat exchanging elements (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **312** and into trap portion **314**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **324** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **324** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **314** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[196] In the operation of insect trap **310**, conductive prongs **322** are inserted into a wall electrical socket and switch **316** is moved to a closed position. LEDs **324** emit light, represented by arrows, which transmits through window **328** in base portion **312** and through bottom surface **366** of housing **318**. In some embodiments, light is not manipulated in base portion **312** and is emitted directly

into trap portion **314**. A portion of the light continues within the enclosure, up one or more sides **372** of housing **318**, and out through inside surfaces **334**. Another portion of the light continues through bottom surface **366** of housing **318** and into the enclosure, where it illuminates inside surfaces **334**. A portion of the light entering housing **318** continues through opening **320** and is emitted into the surrounding area where the trap is installed. Insects in the area are attracted to the light transmitted through opening **320** and fly or crawl into opening **320** and onto inside surfaces **334**, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through opening **320**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **314** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **314**, and replace it with a new trap portion **314**. New trap portion **314** has fresh adhesive-coated inside surfaces **334**, housing **318** has a clean bottom surface **366** through which the light is transmitted into trap portion **314**, and the transparent or translucent material of trap portion **314** has not been degraded by prolonged exposure to UV light from LEDs **324**, thereby ensuring that insect trap **310** will continue to efficiently and effectively attract and trap insects.

[197] In some embodiments, because trap portion **314** mounts on top of, and not in front of, base portion **312**, insect trap **310** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **310** is configured such that when insect trap **310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **310** protrudes from the wall, is smaller than its overall height and its overall width.

[198] It should be appreciated that a benefit of insect trap **310** is the manipulation of light within trap portion **314**. In some embodiments, light manipulation occurs solely within trap portion **314**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., housing **318** and inside surfaces **334**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within

trap portion **314**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[199] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[200] Insect trap **310** of this configuration may accommodate a variety of different trap portions **314** that may be removably mounted to base portion **312**, each trap portion **314** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **314**, and the size, shape, location and orientation of opening **320** in housing **318** of trap portion **314**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **314** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **314** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **314** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[201] In some embodiments, base portion **312** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **312** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **312** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[202] As provided herein, opening **320** may be a variety of shapes and/or sizes. For example, opening **320** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **320** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **320** is circular, opening **320** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **320** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **320** is approximately 0.5mm to 15mm in

diameter. When opening **320** is slot shaped, opening **320** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **320** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **320** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[203] In some embodiments, opening **320** covers all or a portion of trap portion **314**. For example, opening **320** may cover a range of approximately 1% to 75% of the surface area of trap portion **314**. In some embodiments, opening **320** covers approximately 5% to 50% of the surface area of trap portion **314**. In some embodiments, opening **320** covers approximately 10% to 30% of the surface area of trap portion **314**.

[204] Although as shown in the embodiments of Figures **1-9**, the trap portion mounts on a top surface of the base portion, other configurations are also contemplated. For example, Figures **10** and **11** show a fourth embodiment of an insect trap, where the trap portion mounts to the front of the base portion.

[205] Figure **10** is a front perspective view and Figure **11** is a rear perspective view, both showing a fourth embodiment of an insect trap, indicated generally at **410**. Insect trap **410** includes a base portion **412** and a removable trap portion **420**. Trap portion **420** is shown removed from base portion **412** in both views. Protruding from a rear surface **432**of base portion **412** are a plurality of electrically conductive prongs **434**, adapted to mount insect trap **410** to a wall and provide power to insect trap **410** by inserting into a standard household electrical wall socket. Alternatively, base portion **412** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **412**. While an electrical socket and batteries have been described as providing power to insect trap **410**, any suitable power source may be used. A lighting element such as one or more LEDs **414** may be mounted on a cross-shaped protrusion **416** protruding from a front surface **418** of base portion **412**. Alternatively, LEDs **414** may form a protrusion themselves. While shown as a cross-shaped protrusion, the mounting surface and/or configuration of LEDs **414** may be any desired shape. In some embodiments, base portion **412** includes a circuit board (not shown) having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **434** and LEDs **414**. Trap portion **420** includes a housing **450** of translucent or transparent

material with one or more adhesive-coated inside surfaces **422** and at least one opening **424**. In some embodiments, the material and thickness of housing **450** and the material and thickness of the adhesive are selected to transmit a substantial proportion of the light, for example greater than 60% of the light is transmitted through housing **450** and the adhesive coating. Opening **424** may be configured to admit a wide variety of insects into insect trap **410**, or alternatively it may be configured to admit one or more specific insect species. Opening **424** may be configured to prevent user's fingers from penetrating opening **424** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **420**. Opening **424** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through the at least one opening **424**, and opening **424** may preferably have a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **424**. Opening **424** may be of uniform or of varying width, shape and orientation, and if trap portion **420** has more than one opening **424**, they may be of identical or of differing widths, shapes and orientations. Trap portion **420** may include a coating (not shown) configured to reduce the amount of light emitted by its outside surfaces **452**, on outside surfaces **452** except for at opening **424** and at a cross-shaped blind cavity **426** in its rear surface **428**. As shown, blind cavity **426** is cross-shaped **454**, but may be any desired shape. For example, cross-shaped protrusion **416** on front surface **418** of base portion **412** may engage with a recess in cross-shaped cavity **454** in rear surface **428** of trap portion **420** to removably attach trap portion **420** to base portion **412**. In this configuration, therefore, trap portion **420** mounts in front of base portion **412**.

[206] In the operation of insect trap **410**, base portion **412** is plugged into an electrical wall socket and trap portion **420** is mounted in front of base portion **412**. Light from LEDs **414** transmit into cross-shaped cavity **454** in rear surface **428** of trap portion **420**. In some embodiments, light is not manipulated in base portion **412** and is emitted directly into trap portion **420**. A portion of the light continues within the translucent or transparent walls of trap portion **420**, diffusing the light and spreading it evenly within trap portion **420** and through inside surfaces **422**. Another portion of the light continues through the rear wall of trap portion **420** and into the interior **430** of trap portion **420**, where it illuminates inside surfaces **422**. A portion of the light entering trap portion **420** continues through opening

424 and into the room where insect trap **410** is installed. Insects in the room are attracted to the light transmitted through opening **424**, and fly or crawl into opening **424** and onto inside surfaces **422**, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through opening **424**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **420** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **420**, and replace it with a new trap portion **420**. The new trap portion **420** has fresh adhesive-coated inside surfaces **422**, a clean cross-shaped cavity **426** in rear surface **428** through which the light is transmitted into trap portion **420**, and the transparent or translucent material of trap portion **420** has not been degraded by prolonged exposure to UV light from LEDs **414**, thereby ensuring that insect trap **410** will continue to efficiently and effectively attract and trap insects.

[207] It should be appreciated that a benefit of insect trap **410** is the manipulation of light within trap portion **420**. In some embodiments, light manipulation occurs solely within trap portion **420**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., trap portion **420** and inside surfaces **422**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **420**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[208] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[209] An insect trap **410** of this configuration may accommodate a variety of different trap portions **420** that may be removably mounted to base portion **412**,

each trap portion **420** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **420**, and the size, shape, location and orientation of opening **424** in trap portion **420**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **420** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **420** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **420** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[210] In some embodiments, base portion **412** is approximately 10mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **412** is 10mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **412** is 10mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[211] As provided herein, opening **424** may be a variety of shapes and/or sizes. For example, opening **424** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **424** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **424** is circular, opening **424** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **424** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **424** is approximately 0.5mm to 15mm in diameter. When opening **424** is slot shaped, opening **424** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **424** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **424** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[212] In some embodiments, opening **424** covers all or a portion of trap portion **420**. For example, opening **424** may cover a range of approximately 1% to 75% of the surface area of trap portion **420**. In some embodiments, opening **424** covers approximately 5% to 50% of the surface area of trap portion **420**. In some embodiments, opening **424** covers approximately 10% to 30% of the surface area of trap portion **420**.

[213] Figure **12** is a front perspective view and Figure **13** is a rear perspective view showing a fifth embodiment of an insect trap, indicated generally at **510**. Insect trap **510** includes a base portion **512** and a removable trap portion **514**. Insect trap **510** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **510** is mounted to a wall, its overall depth, defined by the overall distance insect trap **510** protrudes from the wall, is the smallest of the three overall dimensions. Base portion **512** includes a housing **516** with a top opening **518** on its top surface **560** to receive trap portion **514**, at least one front opening **520** on its front surface **562**, and a plurality of electrically conductive prongs **522** on its rear surface **564**, adapted to mount insect trap **510** to a wall and provide power to insect trap **510** by inserting into a standard household electrical wall socket. Alternatively, conductive prongs **522** may be adapted to swivel to allow insect trap **510** to remain upright when conductive prongs **522** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **512** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **512**. While an electrical socket has been described as providing power to insect trap **510**, any suitable power source may be used. Front opening **520** may be configured to admit a wide variety of insects into insect trap **510**, or alternatively it may be configured to admit one or more specific insect species. Front opening **520** may be configured to prevent user's fingers from penetrating front opening **520** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **514**. Front opening **520** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through front opening **520**, and front opening **520** may preferably have a size and shape such that a sphere 1mm in diameter may pass through any portion of front opening **520**. Front opening **520** may be of uniform or of varying width, shape and orientation, and if trap portion **514** has more than one front opening **520**, they may be of identical or of differing widths, shapes and orientations. In some embodiments, base portion **512** is injection molded of opaque plastic, although other materials and construction techniques could also be used.

[214] Figure **14** is a front perspective view of insect trap **510**. Trap portion **514** is shown partially removed from base portion **512** in this view. Trap portion **514** may include a housing **524** with at least one opening **526** and a tab **528** adapted

for removing and replacing trap portion **514**. Trap portion **514** may be removed by grasping tab **528** and lifting trap portion **514** out of housing **516** of base portion **512**. Opening **526** in trap portion **514** may correspond to front opening **520** in base portion **512** with respect to size, shape, orientation and location, so that they may align when trap portion **514** is mounted into base portion **512**. In such embodiments, trap portion **514** may be viewed as an inner sleeve or pocket and base portion **512** may be viewed as an outer sleeve, where the inner sleeve can be dropped or inserted into the outer sleeve by a user.

[215] Figure **15** is a front perspective view of trap portion **514**. Trap portion **514** is shown partially cut away in this view. Housing **524** may include inside surfaces **530** coated with translucent or transparent adhesive. As shown, housing **524** includes ribs **532** or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into the interior of trap portion **514**. In some embodiments, trap portion **514** is thermoformed of translucent or transparent sheet plastic, in two separate pieces, or in a 'clamshell' configuration, in which the two sides are joined at one side and folded together, although trap portion **514** could also be injection molded of translucent or transparent plastic or constructed of translucent paper or of other materials. In some embodiments, the material and thickness of trap portion **514** and the material and thickness of the adhesive are selected to transmit a substantial proportion of light, for example greater than 60% of light is transmitted through trap portion **514** and the adhesive coating. The materials of trap portion **514** may also include one or more insect attractants. For example, trap portion **514** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that increases the insect-attracting efficiency of insect trap **510**. In such embodiments, the insect attractant is integral to trap portion **514**. Alternatively, the insect attractants may be embedded or

contained in a separate piece (not shown) that mounts on inside surfaces **530** of housing **524** or through opening **526** in housing **524**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **510**.

[216] Figure **16** is a cross-sectional view of insect trap **510**. In some embodiments, base portion **512** includes a circuit board **534** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **522**, only one of which is shown, and a lighting element such as one or more LEDs **536**, only one of which is shown. In some embodiments, LEDs **536** include one that emits ultraviolet (UV) light and one that emits visible light. In some embodiments, LEDs **536** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **536** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas. For clarity, not all of the electrical connections are shown. Circuit board **534** may include electronic circuitry to receive any household current from conductive prongs **522** and provide power to LEDs **536**. Alternatively, circuit board **534** may be configured to receive power from batteries (not shown) mounted in base portion **512**. While an electrical socket and batteries have been described as providing power to insect trap **510**, any suitable power source may be used. Circuit board **534** may include a full wave rectifier circuit or any other circuit to provide steady voltage to LEDs **536**, although it could also provide a varying voltage to LEDs **536** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the

breathing rate of mammals) to 270Hz (e.g., the highest flicker frequency known to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **534** may provide power to LEDs **536** to provide UV and /or visible and/or IR light, although it could be configured to provide power to only the UV LEDs **536** or to only the visible light LEDs **536**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **534** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **512** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **510**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1 meter distance from insect trap **510**. Circuit board **534** may also include one or more electrical heating elements **542** such as one or more resistor or one or more resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **512** and into trap portion **514**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **536** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **536** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and

light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **514** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[217] Bottom surface **540** of base portion **512** may be substantially flat or concave to allow insect trap **510** to sit upright on a floor, desk, table or shelf when insect trap **510** is unplugged. Alternatively, bottom surface **540** of base portion **512** may have two or more protrusions (not shown) or legs that allow insect trap **510** to sit upright when insect trap **510** is unplugged.

[218] In the operation of insect trap **510**, conductive prongs **522** are inserted into a wall electrical socket. LEDs **536** emit light, represented by arrows, preferably UV and visible light, which transmit though a rear surface **538** of housing **524** of trap portion **514**. In some embodiments, light is not manipulated in base portion **512** and is emitted directly into trap portion **514**. A portion of the light continues within the enclosure, up one or more sides **572** of housing **524**, and out through inside surfaces **530**. Another portion of the light continues through wall of housing **524** and into the enclosure, where it illuminates inside surfaces **530**. A portion of the light entering the enclosure continues through opening **526** in trap portion **514** and corresponding front opening **520** in base portion and is emitted into the area where insect trap **510** is installed. Insects in the area are attracted to the light transmitted through opening **526** in trap portion **514** and front opening **520** in base portion **512**, and fly or crawl into front opening **520** and onto the inside surfaces **530** of trap portion **514**, where they become stuck in the adhesive and are trapped. The user may observe trapped insects by looking through front opening **520** and opening **526**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **514** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **514**, and replace it with a new trap portion **514**. New trap portion **514** has fresh adhesive coating inside surfaces **530**, housing **524** has a clean rear surface **538**, through which the light is transmitted into trap portion **514**, and the transparent or translucent material of trap portion **514** has not been degraded by prolonged exposure to UV light from LEDs **536**, thereby ensuring

that insect trap **510** will continue to efficiently and effectively attract and trap insects.

[219] In some embodiments, because trap portion **514** mounts on top of, and not in front of, base portion **512**, insect trap **510** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **510** is configured such that when insect trap **510** is mounted to a wall, its overall depth, defined by the overall distance insect trap **510** protrudes from the wall, is smaller than its overall height and its overall width.

[220] It should be appreciated that a benefit of insect trap **510** is the manipulation of light within trap portion **514**. In some embodiments, light manipulation occurs solely within trap portion **514**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., housing **516** and inside surfaces **530**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **514**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[221] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers are used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[222] In some embodiments, trap portion **514** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **514** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **514** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[223] In some embodiments, base portion **512** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **512** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **512** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[224] As provided herein, opening **526** and front opening **520** may be a variety of shapes and/or sizes. For example, opening **526** and front opening **520** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **526** and front opening **520** may be slots having straight, curved or undulating shapes or patterns. When opening **526** and front opening **520** are circular, opening **526** and front opening **520** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **526** and circular front opening **520** are approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **526** and circular front opening **520** are approximately 0.5mm to 15mm in diameter. When opening **526** and front opening **520** are slot shaped, opening **526** and front opening **526** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **526** and slot shaped front opening **520** are approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **526** and slot shaped front opening **520** are approximately 2mm to 15mm wide and 5mm to 100mm long.

[225] In some embodiments, opening **526** covers all or a portion of front surface **562** of housing **516**. For example, opening **526** may cover a range of approximately 1% to 75% of the surface area of front surface **562** of housing **516**. In some embodiments, opening **526** covers approximately 5% to 50% of the surface area of front surface **562** of housing **516**. In some embodiments, opening **526** covers approximately 10% to 30% of the surface area of front surface **562** of housing **516**.

[226] Figure **17** is a front perspective view of a sixth embodiment of an insect trap, indicated generally at **610**. Insect trap **610** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **610** is mounted to a wall, its overall depth, defined by the overall distance insect trap **610** protrudes from the wall, is the smallest of the three overall dimensions. Insect trap **610** includes a base portion **612** and a removable trap portion **614**. Trap

portion **614** is shown removed from base portion **612** in this view. In some embodiments, base portion **612** includes a switch **616**, configurable to enable insect trap **610** to be turned on or off by closing or opening switch **616**, as desired by the user. Alternatively, switch **616** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. In some embodiments, switch **616** may be manually operated, although switch **616** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any method for opening or closing switch **616**. Trap portion **614** includes a front housing **618** with at least one opening **620** in a front surface **652**. Opening **620** may be configured to admit a wide variety of insects into insect trap **610**, or alternatively it may be configured to admit one or more specific insect species. Opening **620** may preferably be configured to prevent user's fingers from penetrating opening **620** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **614**. Opening **620** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through opening **620**, and opening **620** may preferably have a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **620**. Opening **620** may be of uniform or of varying width, shape and orientation, and if trap portion **614** has more than one opening **620**, they may be of identical or of differing widths, shapes and orientations. Opening **620** may be configured to attract one or more individual insect species or a variety of insect species. Protruding from a rear surface **670** (shown in Figure **18**) of base portion **612** are a plurality of electrically conductive prongs **622**, only one of which is shown, adapted to mount insect trap **610** to a wall and provide power to insect trap **610** by inserting conductive prongs **622** into a standard household electrical wall socket. Alternatively, conductive prongs **622** may be adapted to swivel to allow insect trap **610** to remain upright when conductive prongs **622** are inserted into a horizontal outlet. Alternatively, base portion **612** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **612**. While an electrical socket and batteries have been described as providing power to insect trap **610**, any suitable power source may be used. Base portion **612** includes a lighting element such as one or more LEDs **624** and a rear housing **626**, which

includes a reflective-coated inside surface **628**. In some embodiments, LEDs **624** include one that emits ultraviolet (UV) light and one that emits visible light. In some embodiments, LEDs **624** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **624** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas. In some embodiments, the material and surface finish of rear housing **626** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. As shown, base portion **612** includes a transparent or translucent window **630**, shown partially cut away to reveal LEDs **624**. Window **630** protects inside surface **628** of rear housing **626** and LEDs **624** from dust and insect debris and allows base portion **612** to be easily cleaned. Window **630** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. Window **630** may be attached at its perimeter (not shown) to rear housing **626** by any suitable manufacturing technique such as gluing or ultrasonic welding. In some embodiments, window **630** is removably attached to rear housing **626**. Base portion **612** includes at least one opening **632**. In some embodiments, on a perimeter **672** of a top surface **634** of base portion **612** is an upwardly directed rim or protrusions **636**.

[227] Figure **18** is a cross-sectional view of insect trap **610**. Trap portion **614** includes front housing **618** with opening **620** and a back plate **638**, which may be constructed of transparent or translucent material and coated with a transparent or translucent adhesive **640** on a front surface **642**. In some embodiments, the material and thickness of back plate **638** and the material and thickness of adhesive **640** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through back plate **638** and adhesive **640**. In some embodiments, front housing **618** of trap portion **614** and rear housing **626** of base portion **612** are thermoformed from opaque plastic sheet, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **618** and rear housing **626** are constructed by injection molding or by other suitable manufacturing techniques.

Back plate **638** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. Back plate **638** may have a rear surface (not shown), and may be substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, back plate **638** may have ribs or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into trap portion **614**. In some embodiments, front housing **618** is coated with transparent, translucent or opaque adhesive on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **618** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **618** and back plate **638** may be joined together where they engage with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **614** may also include one or more insect attractants. For example, trap portion **614** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that increases the insect-attracting efficiency of insect trap **610**. In such embodiments, the insect attractant is integral to trap portion **610**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface or on an outside surface of front housing **618** or through opening **620** in front housing **618** or on front surface **642** of back plate **638**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more

insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **610**.

[228] As shown, front housing **618** and back plate **638** form a front enclosure **644** in trap portion **614**, and rear housing **626** and window **630** form a rear enclosure **646** in base portion **612**. In some embodiments, base portion **612** includes a circuit board **648** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **622**, switch **616** and LEDs **624**, only one of which is shown. For clarity, however, not all of the electrical connections are shown. Circuit board **648** may include electronic circuitry to receive ordinary household current from conductive prongs **622**, only one of which is shown, respond to the position of switch **616** and provide power to illuminate LEDs **624**. Circuit board **648** may include a full wave rectifier circuit or any other circuit to provide steady voltage to LEDs **624**, although it could also provide a varying voltage to LEDs **624** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 270Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **648** may provide power to LEDs **624** to provide both UV and visible light, although it could be configured to provide power to only UV LEDs **624** or to only visible light LEDs **624**, or to only IR light LEDs **624**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **648** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **612** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies,

and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **610**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **610**.

[229] Circuit board **648** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **612** and into trap portion **614**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **624** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **624** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **614** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[230] As shown, rim or protrusions **636** on top surface **634** of base portion **612** engage with trap portion **614** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **614** to be securely but removably mounted to base portion **612**. A bottom surface **654** of base portion **612** may be substantially flat or concave to allow insect trap **610** to sit

upright on a floor, desk, table or shelf when insect trap **610** is unplugged. Alternatively, bottom surface **654** of base portion **612** may have two or more protrusions (not shown) or legs that allow insect trap **610** to sit upright when insect trap **610** is unplugged.

[231] In the operation of insect trap **610**, conductive prongs **622** are inserted into a wall electrical socket, and switch **616** is moved to a closed position. LEDs **624** emit light, preferably UV and visible light, represented by arrows, which transmit through opening **632** in base portion **612**, into rear enclosure **646**, and onto inside surface **628** of rear housing **626** and rear surface **650** of window **630**. In some embodiments, light is not manipulated in base portion **612** and is emitted directly into trap portion **614**. Inside surface **628** of rear housing **626** may include a concave shape and may be configured to reflect and disperse the light from LEDs **624** to distribute the light evenly onto rear surface **650** of window **630**, although inside surface **628** of rear housing **626** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **650** of window **630**, may be mounted to base portion **612** at or near opening **632** in base portion **612**, and may replace or augment the role of inside surface **628** of rear housing **626**. Alternatively, the light from LEDs **624** may directly strike rear surface **650** of window **630** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across and through window **630** of base portion **612** and onto back plate **638** of trap portion **614**, and may replace or augment the role of inside surface **628** of rear housing **626** or of the lens or lenses mounted to base portion **612**. The light transmits through back plate **638** and adhesive **640** on front surface **642**, and into front enclosure **644**. The light may be further evenly distributed by light-diffusing properties of window **630** of base portion **612**, back plate **638** of trap portion **614**, adhesive **640** on front surface **642** of back plate **638**, or any combination of window **630**, back plate **638** and adhesive **640**. A portion of the light entering front enclosure **644** continues through opening **620** in front housing **618** and is emitted into the area where insect trap **610** is installed. Insects are attracted to the light transmitted through adhesive **640** and through opening **620** in front housing **618**, and fly or crawl through

opening **620** and onto adhesive **640**, where they become trapped. The user may observe trapped insects by looking through opening **620** in front housing **618**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **614** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **614**, and replace it with a new trap portion **614**. The new trap portion **614** has fresh adhesive-coated surfaces, ensuring that insect trap **610** will continue to efficiently and effectively attract and trap insects.

[232] In some embodiments, because trap portion **614** mounts on top of, and not in front of, base portion **612**, insect trap **610** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **610** is configured such that when insect trap **610** is mounted to a wall, its overall depth, defined by the overall distance insect trap **610** protrudes from the wall, is smaller than its overall height and its overall width.

[233] It should be appreciated that a benefit of insect trap **610** is the manipulation of light within trap portion **614**. In some embodiments, light manipulation occurs solely within trap portion **614**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **628**, window **630**, back plate **638** and adhesive **640**). In some embodiments, light manipulation produces an even distribution of light on adhesive **640**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **640** or within trap portion **614**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[234] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[235] Insect trap **610** of this configuration may accommodate a variety of different trap portions **614** that may be removably mounted to base portion **612**, each trap portion **614** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **614**, and the size, shape, location and orientation of opening **620** in front housing **618** of trap portion **614**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **614** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **614** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **614** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[236] In some embodiments, base portion **612** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **612** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **612** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[237] As provided herein, opening **620** may be a variety of shapes and/or sizes. For example, opening **620** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **620** may be a slot having straight, curved or undulating shapes or patterns. When opening **620** is circular, opening **620** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **620** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **620** is approximately 0.5mm to 15mm in diameter. When opening **620** is slot shaped, opening **620** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **620** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **620** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[238] In some embodiments, opening **620** covers all or a portion of front housing **618**. For example, opening **620** may cover a range of approximately 1% to 75% of the surface area of front housing **618**. In some embodiments, opening **620** covers approximately 5% to 50% of the surface area of front housing **618**. In

some embodiments, opening **620** covers approximately 10% to 30% of the surface area of front housing **618**.

[239] Heat may attract a variety of flying insect species, including mosquitos. Accordingly, it may be beneficial for an insect trap to heat its insect-trapping adhesive so that the adhesive itself becomes attractive to insects. It may be particularly beneficial for an insect trap using both heat and light attractants to heat the adhesive to a uniform temperature while allowing the maximum amount of insect-attracting light to project through the adhesive. The insect trap of **610** may be adapted to uniformly heat the adhesive without significantly obstructing the insect attracting light projecting through the adhesive. Figure **19** is a front perspective view of an example of the sixth embodiment of an insect trap, indicated generally at **610A**. Insect trap **610A** includes a base portion **612A** and a removable trap portion **614A**. Trap portion **614A** is shown removed from base portion **612A** in this view. Trap portion **614A** may be identical in configuration to trap portion **614** of insect trap **610.** Base portion **612A** may be similar in configuration to base portion **612** of insect trap **610**, and may include conductive prongs **622A** (only one of which is shown), a lighting element such as one or more LEDs **624A**, a window **630A**, and an opening **632A**. Base portion **612A** of insect trap **610A** also includes a heating element such as one or more heating wires **656A** mounted on the rear surface (not shown) of window **630A**. Heating wires **656A** may be configured in a uniform pattern to produce a uniform heat distribution in response to electric power.

[240] Figure **20**, Figure **21** and Figure **22** are rear views of window **630A** and various configurations of heating wires **656A**. The outline of window **630A** is shown as dashed lines in these views. Figure **20** shows a uniform concentric pattern of heating wires **656A** following the outline of window **630A** and connected in parallel to a plurality of busses **658A,** which, in turn, are electrically connected to a corresponding plurality of connecting wires **660A**. In some embodiments, connecting wires **660A** are electrically connected to busses **658A** with solder. Figure **21** shows a uniform pattern of vertical heating wires **656A** connected in parallel to busses **658A,** which, in turn, are electrically connected to connecting wires **660A**. Alternatively, heating wires **656A** may be oriented horizontally or at an oblique angle across window **630A**. Figure **22** shows a uniform labyrinthine pattern of a single heating wire **656A** following the outline

of window **630A**. As there is only one heating wire **656A** in this view, there is no need for busses (not shown in this view), and heating wire **656A** is electrically connected directly to connecting wires **660A**. In some embodiments, heating wires **656A** may be configured in a non-uniform pattern to increase or decrease the temperature of some regions and improve temperature uniformity across window **630A**. In some embodiments, heating wires **656A** may be made of resistance wires glued or otherwise affixed to the rear surface of window **630A** in a uniformly-spaced pattern and configured to produce heat in response to electric current. In some embodiments, heating wires **656A** may be of conductive polymer or other conductive material applied directly to the rear surface of window **630A**. In some embodiments, heating wires **656A** may be of a self-correcting conductive polymer or other self-correcting conductive material that increases its internal resistance at higher temperatures and transfers electrical power from warmer regions to cooler ones, thereby improving temperature uniformity across heating wires **656A** and window **630A**. In some embodiments busses **658A** may be made of highly conductive metal such as copper. In some embodiments, heating wires **656A** and busses **658A** both may be made of conductive polymer. In some embodiments, heating wires **656A** may be of a transparent or translucent material. In some embodiments, heating wires **656A** are replaced by a thin, transparent layer of metal oxide (not shown) on the rear surface of window **630A** that is electrically connected at opposite sides of the rear surface of window **630A** and produces heat in response to electric current. In general, the heat generated may increase and maintain the temperature of at least a portion of adhesive to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals.

[241] Figure **23** is a cross-sectional view of insect trap **610A,** and Figure **24** is an enlarged view of a portion of Figure **23**. Trap portion **614A** includes back plate **638A** with a coating of insect-attracting adhesive **640A** on its front surface **642A**. Base portion **612A** includes a rear housing **626A** with an inside surface **628A**. Rear housing **626A** and window **630A** form a rear enclosure **646A**. Base portion **612A** also includes a circuit board **648A** electrically connected to conductive prongs **622A** (only one of which is shown), LEDs **624A** (only one of which is shown), and connecting wires **660**A (only one of which is shown). For clarity, not

all electrical connections are shown. Circuit board **648A** is configured to receive ordinary household current from conductive prongs **622A**, provide power to illuminate LEDs **624A**, and provide power to connecting wires **660A**, which, in turn, provide power to buses **658A** (not shown in this view), which, in turn, provide power to heating wires **656A**, which generate heat and warm window **630A**, which, in turn, warms back plate **638A**, which warms adhesive **640A** to a uniform temperature. In some embodiments, circuit board is configured to monitor the current through connecting wires **660A** and respond to temperature-related changes in resistance through heating wires **656A** by increasing or decreasing voltage through heating wires **656A**, thereby warming adhesive **640A** to a steady, uniform temperature. Light from LEDs **624A** transmits through opening **632A** in base **612A** and into rear enclosure **646A**. A portion of light from LEDs **624A** directly illuminates window **630A** and a portion of light reflects off inside surface **628A** of rear housing **626A** and illuminates window **630A**. Light transmits through window **630A**, back plate **638A**, and adhesive **640A**. Heating wires **656A** are sufficiently thin to obstruct only a small fraction of the light transmitting through adhesive **640A**. Accordingly, insect trap **610A** may warm adhesive **640A** to a uniform temperature without significantly obstructing the insect-attracting light projecting through adhesive **640A**. In some embodiments, heat alone is used as an attractant, and light sources are not used in insect trap **610A**.

[242] Figure **25** is a cross-sectional view of a seventh embodiment of an insect trap, indicated generally at **710**, and Figure **26** is an enlarged view of a portion of Figure **25**. Insect trap **710** includes a base portion **712** and a removable trap portion **714**. Insect trap **710** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **710** is mounted to a wall, its overall depth, defined by the overall distance insect trap **710** protrudes from the wall, is the smallest of the three overall dimensions. As shown, base portion **712** includes a switch **716**, configurable to enable insect trap **710** to be turned on or off by closing or opening switch **716**, as desired by the user. Alternatively, switch **716** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on when the room gets dark, or a remote control setting, for example. Switch **716** may be manually operated, although switch **716** may also be operated electrically, optically, electro-

mechanically, electro-optically, or by any method for opening or closing switch **716**. Protruding from a rear surface **770** of base portion **712** are a plurality of electrically conductive prongs **718** (only one of which is shown in this view) adapted to mount insect trap **710** to a wall and provide power to insect trap **710** by inserting conductive prongs **718** into a standard household electrical wall socket. Alternatively, conductive prongs **718** may be adapted to swivel to allow insect trap **710** to remain upright when conductive prongs **718** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **712** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **712**. While an electrical socket and batteries have been described as providing power to insect trap **710**, any suitable power source may be used. In some embodiments, a slot **722** is located in a top surface **720** of base portion **712**, and an upwardly directed rim or protrusions **724** are located on a perimeter of top surface **720**.

[243] Trap portion **714** includes a front housing **726** with at least one opening **728** in a front surface **754**, a divider **730**, a rear housing **736**, a lighting element such as one or more LEDs **740** (only one of which is shown), and electrical trap contacts **742**. Opening **728** in front housing **726** may be configured to admit a wide variety of insects into insect trap **710**, or alternatively it may be configured to admit one or more specific insect species. Opening **728** may preferably be configured to prevent user's fingers from penetrating opening **728** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **714**. Opening **728** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through opening **728**. Opening **728** may preferably have a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **728**. Opening **728** may be of uniform or of varying width, shape and orientation, and if trap portion **714** has more than one opening **728**, they may be of identical or of differing widths, shapes and orientations. Opening **728** may be configured to attract one or more individual species or a variety of insect species. In some embodiments, divider **730** is constructed from transparent or translucent material and is coated with a transparent or translucent adhesive **732** on a front surface **734**. In some embodiments, the material and thickness of divider **730** and the material and thickness of adhesive **732** are selected to transmit a substantial proportion of light, for example greater than 60% of the light is transmitted

through divider **730** and adhesive **732**. Divider **730** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, LEDs **740** include one that emits ultraviolet (UV) light and one that emits visible light. In some embodiments, LEDs **740** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **740** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas. As shown, there are two trap contacts **742** for each of LEDs **740**. Thus, trap contacts **742** are electrically connected to their respective LEDs **740**. While two trap contacts **742** are shown for each of LEDs **740**, any suitable number may be used.

[244] In some embodiments, rear housing **736** includes a reflective-coated inside surface **738**. The material and surface finish of rear housing **736** may alternatively be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. In some embodiments, front housing **726** and rear housing **736** are thermoformed from opaque sheet plastic, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **726** and rear housing **736** are constructed by injection molding or by other suitable manufacturing techniques.

[245] As shown, divider **730** may be substantially planar, and may be configured to be parallel to, or at an angle to the primary direction of the light produced by LEDs **740**, although divider **730** may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, divider **730** may include ribs or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into interior of trap portion **714**. In some embodiments, front housing **726** is coated with transparent, translucent or opaque adhesive on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **726** may include a reflective coating underneath the adhesive coating on an inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **726**, divider **730** and rear

housing **736** may be joined together where they intersect or engage with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **714** may also include one or more insect attractants. For example, trap portion **714** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that increases the insect-attracting efficiency of insect trap **710**. In such embodiments, the insect attractant is integral to trap portion **714**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of front housing **726** or through opening **728** in front housing **726** or on front surface **754** of front housing **726** or on front surface **734** of divider **730**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **710**. As shown, divider **730** has a rear surface **752**, and separates trap portion **714** into a front enclosure **744** and a rear enclosure **746**.

[246] In some embodiments, base portion **712** includes electrical base contacts **750** and a circuit board **748** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **718**, switch **716**, and base contacts **750**. For clarity, however, not all of the electrical

connections are shown. While two base contacts **750** are shown in base portion **712** for each of LEDs **740** in trap portion **714**, any suitable number may be used. Base contacts **750** may be configured to provide an electrical connection with trap contacts **742** when trap portion **714** is removably mounted to base portion **712**. Circuit board **748** may include electronic circuitry to receive ordinary household current from conductive prongs **718**, respond to the position of switch **716** and provide power to base contacts **750**, which, in turn, provide power to trap contacts **742** and illuminate LEDs **740** in trap portion **714** when trap portion **714** is mounted to base portion **712**. In some embodiments, circuit board **748** includes an energy stabilizer such as a full wave rectifier circuit or any other circuit to provide steady voltage to LEDs **740**, although it could also provide a varying voltage to LEDs **740** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 270Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **748** may provide power to LEDs **740** to provide UV and/or visible and/or IR light, although it could be configured to provide power to only UV LEDs **740** or to only visible light LEDs **740** or to only IR LEDs **740**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **748** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker or other device that may be mounted in base portion **712** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately

35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **710**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **710**. Circuit board **748** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **712** and into trap portion **714**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **740** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **740** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **714** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[247] Slot **722** and protrusions **724** in top surface **720** of base portion **712** are configured to engage with trap portion **714** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **714** to be securely but removably mounted to base portion **712**. A bottom surface **756** of base portion **712** may be substantially flat or concave to allow insect trap **710** to sit upright on a floor, desk, table or shelf when insect trap **710** is unplugged. Alternatively, bottom surface **756** of base portion **712** may have two or more protrusions (not shown) or legs that allow insect trap **710** to sit upright when insect trap **710** is unplugged.

[248] In the operation of insect trap **710**, conductive prongs **718** are inserted into a wall electrical socket, switch **716** is moved to a closed position, and trap portion **714** is mounted to base portion **712**. LEDs **740** emit light, represented by arrows, which transmit light into rear enclosure **746**, and onto inside surface **738** of rear housing **736** and rear surface **752** of divider **730**. In some embodiments, light is

not manipulated in base portion **712** and is emitted directly into trap portion **714**. Inside surface **738** of rear housing **736** may be a concave shape and configured to reflect and disperse light from LEDs **740** to distribute the light evenly onto rear surface **752** of divider **730**, although the shape of inside surface **738** of rear housing **736** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs (not shown) or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **752** of divider **730**, may be mounted to rear housing **736** proximate to or above LEDs **740** or may be mounted to LEDs **740**, and may replace or augment the role of inside surface **738** of rear housing **736**. Alternatively, the light from LEDs **740** may directly strike rear surface **752** of divider **730** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider **730**, and may replace or augment the role of inside surface **738** of rear housing **736**, or of the lens or lenses mounted to rear housing **736** or to LEDs **740**. The light may transmit through divider **730** and adhesive **732** on front surface **734**, and into front enclosure **744**. The light may be further evenly distributed by the light-diffusing properties of divider **730**, adhesive **732** on front surface **734**, or both. A portion of the light entering front enclosure **744** continues through opening **728** in front housing **726** and is emitted into the area where insect trap **710** is installed. Insects are attracted to the light transmitted through adhesive **732** and through opening **728** in front housing **726**, and fly or crawl into opening **728** and onto adhesive **732**, where they become trapped. The user may observe trapped insects by looking through opening **728** in front housing **726**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **714** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **714**, and replace it with a new trap portion **714**. The new trap portion **714** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **710** will continue to efficiently and effectively attract and trap insects.

[249] In some embodiments, because trap portion **714** mounts on top of, and not in front of, base portion **712**, insect trap **710** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally

into the home environment. In some embodiments, insect trap **710** is configured such that when insect trap **710** is mounted to a wall, its overall depth, defined by the overall distance insect trap **710** protrudes from the wall, is smaller than its overall height and its overall width.

[250] It should be appreciated that a benefit of insect trap **710** is the manipulation of light within trap portion **714**. In some embodiments, light manipulation occurs solely within trap portion **714**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **738**, divider **730** and adhesive **732**). In some embodiments, light manipulation produces an even distribution of light on an adhesive surface or adhesive coating. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive coating or within trap portion **714**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[251] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[252] An insect trap **710** of this configuration may accommodate a variety of different trap portions **714** that may be removably mounted to base portion **712**, each trap portion **714** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **714**, the size, shape, location and orientation of opening **728** in front housing **726** of trap portion **714**, and the wavelength and intensity of LEDs **740** may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **714** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **714** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap

portion **714** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[253] In some embodiments, base portion **712** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **712** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **712** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[254] As provided herein, opening **728** may be a variety of shapes and/or sizes. For example, opening **728** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **728** may be slot shaped having straight, curved or undulating shapes or patterns. When opening **728** is circular, opening **728** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **728** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **728** is approximately 0.5mm to 15mm in diameter. When opening **728** is slot shaped, opening **728** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **728** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **728** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[255] In some embodiments, opening **728** covers all or a portion of front housing **726**. For example, opening **728** may cover a range of approximately 1% to 75% of the surface area of front housing **726**. In some embodiments, opening **728** covers approximately 5% to 50% of the surface area of front housing **726**. In some embodiments, opening **728** covers approximately 10% to 30% of the surface area of front housing **726**.

[256] Figure **27** is a front perspective view of an eighth embodiment of an insect trap, indicated generally at **810**. Insect trap **810** includes a trap portion **814** and a base portion **812**. Trap portion **814** is shown removed from base portion **812** in this view. In some embodiments, trap portion **814** includes an engageable portion **818** protruding downward from a bottom surface **850**. However, engageable portion **818** does not need to protrude from trap portion **814**. Engageable portion **818** may be a non-protruding portion of a flush bottom surface of trap portion **814** that engages at least partially with base portion **812**. Base portion **812** may have a corresponding opening **824** (shown in Figure **29**) to receive engageable portion

818 when trap portion 814 is mounted to base portion 812. Opening 824 may preferably be configured such that the user's finger cannot pass through opening 824. Opening 824 may preferably be configured such that a sphere 10mm in diameter cannot pass through opening 824. As shown, base portion 812 includes a switch 816.

[257] Figure 28 is a cross sectional view of insect trap 810 and Figure 29 is an enlarged view of a portion of Figure 28. Base portion 812 may include a circuit board 822, a docking switch 820, and one or more LEDs 826, only one of which is shown. Although docking switch 820 is shown mounted on circuit board 822, docking switch 820 may also be mounted directly to base portion 812. In some embodiments, LEDs 826 may include one or more that emits ultraviolet (UV) light and one or more that emits visible light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, one or more of LEDs 826 may emit infrared (IR) light to better attract certain types of insects such as mosquitos and fleas. In some embodiments, circuit board 822 has a programmable processor or chip (not shown) for executing commands, and is configured to provide power and instructions to desired components (e.g., switch 816, LEDs 826, etc.). For clarity, however, not all of the electrical connections are shown. In some embodiments, circuit board 822 includes a docking switch 820 mounted thereon.

[258] Engageable portion 818 of trap portion 814 engages docking switch 820 when trap portion 814 is mounted to base portion 812. Docking switch 820 may be configured to close when engageable portion 818 of trap portion 814 engages with it, as when trap portion 814 is mounted to base portion 812, and may be configured to open when engageable portion 818 of trap portion 814 is lifted from docking switch 820, as when trap portion 814 is removed from base portion 812. Docking switch 820 may be configured to activate in response to force or pressure from engageable portion 818 on trap portion 814. Alternatively, docking switch 820 may be configured to activate in response to displacement by engageable portion 818 on trap portion 814. Alternatively, docking switch 820 may be configured as an optical switch to close when a light beam is broken by the engageable portion 818 of trap portion 814, or may be configured as a Hall effect sensor to close when in proximity to a magnet on trap portion 814, or may be

configured as any other switch or sensor that opens or closes when trap portion **814** is mounted or removed from base portion **812**. Docking switch **820** may be electrically connected to circuit board **822** and/or switch **816** to deactivate UV and /or visible light and/or IR LEDs **826** when trap portion **814** is removed from base portion **812**, thereby preventing the user from looking directly at the UV and/or visible and/or IR light from LEDs **826** as well as reducing energy consumption. Alternatively, docking switch **820** may be electrically connected to circuit board **822** and/or switch **816** to deactivate only UV LEDs **826** and/or IR LEDs **826** and/or visible light LEDs **826** when trap portion **814** is removed from base portion **812**.

[259] Figure **30** is a front perspective view of a ninth embodiment of an insect trap, indicated generally at **910**. Insect trap **910** includes a trap portion **914** and a base portion **912**. Trap portion **914** is shown removed from base portion **912** in this view. In some embodiments, trap portion 914 includes an engageable portion **918** protruding downward from a bottom surface (not shown). However, engageable portion **918** does not need to protrude from trap portion **914**. Engageable portion **918** may be a non-protruding portion of a flush bottom surface of trap portion **914** that engages at least partially with base portion **912**. Base portion **912** may have a corresponding opening **924** (shown in Figure **32**), to receive engageable portion **918** when trap portion **914** is mounted to base portion **912**. Opening **924** may preferably be configured such that a user's finger cannot pass through opening **924**. Opening **924** may preferably be configured such that a sphere 10mm in diameter cannot pass through opening **924**. As shown, base portion **912** may also have a switch **916**.

[260] Figure **31** is a cross sectional view of insect trap **910** and Figure **32** is an enlarged view of a portion of Figure **31**. Base portion **912** may include a circuit board **922**, a docking switch **920**, and one or more LEDs **926**, only one of which is shown. Although docking switch **920** is shown mounted on circuit board **922**, docking switch **920** may also be mounted directly to base portion **912**. In some embodiments, LEDs **926** may include one or more that emits ultraviolet (UV) light and one or more that emits visible light, preferably blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, one or more of LEDs **926** may emit infrared (IR) light to better attract certain types of

insects such as mosquitos and fleas. In some embodiments, circuit board **922** has a programmable processor or chip (not shown) for executing commands, and is configured to provide power and instructions to desired components (e.g., switch **916**, LEDs **926**, etc.). For clarity, however, not all of the electrical connections are shown. Base portion **912** may include a screen **928**. Engageable portion **918** on trap portion **914** engages docking switch **920** when trap portion **914** is mounted to base portion **912**. Docking switch **920** may be configured to close when engageable portion **918** on trap portion **914** engages with it, as when trap portion **914** is mounted to base portion **912,** and may be configured to open when engageable portion **918** of trap portion **914** is lifted from docking switch **920**, as when trap portion **914** is removed from base portion **912**. Docking switch **920** may be configured to activate in response to force or pressure from engageable portion **918** on trap portion **914**. Alternatively, docking switch **920** may be configured to activate in response to displacement by engageable portion **918** on trap portion **914**. Alternatively, docking switch **920** may be configured as an optical switch to close when a light beam is broken by engageable portion **918** of trap portion **914**, or may be configured as a Hall effect sensor to close when in proximity to a magnet on trap portion **914**, or may be configured as any other switch or sensor that opens or closes when trap portion **914** is mounted or removed from base portion **912**. Docking switch **920** may be electrically connected to circuit board **922** and/or switch **916**. Circuit board **922** may be electrically connected to one or more UV and/or visible light and/or IR LEDs **926**, only one of which is shown, and may also be electrically connected to screen **928**, and may activate screen **928** when docking switch **920** is closed. In some embodiments, screen **928** may use liquid crystal (LC) technology and be configured to block all or a portion of the light from UV and/or visible and/or IR light LEDs **926** when screen **928** is activated, thereby preventing the user from looking directly at the UV and/or visible and/or IR light from LEDs **926** as well as reducing energy consumption. In some embodiments, when activated, screen **928** may be configured to block all or a portion of the light from only UV LEDs **926**, or all or a portion of the light from only visible light LEDs **926**, or all or a portion of the light from only IR LEDs **926**, or any combination of UV, visible light, and IR LEDs **926**. In some embodiments, screen **928** may use an electric motor, or a solenoid, or a magnetostrictive actuator, or a piezoelectric actuator, or one or more

of a variety of electromechanical methods to close a shutter and block all or a portion of the light from UV LEDs **926**, or the light from visible light LEDs **926**, or the light from IR LEDs **926**, or the light from any combination of UV, visible light, and IR LEDs **926**. Alternatively, screen **928** may be configured to be actuated mechanically by engageable portion **918** of trap portion **914** to close a shutter in screen **928** and block all or a portion of the light from UV and/or visible light and/or IR LEDs **926** when trap portion **914** is removed from base portion **912**.

[261] Figure **33** is a front perspective view of a tenth embodiment of an insect trap, indicated generally at **1010**. Insect trap **1010** includes a base portion **1012** and a removable trap portion **1014**. Trap portion **1014** is shown removed from base portion **1012** in this view. Insect trap **1010** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1010** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1010** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **1014** includes a front housing **1018** with at least one opening **1020** in a front surface **1058**. Opening **1020** in front housing **1018** may be configured to admit a wide variety of insects into insect trap **1010**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1020** is configured to prevent the user's fingers from penetrating opening **1020** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1014**. In some embodiments, opening **1020** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1020**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1020**. Opening **1020** may be of uniform or of varying width, shape and orientation, and if trap portion **1014** has more than one opening **1020**, they may be of identical or of differing widths, shapes and orientations. Opening **1020** may be configured to attract one or more individual insect species or a variety of insect species. Trap portion **1014** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **1014** is mounted in insect trap **1010**, and insect trap **1010** is mounted to a wall, the overall depth of trap portion **1014**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1014**.

[262] Protruding from a rear surface **1060** (shown in Figure **34**) of base portion **1012** are a plurality of electrically conductive prongs **1022**, adapted to mount insect trap **1010** to a wall and provide power to insect trap **1010** by inserting conductive prongs **1022** into a standard household electrical wall socket. Alternatively, conductive prongs **1022** may be adapted to swivel to allow insect trap **1010** to remain upright when conductive prongs **1022** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1012** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1012**. While an electrical socket and batteries have been described as providing power to insect trap **1010**, any suitable power source may be used. Base portion 1012 includes a lighting element such as one or more LEDs **1024**. In some embodiments, base portion **1012** includes an array of LEDs **1024**. As shown, LEDs **1024** are configured in a 2 by 3 array of blue and UV LEDS **1024**, although different array configurations with different numbers and arrangements (e.g., a 3 by 2 array or a 4 by 3 array or a 1 by 2 array, for example) of LEDs **1024**, LEDs **1024** emitting different wavelengths of light, and different combinations of LEDs **1024** emitting different wavelengths of light, could also be used. In some embodiments, LEDs **1024** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1024** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **1024** include at least one that emits infrared (IR) light to better attract certain species of insects including mosquitos. Mounted in a top surface **1026** of base portion **1012** may be a transparent or translucent window **1028**, shown partially cut away to reveal LEDs **1024**. Window **1028** protects LEDs **1024** from dust and insect debris, and allows base portion **1012** to be easily cleaned. In top surface **1026** may be a slot **1030**, and on the perimeter of top surface **1026** is a rim or upwardly directed protrusions **1032**.

[263] Figure **34** is a cross-sectional view of insect trap **1010**. In some embodiments, the light emitted from each of LEDs **1024** has a primary direction **1054**. Trap portion **1014** includes a divider **1034** with a front surface **1038**, and a rear housing **1040**. In some embodiments, divider **1034** is constructed from or includes a transparent or translucent material and may be coated with a transparent or

translucent adhesive **1036** on front surface **1038**. In some embodiments, divider **1034** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **1034** and the material and thickness of adhesive **1036** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **1034** and adhesive **1036**. In some embodiments, rear housing **1040** includes a reflective-coated inside surface **1042**. Alternatively, the material and surface finish of rear housing **1040** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. Rear housing **1040** may include an opening **1044** on its bottom surface, or alternatively opening **1044** may be replaced by a transparent or translucent window (not shown).

[264] In some embodiments, front housing **1018** and rear housing **1040** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1018** and rear housing **1040** are constructed by injection molding, casting or by other suitable manufacturing techniques. As shown, divider **1034** is substantially planar, and may be configured to be parallel to, or at an angle **1052** to the primary direction **1054** of the light produced by one or more of LEDs **1024**. Angle **1052** may be an acute angle, and may preferably be from 0° to 45° such that when insect trap **1010** is mounted to a wall, the top end or distal end of divider **1034** (e.g., the end farther from base portion **1012**) is closer to the wall than its bottom or proximal end. In some embodiments, divider **1034** may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. In some embodiments, divider **1034** may have ribs or other features that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[265] In some embodiments, front housing **1018** may be coated with transparent, translucent or opaque adhesive on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1018** may also have a

reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[266] In some embodiments, front housing **1018**, divider **1034** and rear housing **1040** are joined together at where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or by any other suitable assembly method. The materials of trap portion **1014** may also include one or more insect attractants. For example, trap portion **1014** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of insect trap **1010**. In such embodiments, the insect attractant is integral to trap portion **1014**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of front housing **1018** or through opening **1020** in front housing **1018** or on front surface **1058** of front housing **1018** or on front surface **1038** of divider **1034**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1010**. Divider **1034** separates trap portion **1014** into a front enclosure **1046** and a rear enclosure **1048**. In some embodiments, base portion **1012** includes a circuit board **1050** having a

programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1022**, only one of which is shown, and LEDs **1024**, only one of which is shown. For clarity, however, not all of the electrical connections are shown. Circuit board **1050** may include electronic circuitry to receive ordinary household current from conductive prongs **1022** and provide power to illuminate LEDs **1024**. Circuit board **1050** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **1024**, although it may also provide a varying voltage to LEDs **1024** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1050** may provide power to LEDs **1024** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **1024** or to only visible light LEDs **1024** or to only IR LEDs **1024**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1050** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1012** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1010**. It is desirable for such insect-attracting sound to be undetectable by a

human beyond approximately a 1-meter distance from insect trap **1010**. Circuit board **1050** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1012** and into trap portion **1014**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1024** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1024** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1014** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[267] As shown, slot **1030** in top surface **1026** of base portion **1012** and protrusions **1032** on top surface **1026** of base portion **1012** engage with trap portion **1014** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **1014** to be securely but removably mounted to base portion **1012**. Bottom surface **1016** of base portion **1012** may be substantially flat or concave to allow insect trap **1010** to sit upright on a floor, desk, table or shelf when insect trap **1010** is unplugged. Alternatively, bottom surface **1016** of base portion **1012** may have two or more protrusions (not shown) or legs that allow insect trap **1010** to sit upright when insect trap **1010** is unplugged.

[268] In the operation of insect trap **1010**, conductive prongs **1022** are inserted into a wall electrical socket. LEDs **1024** emit light, represented by arrows, preferably UV and visible light, which is transmitted through window **1028** in base portion **1012**, through opening **1044** in rear housing **1040** of trap portion **1014**, into rear enclosure **1048**, and directly onto inside surface **1042** of rear housing **1040** and a rear surface **1056** of divider **1034**. For clarity, arrows representing the light are only shown emitted from one of LEDs **1024**. Because the light from LEDS **1024**

enters rear enclosure **1048** through opening **1044** in a bottom face of rear housing **1040** of trap portion **1014** (e.g., in a face that is substantially parallel to the overall depth of trap portion **1014**), the light can travel the entire length of rear enclosure **1048** and can diverge over the entire length of rear enclosure **1048,** and therefore can be more evenly distributed throughout rear enclosure **1048**. In some embodiments, light is not manipulated in base portion **1012** and is emitted directly into trap portion **1014**. Inside surface **1042** of rear housing **1040** may include a concave shape and may be configured to reflect and disperse the light from LEDs **1024** to distribute the light evenly onto rear surface **1056** of divider **1034**, although inside surface **1042** of rear housing **1040** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **1056** of divider **1034**, may be mounted to rear housing **1040** at or near opening **1044** or to base portion **1012** at or near window **1028**, and may replace or augment the role of inside surface **1042** of rear housing **1040**. In some embodiments, the light from LEDs **1024** may directly strike rear surface **1056** of divider **1034** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across divider **1034**, and may replace or augment the role of inside surface **1042** of rear housing **1040** or of the lens or lenses mounted to rear housing **1040**.

[269] Thereafter, light transmits through divider **1034** and adhesive **1036** on front surface **1038**, and into front enclosure **1046**. Light may be further evenly distributed by the light-diffusing properties of divider **1034**, adhesive **1036** on front surface **1038**, or both. A portion of the light entering front enclosure **1046** continues through opening **1020** in front housing **1018** and is emitted into the surrounding area where insect trap **1010** is installed. Insects are attracted to the light emitted through adhesive **1036** and through opening **1020** in front housing **1018**, and fly or crawl into opening **1020** and onto adhesive **1036**, where they become trapped. A user may observe trapped insects by looking through opening **1020** in front housing **1018**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1014** without touching the trapped insects, insect debris or adhesive, which remain out

of reach inside trap portion **1014**, and replace it with a new trap portion **1014**. New trap portion **1014** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1010** will continue to efficiently and effectively attract and trap insects.

[270] In some embodiments, because trap portion **1014** mounts on top of, and not in front of, base portion **1012**, insect trap **1010** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1010** is configured such that when insect trap **1010** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1010** protrudes from the wall, is smaller than its overall height and its overall width.

[271] It should be appreciated that a benefit of insect trap **1010** is the manipulation of light within trap portion **1014**. In some embodiments, light manipulation occurs solely within trap portion **1014**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1042**, divider **1034** and adhesive **1036**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1036**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1036** or within trap portion **1014**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[272] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[273] Insect trap **1010** of this configuration may accommodate a variety of different trap portions **1014** that may be removably mounted to base portion **1012**, each trap portion **1014** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **1014**, and the size, shape, location and orientation of opening

1020 in front housing **1018** of trap portion **1014**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect.

[274] For example, in some embodiments, trap portion **1014** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1014** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1014** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[275] In some embodiments, base portion **1012** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1012** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1012** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[276] As provided herein, opening **1020** may be a variety of shapes and/or sizes. For example, opening **1020** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1020** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1020** is circular, opening **1020** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1020** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1020** is approximately 0.5mm to 15mm in diameter. When opening **1020** is slot shaped, opening **1020** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1020** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1020** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[277] In some embodiments, opening **1020** covers all or a portion of front housing **1018**. For example, opening **1020** may cover a range of approximately 1% to 75% of the surface area of front housing **1018**. In some embodiments, opening **1020** covers approximately 5% to 50% of the surface area of front housing **1018**. In some embodiments, opening **1020** covers approximately 10% to 30% of the surface area of front housing **1018**.

[278] Figure **35** is a front perspective view of an eleventh embodiment of an insect trap, indicated generally at **1110**. Insect trap **1110** includes a base portion **1112** and a removable trap portion **1114**. Insect trap **1110** may have an overall length,

an overall width and an overall depth, and may be configured such that when insect trap **1110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1110** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **1114** is shown removed from base portion **1112** in this view. In some embodiments, base portion **1112** includes a switch **1116**, configurable to enable insect trap **1110** to be turned on or off by closing or opening switch **1116** as desired by the user. Alternatively, switch **1116** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on insect trap **1110** when the room gets dark, or a remote control setting, for example. In some embodiments, switch **1116** may be manually operated, although switch **1116** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any method for opening or closing switch **1116**. Trap portion **1114** may include a front housing **1118** with at least one opening **1120** in a front surface **1132**. Opening **1120** may be configured to admit a wide variety of insects into insect trap **1110**, or alternatively it may be configured to admit one or more specific insect species. Opening **1120** may preferably be configured to prevent user's fingers from penetrating opening **1120** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1114**. Opening **1120** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through opening **1120**, and opening **1120** may preferably have a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1120**. Opening **1120** may be of uniform or of varying width, shape and orientation, and if trap portion **1114** has more than one opening **1120**, they may be of identical or of differing widths, shapes and orientations. Opening **1120** may be configured to attract one or more individual insect species or a variety of insect species. Protruding from a rear surface **1152** (shown in Figure **36**) of base portion **1112** are a plurality of electrically conductive prongs **1122**, only one of which is shown, adapted to mount insect trap **1110** to a wall and provide power to insect trap **1110** by inserting conductive prongs **1122** into a standard household electrical wall socket. Alternatively, conductive prongs **1122** may be adapted to swivel to allow insect trap **1110** to remain upright when conductive prongs **1122** are inserted into a horizontal outlet. Alternatively, base portion **1112** may be configured to sit or

hang wherever desired and receive power from batteries (not shown) mounted in base portion **1112**. While an electrical socket and batteries have been described as providing power to insect trap **1110**, any suitable power source may be used. Base portion **1112** includes a top surface **1134**, and a rear housing **1126**, which includes a reflective-coated inside surface **1128**. In some embodiments, the material and surface finish of rear housing **1126** may be configured to reflect and disperse UV and/or visible light without a reflective coating. Mounted in rear housing 1126 of base portion **1112** is a lighting element such as one or more LEDs **1124**. In some embodiments, the lighting element includes an array of LEDs **1124**, including at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1124** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **1124** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas.

[279] As shown, base portion **1112** includes a transparent or translucent window **1130**, shown partially cut away to reveal LEDs **1124**. Window **1130** has a rear surface **1150** (shown in Figure **36**), and protects inside surface **1128** of rear housing **1126** and LEDs **1124** from dust and insect debris and may allow base portion **1112** to be easily cleaned. Window **1130** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. Window **1130** may be attached at its perimeter to rear housing **1126** by any suitable manufacturing technique such as gluing or ultrasonic welding. In some embodiments, window **1130** is removably attached to rear housing **1126**. In some embodiments, on a perimeter **1154** of top surface **1134** of base portion **1112** is an upwardly directed rim or protrusions **1136**.

[280] Figure **36** is a cross-sectional view of insect trap **1110**. Trap portion **1114** includes a back plate **1138** with a front surface **1142**. Back plate **1138** may be constructed of transparent or translucent material and coated with a transparent or translucent adhesive **1140** on front surface **1142**. Back plate **1138** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects. In some embodiments, the material

and thickness of back plate **1138** and the material and thickness of adhesive **1140** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through back plate **1138** and adhesive **1140**. In some embodiments, front housing **1118** of trap portion **1114** and rear housing **1126** of base portion **1112** are thermoformed from opaque sheet plastic, although other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1118** and rear housing **1126** are constructed by injection molding or by other suitable manufacturing techniques. Back plate **1138** may be substantially planar, although it may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. Alternatively, back plate **1138** may have ribs or other features that increase the adhesive-coated surface area, produce alternating light/dark regions that some insect species find attractive, and enhance the transmission of insect-attracting light into trap portion **1114**. In some embodiments, front housing **1118** is coated with transparent, translucent or opaque adhesive on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1118** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. Front housing **1118** and back plate **1138** may be joined together where they engage with adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **1114** may also include one or more insect attractants. For example, trap portion 1114 may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-

attracting efficiency of insect trap **1110**. In such embodiments, the insect attractant is integral to trap portion **1114**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of front housing **1118** or through opening **1120** in front housing **1118** or on front surface **1132** of front housing **1118** or on front surface **1142** of back plate **1138**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1110**.

[281] As shown, front housing **1118** and back plate **1138** form a front enclosure **1144** in trap portion **1114**, and rear housing **1126** and window **1130** form a rear enclosure **1146** in base portion **1112**. In some embodiments, base portion **1112** includes a circuit board **1148**, having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1122**, switch **1116** and LEDs **1124** (only one of which is shown). For clarity, however, not all of the electrical connections are shown. Circuit board **1148** may include electronic circuitry to receive ordinary household current from conductive prongs **1122**, only one of which is shown, respond to the position of switch **1116** and provide power to illuminate LEDs **1124**. Circuit board **1148** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit to provide steady voltage to LEDs **1124** when switch **1116** is in the closed position, although it could also provide a varying voltage to LEDs **1124** to provide a flickering light which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05Hz (e.g., to mimic the breathing rate of mammals) to 270Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1148** may provide power to LEDs **1124** to provide both UV and visible light, although it

could be configured to provide power only UV LEDs **1124** or to only visible light LEDs **1124** or to only IR LEDs **1124**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. In some embodiments, circuit board **1148** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1112** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects, and may include one or more of mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1110**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1110**. Circuit board **1148** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1112** and into trap portion **1114**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1124** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1124** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1114** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to

mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[282] As shown, rim or protrusions **1136** on top surface **1134** of base portion **1112** and window **1130** engage with trap portion **1114** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **1114** to be securely but removably mounted on base portion **1112**. Bottom surface **1156** of the base portion **1112** may be substantially flat or concave to allow insect trap **1110** to sit upright on a floor, desk, table or shelf when insect trap **1110** is unplugged. Alternatively, bottom surface **1156** of base portion **1112** may have two or more protrusions (not shown) or legs that allow insect trap **1110** to sit upright when insect trap **1110** is unplugged.

[283] In the operation of insect trap **1110**, conductive prongs **1122** are inserted into a wall electrical socket, and switch **1116** is moved to a closed position. LEDs **1124** emit light, represented by arrows, which transmits directly onto rear surface **1150** of window **1130**. In some embodiments, light is not manipulated in base portion **1112** and is emitted directly into trap portion **1114**. Inside surface **1128** of rear housing **1126** may include a concave shape and may be configured to reflect and disperse the UV and visible light from LEDs **1124** to distribute the light evenly onto rear surface **1150** of window **1130**, although inside surface **1128** of rear housing **1126** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. In some embodiments, LEDs **1124** are substantially perpendicular (e.g., configured so that their primary direction of light is substantially perpendicular) to window **1130**. The light transmits through back plate **1138** and adhesive **1140** on front surface **1142**, and into front enclosure **1144**. The light may be further evenly distributed by the light-diffusing properties of window **1130** of base portion **1112**, back plate **1138** of trap portion **1114**, adhesive **1140** on front surface **1142** of back plate **1138**, or any combination of window **1130**, back plate **1138** and adhesive **1140**. In some embodiments, a portion of the light entering front enclosure **1144** continues through opening **1120** in front housing **1118** and is emitted into the area where insect trap **1110** is installed. Insects are attracted to the UV and/or visible light transmitted through adhesive **1140** and through opening **1120** in front housing **1118**, and fly or crawl through opening **1120** and onto adhesive **1140**,

where they become trapped. The user may observe trapped insects by looking through opening **1120** in front housing **1118**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1114** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1114**, and replace it with a new trap portion **1114**. New trap portion **1114** has fresh adhesive-coated surfaces, ensuring that insect trap **1110** will continue to efficiently and effectively attract and trap insects.

[284] In some embodiments, because trap portion **1114** mounts on top of, and not in front of, base portion **1112**, insect trap **1110** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1110** is configured such that when insect trap **1110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1110** protrudes from the wall, is smaller than its overall height and overall width.

[285] It should be appreciated that a benefit of insect trap **1110** is the manipulation of light within trap portion **1114**. In some embodiments, light manipulation occurs solely within trap portion **1114**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1128**, window **1130**, back plate **1138** and adhesive **1140**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1140**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1140** or within trap portion **1114**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[286] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[287] Insect trap **1110** of this configuration may accommodate a variety of different trap portions **1114** that may be removably mounted to base portion **1112**, each trap portion **1114** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **1114**, and the size, shape, location and orientation of opening **1120** in front housing **1118** of trap portion **1114**, may be uniquely configured to attract and trap a specific species or multiple species of insects. For example, in some embodiments, trap portion **1114** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1114** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1114** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[288] In some embodiments, base portion **1112** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1112** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1112** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[289] As provided herein, opening **1120** may be a variety of shapes and/or sizes. For example, opening **1120** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1120** may be a slot having straight, curved or undulating shapes or patterns. When opening **1120** is circular, opening **1120** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1120** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1120** is approximately 0.5mm to 15mm in diameter. When opening **1120** is slot shaped, opening **1120** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1120** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1120** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[290] In some embodiments, opening **1120** covers all or a portion of front housing **1118**. For example, opening **1120** may cover a range of approximately 1% to 75% of the surface area of front housing **1118**. In some embodiments, opening **1120** covers approximately 5% to 50% of the surface area of front housing **1118**.

In some embodiments, opening **1120** covers approximately 10% to 30% of the surface area of front housing **1118**.

[291] Figure **37** is a front perspective view of a twelfth embodiment of an insect trap, indicated generally at **1210**. Insect trap **1210** includes a base portion **1212** and a removable trap portion **1214**. Trap portion **1214** is shown partially cut away and removed from base portion **1212** in this view. Insect trap **1210** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1210** protrudes from the wall, is the smallest of the three overall dimensions. A front surface **1238** of base portion **1212** may include a switch **1216**, configurable to enable insect trap **1210** to be turned on or off by closing or opening switch **1216** as desired by the user. Alternatively, switch **1216** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on insect trap **1210** when the room gets dark, or a remote control setting, for example. Switch **1216** may preferably be manually operated, although switch **1216** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any method for opening or closing switch **1216**. Protruding from a rear surface **1242** (shown in Figure **38**) of base portion **1212** are a plurality of electrically conductive prongs **1222**, adapted to mount insect trap **1210** to a wall and provide power to insect trap **1210** by inserting conductive prongs **1222** into a standard household electrical wall socket. Alternatively, conductive prongs **1222** may be adapted to swivel to allow insect trap **1210** to remain upright when conductive prongs **1222** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1212** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1212**. While an electrical socket and batteries have been described as providing power to insect trap **1210**, any suitable power source may be used. Base portion **1212** includes a lighting element such as one or more LEDs **1224**. In some embodiments, LEDs **1224** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1224** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic

sunlight. In some embodiments, LEDs **1224** include at least one that emits IR light to better attract certain species of insects including mosquitos and fleas. In a top surface **1234** of base portion **1212** may be at least one opening **1232**, and mounted in opening **1232** may be a transparent or translucent window **1230**, shown partially cut away to reveal LEDs **1224**. Window **1230** protects LEDs **1224** from dust and insect debris and allows base portion **1212** to be easily cleaned. Also in top surface **1234** may be a slot **1246**, and on the perimeter of top surface **1234** may be an upwardly directed rim or protrusions **1236**. Trap portion **1214** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **1214** is mounted in insect trap **1210**, and insect trap **1210** is mounted to a wall, the overall depth of the portion **1214**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1214**. Trap portion **1214** includes a front housing **1218** with at least one opening **1220** in a front surface **1254**, and a rear housing **1226**. Opening **1220** in front housing **1218** may be configured to admit a wide variety of insects into insect trap **1210**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1220** is configured to prevent a user's fingers from penetrating opening **1220** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1214**. In some embodiments, opening **1220** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1220**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1220**. Opening **1220** may be of uniform or of varying width, shape and orientation, and if trap portion **1214** has more than one opening **1220**, they may be of identical or of differing widths, shapes and orientations. Opening **1220** may be configured to attract one or more individual insect species or a variety of insect species. Front housing **1218** and rear housing **1226** of trap portion **1214** form an enclosure **1244**. Rear housing 1226 includes an inside surface **1228** that may be coated with a transparent, translucent or opaque adhesive **1240**. In some embodiments, inside surface **1228** of rear housing **1226** also has a reflective coating (not shown) under adhesive **1240**. Alternatively, the material and surface finish of rear housing **1226** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. Alternatively, adhesive **1240** may also be configured to reflect UV and/or visible and/or IR light. Inside surface

1228 of rear housing **1226** may also be configured of material that may polarize light reflecting from it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. Rear housing **1226** may include an opening **1250** on its bottom surface **1252**, or alternatively opening **1250** may be replaced by a transparent or translucent window (not shown). In some embodiments, front housing **1218** may be coated with transparent, translucent or opaque adhesive on its inside surface (not shown) to provide additional insect trapping efficiency and capacity. Front housing **1218** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **1218** and rear housing **1226** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1218** and rear housing **1226** are constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, front housing **1218** and rear housing **1226** are joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **1214** may also include one or more insect attractants. For example, trap portion **1214** may be impregnated sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **1210**. In such embodiments, the insect attractant is integral to trap portion **1214**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an

inside surface of enclosure **1244** or through an opening in front housing **1218** or rear housing **1226** or on front surface **1254** of front housing **1218**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1210**.

[292] Figure **38** is a cross-sectional view of insect trap **1210**. In some embodiments, base portion **1212** includes a circuit board **1248** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1222** (only one of which is shown), switch **1216** and LEDs **1224** (only one of which is shown). For clarity, however, not all of the electrical connections are shown. Circuit board **1248** may include electronic circuitry to receive ordinary household current from conductive prongs **1222**, respond to the position of switch **1216** and provide power to illuminate LEDs **1224**. Circuit board **1248** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that may provide steady voltage to LEDs **1224** when switch **1216** is in the closed position, although it may also provide a varying voltage to LEDs **1224** to provide a flickering light which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1248** may provide power to LEDs **1224** to provide both UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **1224** or to only visible light LEDs **1224** or to only IR LEDs **1224**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1248** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other

device that may be mounted in base portion **1212** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1210**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1210**. Circuit board **1248** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1212** and into trap portion **1214**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1224** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1224** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1214** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[293] As shown, slot **1246** in top surface **1234** of base portion **1212** and rim or protrusions **1236** on top surface **1234** engage with trap portion **1214** to secure it in

place during use, although any other form of attachment may be substituted that allows trap portion **1214** to be securely but removably mounted on base portion **1212**. A bottom surface **1256** of base portion **1212** may be substantially flat or concave to allow insect trap **1210** to sit upright on a floor, desk, table or shelf when insect trap **1210** is unplugged. Alternatively, bottom surface **1256** of the base portion **1212** may have two or more protrusions (not shown) or legs that allow insect trap **1210** to sit upright when insect trap **1210** is unplugged.

[294] In the operation of insect trap **1210**, conductive prongs **1222** are inserted into a wall electrical socket, and switch **1216** may be moved to the closed position. LEDs **1224** emit light, represented by arrows, which transmits through opening **1232** in base portion **1212** and into enclosure **1244**, and directly onto adhesive **1240** coating inside surface **1228** of rear housing **1226**. In some embodiments, light is not manipulated in base portion **1212** and is emitted directly into trap portion **1214**. Because the light from LEDs **1224** enters enclosure **1244** through opening **1238** in the bottom surface **1252** of rear housing **1226** of trap portion **1214** (e.g., a face that is substantially parallel to the overall depth of trap portion **1214**), the light can travel the entire length of enclosure **1244** and can diverge over the entire length of rear enclosure **1244**, and therefore can be more evenly distributed throughout enclosure **1244**.

[295] Inside surface **1228** of rear housing **1226** may include a concave shape and may be configured to reflect light from LEDs **1224** to distribute the light evenly through enclosure **1244**, although inside surface **1228** of rear housing **1226** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto inside surface **1228** of rear housing **1226**, may be mounted to base portion **1212** at or near opening **1232** or to trap portion **1214** at or near opening **1250**, and may replace or augment the light-distributing role of inside surface **1228** of rear housing **1226**. In some embodiments, the light from LEDs **1224** may directly strike inside surface **1228** of rear housing **1226** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across inside surface **1228**, and may replace or augment the light-distributing role of inside surface **1228** the lens or lenses mounted to trap

portion **1214** or to base portion **1212**. Light may be further evenly distributed by the light-diffusing properties of window **1230** in base portion **1212**, by adhesive **1240** on inside surface **1228** of rear housing **1226**, or by a combination of the two.

[296] Thereafter, a portion of the light continues through opening **1220** in front housing **1218** and into the surrounding area where the trap is installed. Insects are attracted to the UV and/or visible light transmitted through opening **1220**, and fly or crawl into opening **1220** and onto adhesive **1240**, where they become trapped. A user may observe trapped insects by looking through opening **1220** in front housing **1218**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1214** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1214**, and replace it with a new trap portion **1214**. New trap portion **1214** has fresh adhesive-coated surfaces, ensuring that insect trap **1210** will continue to efficiently and effectively attract and trap insects.

[297] In some embodiments, because trap portion **1214** mounts on top of, and not in front of, base portion **1212**, insect trap **1210** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1210** is configured such that when insect trap **1210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1210** protrudes from the wall, is smaller than its overall height and its overall width.

[298] It should be appreciated that a benefit of insect trap **1210** is the manipulation of light within trap portion **1214**. In some embodiments, light manipulation occurs solely within trap portion **1214**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1228** and adhesive **1240**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1240**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1240** or within trap portion **1214**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[299] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers,

styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[300] Insect trap **1210** of this configuration may accommodate a variety of different trap portions **1214** that may be removably mounted to base portion **1212**, each trap portion **1214** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **1214**, and the size, shape, location and orientation of opening **1220** in front housing **1218** of trap portion **1214**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **1214** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1214** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1214** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[301] In some embodiments, base portion **1212** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1212** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1212** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[302] As provided herein, opening **1220** may be a variety of shapes and/or sizes. For example, opening **1220** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1220** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1220** is circular, opening **1220** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1220** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1220** is approximately 0.5mm to 15mm in diameter. When opening **1220** is slot shaped, opening **1220** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1220** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1220** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[303] In some embodiments, opening **1220** covers all or a portion of front housing **1218**. For example, opening **1220** may cover a range of approximately 1% to 75% of the surface area of front housing **1218**. In some embodiments, opening **1220** covers approximately 5% to 50% of the surface area of front housing **1218**. In some embodiments, opening **1220** covers approximately 10% to 30% of the surface area of front housing **1218**.

[304] Figure **39** is a front perspective view of a thirteenth embodiment of an insect trap, indicated generally at **1310**. Insect trap **1310** includes a base portion **1312** and a removable trap portion **1314**. Trap portion **1314** is shown partly cut away and partially removed from base portion **1312** in this view. Insect trap **1310** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1310** protrudes from the wall, is the smallest of the three overall dimensions. A front surface **1346** of base portion **1312** may include a switch **1316**, configurable to enable insect trap **1310** to be turned on or off by closing or opening switch **1316** as desired by the user. Alternatively, switch **1316** may be configured to control other features such as light intensity, combinations of light wavelengths, different modes or frequencies of flickering light, an automatic setting that turns on insect trap **1310** when the room gets dark, or a remote control setting for example. Switch **1316** may be manually operated, although switch **1316** may also be operated electrically, optically, electro-mechanically, electro-optically, or by any method for opening or closing switch **1316**. Protruding from a rear surface **1350** (shown in Figure **40**) of base portion **1312** are a plurality of electrically conductive prongs **1322**, adapted to mount insect trap **1310** to a wall and provide power to insect trap **1310** by inserting conductive prongs **1322** into a standard household electrical wall socket. Alternatively, conductive prongs **1322** may be adapted to swivel to allow insect trap **1310** to remain upright when conductive prongs **1322** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1312** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1312**. While an electrical socket and batteries have been described as providing power to insect trap **1310**, any suitable power source may be used. Base portion **1312** includes a top surface **1332** and one or more light sources **1324**. Light sources **1324** may use fluorescent,

incandescent, LED, or any other lighting technology or combination of lighting technologies. In some embodiments, light sources **1324** emit both UV and visible light. In some embodiments, one or more of light sources **1324** emit UV light and one or more of light sources **1324** emit blue light to better attract a wide variety of insect species. In some embodiments, light sources **1324** emit a combination of wavelengths to mimic sunlight. In some embodiments, one or more of light sources **1324** may emit infrared (IR) light to better attract certain species of insects including mosquitos and fleas. In some embodiments, light sources **1324** may at least partially protrude from top surface **1332** of base portion **1312**. In top surface **1332** of base portion **1312** may be at least one opening **1330**, which may receive light sources **1324**. On the perimeter of top surface **1332** may be an upwardly directed rim or protrusions **1334**. Trap portion **1314** includes a front housing **1318** with at least one opening **1320** in a front surface **1352**, and a rear housing **1326** with an inside surface **1328**. Opening **1320** in front housing **1318** may be configured to admit a wide variety of insects into insect trap **1310**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1320** is configured to prevent a user's fingers from penetrating opening **1320** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1314**. In some embodiments, opening **1320** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1320**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1320**. Opening **1320** may be of uniform or of varying width, shape and orientation, and if trap portion **1314** has more than one opening **1320**, they may be of identical or of differing widths, shapes and orientations. Opening **1320** may be configured to attract one or more individual insect species or a variety of insect species. Front housing **1318** and rear housing **1326** of trap portion **1314** form an enclosure **1344**. Inside surface **1328** of rear housing **1326** may be coated with a transparent, translucent or opaque adhesive. In some embodiments, inside surface **1328** of rear housing **1326** also has a reflective coating (not shown) under adhesive **1340**. Alternatively, the material and surface finish of rear housing **1326** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. Alternatively, adhesive **1340** may also be configured to reflect and disperse UV and/or visible and/or IR light. Inside surface **1328** of rear housing **1326** may also

be configured of material that may polarize light reflecting from it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, front housing **1318** may be coated with transparent, translucent or opaque adhesive on its inside surface (not shown) to provide additional insect trapping efficiency and capacity. Front housing **1318** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and may further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **1318** and rear housing **1326** of trap portion **1314** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1318** and rear housing **1326** are constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, front housing **1318** and rear housing **1326** are joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **1314** may also include one or more insect attractants. For example, trap portion **1314** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **1310**. In such embodiments, the insect attractant is integral to trap portion **1314**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of enclosure **1344** or through an opening in front housing **1318** or rear housing **1326** or on front surface **1352** of front housing **1318**. Alternatively, water

may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1310**. In some embodiments, trap portion **1314** also includes at least one transparent or translucent sleeve **1336** that receive and protect light sources **1324** when trap portion **1314** is mounted on base portion **1312**. In some embodiments, the material and thickness of sleeve **1336** is selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through sleeve **1336**.

[305] Figure **40** is a cross-sectional view of insect trap **1310**. In some embodiments, base portion **1312** includes a circuit board **1348** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1322** (only one of which is shown), switch **1316** and light sources **1324** (only one of which is shown). For clarity, however, not all of the electrical connections are shown. Circuit board **1348** may include electronic circuitry to receive ordinary household current from conductive prongs **1322**, respond to the position of switch **1316** and provide power to illuminate light sources **1324**. Circuit board **1348** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to light sources **1324** when switch **1316** is in the closed position, although it may also provide a varying voltage to light sources **1324** to provide a flickering light which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1348** may provide power to light sources **1324** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only light sources **1324** that

produce UV light or to only light sources **1324** that produce visible light or to only light sources **1324** that produce IR light, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1348** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1312** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1310**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1310**. Circuit board **1348** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1312** and into trap portion **1314**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of light sources **1324** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1314** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[306] Trap portion **1314** may have at least one opening **1338**. Sleeve **1336** of trap portion **1314** may be mounted with its open end adjacent to opening **1338** and may include a tapered section **1342** adjacent to opening **1338** configured to guide light sources **1324** into sleeve **1336** when trap portion **1314** is mounted to base portion **1312**. Alternatively, sleeve **1336** of trap portion **1314** may be made of an opaque material and include one or more openings (not shown) to allow light from light sources **1324** to transmit into enclosure **1344**. Alternatively, sleeve **1336** may have an opaque coating (not shown) on its outside surface adjacent to front housing **1318** of trap portion **1314** to prevent light from transmitting directly from light sources **1324** through enclosure **1344** and out through opening **1320** of front housing **1318**. Alternatively, sleeve **1336** may be configured of plastic or metal wire mesh (not shown) or any configuration that guides light sources **1324** into trap portion **1314**, protects light sources **1324** from touching adhesive **1340**, and allows light from light sources **1324** to enter enclosure **1344**.

[307] As shown, rim or protrusions **1334** on top surface **1332** of base portion **1312** engage with trap portion **1314** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **1314** to be securely but removably mounted on base portion **1312**. Bottom surface **1354** of the base portion **1312** may be substantially flat or concave to allow the insect trap **1310** to sit upright on a floor, desk, table or shelf when the insect trap **1310** is unplugged. Alternatively, the bottom surface **1354** of the base portion **1312** may have two or more protrusions (not shown) or legs that allow the insect trap **1310** to sit upright when the insect trap **1310** is unplugged.

[308] In the operation of insect trap **1310**, conductive prongs **1322** are inserted into a wall electrical socket, and switch **1316** is moved to the closed position. Light sources **1324** emit light, represented by arrows, which transmits through sleeve **1336** in trap portion **1314**, into enclosure **1344**, and directly onto adhesive **1340** coating inside surface **1328** of rear housing **1326**. In some embodiments, light is not manipulated in base portion **1312** and is emitted directly into trap portion **1314**.

[309] Inside surface **1328** of rear housing **1326** may include a concave shape and may be configured to reflect and disperse light from light sources **1324** to project the light evenly through enclosure **1344** and out through openings **1320** of front housing **1318**, although inside surface **1328** of rear housing **1326** may have a

convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. The light may be further evenly distributed by the light-diffusing properties of sleeve **1336**, by adhesive **1340** on inside surface **1328** of rear housing **1326**, or by a combination of the two.

[310] Thereafter, a portion of the light entering enclosure **1344** continues through opening **1320** in front housing **1318** and into the surrounding area where insect trap **1310** is installed. Insects are attracted to the light transmitted through opening **1320** in front housing **1318**, and fly or crawl into opening **1320** and onto adhesive **1340**, where they become trapped. A user may observe trapped insects by looking through openings **1320** in front housing **1318**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire trap portion **1314** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1314**, and replace it with a new trap portion **1314**. New trap portion **1314** has fresh adhesive-coated surfaces, ensuring that insect trap **1310** will continue to efficiently and effectively attract and trap insects. Because sleeve **1336** protects light sources **1324** from contacting insects, insect debris and adhesive **1340**, light sources **1324** remain clean and maintain their light-producing efficiency.

[311] In some embodiments, because trap portion **1314** mounts on top of, and not in front of, base portion **1312**, insect trap **1310** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1310** is configured such that when insect trap **1310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1310** protrudes from the wall, is smaller than its overall height and its overall width.

[312] It should be appreciated that a benefit of insect trap **1310** is the manipulation of light within trap portion **1314**. In some embodiments, light manipulation occurs solely within trap portion **1314**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1328** and adhesive **1340**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1340**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1340** or within trap portion **1314**,

for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[313] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[314] Insect trap **1310** of this configuration may accommodate a variety of different trap portions **1314** that may be removably mounted to base portion **1312**, each trap portion **1314** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **1314**, and the size, shape, location and orientation of opening **1320** in front housing **1318** of trap portion **1314**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **1314** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1314** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1314** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[315] In some embodiments, base portion **1312** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1312** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1312** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[316] As provided herein, opening **1320** may be a variety of shapes and/or sizes. For example, opening **1320** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1320** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1320** is circular, opening **1320** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1320** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1320** is approximately 0.5mm

to 15mm in diameter. When opening **1320** is slot shaped, opening **1320** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1320** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1320** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[317] In some embodiments, opening **1320** covers all or a portion of front housing **1318**. For example, opening **1320** may cover a range of approximately 1% to 75% of the surface area of front housing **1318**. In some embodiments, opening **1320** covers approximately 5% to 50% of the surface area of front housing **1318**. In some embodiments, opening **1320** covers approximately 10% to 30% of the surface area of front housing **1318**.

[318] Figure **41** is a front perspective view and Figure **42** is a rear perspective view of an example of the thirteenth embodiment of an insect trap, indicated generally at **1310A**. Insect trap **1310A** includes a base portion **1312A** and a removable trap portion **1314A**. Base portion **1312A** is shown partially cut away in Figure **41**. Trap portion **1314A** is shown partially removed from base portion **1312A** in Figure **41** and Figure **42**. Base portion **1312A** includes one or more light sources **1324A** and a housing **1356A** with one or more side channels **1358A** adapted to receive trap portion **1314A** and guide it into place when trap portion **1314A** is mounted in base portion **1312A**. Trap portion **1314A** includes a frame **1360A** and a membrane **1362A** with a coating of insect-trapping adhesive on its front surface **1364A**. Frame **1360A** includes a tab **1366A** and at least one opening **1368A**. Tab **1366A** is configured to protrude above housing **1356A** when trap portion **1314A** is mounted in base portion **1312A**. Membrane **1362A** is mounted to frame **1360A** such that front surface **1364A** of membrane **1362A** is recessed within frame **1360A** and the coating of adhesive is exposed through opening **1368A** in frame **1360A**. As shown, frame **1360A** surrounds the entire periphery of membrane **1362A**, although frame **1360A** may surround only a portion (e.g., one, two or three sides) of the periphery of membrane **1362A**. Membrane **1362A** may be constructed from opaque or translucent materials such as paper, paperboard or plastic. Frame **1360A** may be of varying thickness and may be made of a variety of sheet materials including corrugated cardboard, polystyrene foam and paperboard, as well as from molded or thermoformed plastic. Trap portion **1314A** may be removed from base portion **1312A** by grasping and lifting tab **1366A**.

Trap portion **1314A** is mounted in base portion **1312A** by grasping tab **1366A**, inserting trap portion **1314A** into side channels **1358A** and lowering trap portion **1314A** into place. Frame **1360A** and membrane **1362A** are configured to allow users to remove and replace trap portion without contacting adhesive or dead insects.

[319] A variety of configurations are contemplated to protect the user from touching adhesive and from seeing and touching dead insects. Figure **43** is a front perspective view and Figure **44** is a rear perspective view of an example of the thirteenth embodiment of an insect trap, indicated generally at **1310B**. Insect trap **1310B** includes a base portion **1312B** and a removable trap portion **1314B**. Trap portion **1314B** is shown partially removed from base portion **1312B** in this view. Base portion **1312B** includes a housing **1356B** with one or more side channels **1358B.** Trap portion **1314B** includes a frame **1360B**, a membrane **1362B** with a coating of insect-trapping adhesive on its front surface **1364B,** and a cover **1370B** with a flexible web **1372B** and a cover portion **1374B**. Frame **1360B** includes a tab **1366B** and at least one opening **1368B**. Membrane **1362B** is mounted to frame **1360B** such that front surface **1364B** of membrane **1362B** is recessed within frame **1360B** and the coating of adhesive is exposed through opening **1368B** in frame **1360B**. As shown, frame **1360B** surrounds the entire periphery of membrane **1362B**, although frame **1360B** may surround only a portion (e.g., one, two or three sides) of the periphery of membrane **1362B**. Web **1372B** of cover **1370B** attaches to tab **1366B** of frame **1360B**, and is configured to act as a hinge, thereby allowing cover portion **1374B** to fold behind frame **1360B** and membrane **1362B** when cover **1370B** is in the open position (as shown) and allowing cover portion **1374B** to fold over frame **1360B** when cover **1370B** is in the closed position. Although web **1372B** is shown attached to tab **1366B** at the top of frame **1360B**, and cover portion **1374B** opens from the bottom of trap portion **1314B** (e.g., the opposite end from where web **1372B** is attached), web **1372B** may attach anywhere on its periphery of frame **1360B**, and cover portion **1374B** may open from anywhere on the periphery of frame **1360B**. Cover portion **1374B** is shown folded behind frame **1360B** (e.g., in the open position) in Figure **43** and in Figure **44**. Side channels **1358B** may be adapted to receive trap portion **1314B** with cover portion **1374B** folded behind frame **1360B** and membrane **1362B** (e.g., in the open position) and guide trap portion **1314B** into place as trap portion **1314B** is

mounted in base portion **1312B**. Membrane **1362B** may be made of opaque or translucent materials such as paper, paperboard or plastic. Frame **1360B** may be made of a variety of sheet materials including corrugated cardboard, polystyrene foam and paperboard, as well as from molded or thermoformed plastic. Cover portion **1374B** may be made of a variety of materials and processes including thermoformed sheet plastic, molded plastic, formed paperboard or formed paper pulp.

[320] Figure **45** is a front perspective view of trap portion **1314B**. As shown, trap portion **1314B** has several trapped insects stuck on the adhesive coating on front surface **1364B** of membrane **1362B** and has been removed from base portion **1312B**, with cover portion **1374B** shown in the partially closed position. In some embodiments, cover portion **1374B** may include one or more features such as ribs, bumps or lips (not shown) to engage with the periphery of frame **1360B**, which may have corresponding features such as recesses (not shown), to firmly but removably secure cover portion **1374B** to frame **1360B** when cover portion **1374B** is in the closed position, and to firmly but removably secure cover portion **1374B** to frame **1360B** and/or membrane **1362B** when cover portion **1374B** is folded back in the open position. In some embodiments, cover portion **1374B** and frame **1360B** may also include one or more features such as tabs or recesses (not shown) that allow cover portion **1374B** to be easily opened and closed.

[321] Returning to Figure **43** and Figure **44**, trap portion **1314B** may be removed from base portion **1312B** by grasping and lifting tab **1366B**. Cover portion **1374B** may then be folded into the closed position over frame **1360B**, thereby covering frame **1360B** and front surface **1364B** of membrane **1362B** and protecting user from seeing or contacting dead insects during disposal of trap portion **1314B**. To install new trap portion **1314B**, cover portion **1374B** is folded into the open position and trap portion **1314B** is mounted in base portion **1312B** by grasping tab **1366B**, inserting trap portion **1314B** into side channels **1358B** and lowering trap portion **1314B** into place. It may be desirable to further protect the user from touching adhesive and from seeing and touching dead insects when removing and replacing the removable and trap portion. Figure **46** is a front perspective view of an example of the thirteenth embodiment of an insect trap, indicated generally at **1310C**. Insect trap **1310C** includes a base portion **1312C** and a removable trap portion **1314C**. Base portion is shown partly cut away and trap portion **1314C** is

shown removed from base portion **1312C**. Base portion **1312C** includes one or more light sources **1324C** and a housing **1356C** with one or more side channels **1358C** (only one of which is shown) adapted to receive trap portion **1314C** and guide it into place when trap portion **1314C** is mounted to base portion **1312C**.

[322] Figure **47** is a front perspective view of trap portion **1314C**. Trap portion **1314C** is shown partially cut away in this view. Trap portion **1314C** includes a front plate **1370C** with an opening **1368C**, a front spacer **1372C** with an opening **1374C**, a core **1376C** with recesses **1378C** (only one of which is shown), a membrane **1362C** with a coating of insect-trapping adhesive on its front surface **1364C**, a back spacer **1380C** with an opening **1382C**, a back plate **1384C**, a shade **1386C** and a cylindrical pin **1388C**. Shade **1386C** is configured to move freely over pin **1388C**, in the space bounded by front plate **1370C**, core **1376C** and opening **1374C** of front spacer **1372C**, and in the space bounded by membrane **1362C**, back plate **1384C** and opening **1382C** of back spacer **1380C**. Recesses **1378C** in core **1376C** hold pin **1388C** in place and allow it to turn freely. Shade **1386C** includes a knob **1390C** configured to engage with housing **1356C** (not shown in this view) and to raise shade **1386C**, thereby exposing the insect-trapping adhesive on front surface **1364C** of membrane **1362C** when trap portion **1314C** is mounted to base portion **1312C**, and to lower shade **1386C**, thereby covering the adhesive when trap portion **1314C** is removed from base portion **1312C**, as well as allowing the user to raise and lower shade **1386C** by hand. Shade **1386C** is configured to operate as a tambour (e.g., in a similar manner to the cover of a roll-top desk). Knob **1390C** also prevents shade **1386C** from being raised above top edge of opening **1368C** in front plate **1370C** and from being lowered below bottom edge of opening **1368C** of front plate **1370C**. Front plate **1370C**, front spacer **1372C**, core **1376C**, membrane **1362C**, back spacer **1380C** and back plate **1384C** may be made from a variety of materials including sheet plastic, molded plastic, corrugated cardboard, paperboard or foamed plastic, and may be assembled one over of the other in a layered configuration using a variety of manufacturing techniques including gluing, stapling ultrasonic welding and high-frequency welding. Shade **1386C** may be made from a variety of materials including sheet plastic, molded plastic and paper. In some embodiments, shade **1386C** may include a series of transverse scores to enhance its flexibility. Pin **1388C** may be made from turned wood, molded plastic or metal. Housing **1356C**

may be made of a variety of materials, including thermoformed sheet plastic, molded plastic and molded paper pulp.

[323] Figure **48** is a cross-sectional view of insect trap **1310C,** and Figure **49** is an enlarged view of a portion of Figure **48**. Trap portion **1314C** is shown being lifted from base portion **1312C** in these views. Housing **1356C** includes a lip **1392C**. Knob **1390C** protrudes beyond front plate **1370C** and includes a top angled surface **1394C** and a bottom angled surface **1396C.** Bottom angled surface **1396C** of knob **1390C** is configured to engage with lip **1392C** of housing **1356C** as trap portion **1314C** is lowered onto base portion **1312C**. When knob **1390C** reaches the top edge of opening **1368C** of front plate **1370C** (e.g., when shade **1386C** is fully open, exposing the insect-trapping adhesive), lip **1392C** of housing **1356C** flexes, allowing knob **1390C** to pass by as trap portion **1314C** is lowered into position on base portion **1312C**. Top angled surface **1394C** of knob **1390C** is configured to engage with lip **1392C** of housing **1356C** as trap portion **1314C** is lifted from base portion **1312C**. When knob **1390C** reaches the bottom edge of opening **1368C** of front plate **1370C** (e.g., when shade **1386C** is fully closed), lip **1392C** of housing **1356C** flexes, allowing knob **1390C** to pass by as trap portion **1314C** is removed from base portion **1312C**. Accordingly, shade **1386C** of trap portion **1314C** automatically opens when trap portion **1314C** is mounted on base portion **1312C**, and automatically closes when trap portion **1314C** is removed from base portion **1312C**, thereby preventing the user from touching the insect-trapping adhesive and from seeing or touching dead insects while removing and replacing trap portion **1314C**.

[324] A variety of configurations are contemplated to automatically protect the user from touching adhesive and from seeing and touching dead insects when removing and replacing the removable and trap portion. Figure **50** is a front perspective view of an example of a trap portion, indicated generally at **1314D**, and Figure **51** is an enlarged view of a portion of Figure **50**. Trap portion **1314D** is shown partially cut away in this view. Trap portion **1314D** includes a front plate **1370D** with an opening **1368D**, a spacer **1372D** with an opening **1374D,** a core **1376D** with an opening **1378D** and a roll recess **1380D**, a membrane **1362D** with a coating of insect-trapping adhesive on its front surface **1364D**, and a shade **1386D** with a knob **1390D** on its proximal end **1382D.** As shown, trap portion **1314D** has a layered construction, such that front surface **1364D** of membrane

1362D attaches to the back surface (not shown) of core **1376D**, and the front surface of core **1376D** attaches to the back surface (not shown) of spacer **1372D**, and the front surface of spacer **1372D** attaches to the back surface (not shown) of front plate **1370D**, and membrane **1362D**, core **1376D**, front spacer **1372D** and front plate **1370D** align along the perimeter of trap portion **1314D**. The coating of insect-attracting adhesive on front surface **1364D** of membrane **1362D** is exposed through opening **1378D** in core **1376D**, opening **1374D** in spacer **1372D** and opening **1368D** in front plate **1370D**. Front plate **1370D**, spacer **1372D**, core **1376D** and membrane **1362D** may be made from a variety of materials including sheet plastic, molded plastic, corrugated cardboard, paperboard and foamed plastic, and may be assembled together in a variety of methods including adhesive, mechanical fasteners and welding. Shade **1386D** has a distal end (not shown) which is rolled into a cylindrical roll portion **1394D** with roll ends **1396D** (only one of which is shown) and fits loosely inside roll recess **1380D** of core **1376D**. Roll portion **1394D** of shade **1386D** is configured to unroll when proximal end **1382D** of shade **1386D** is lowered, operating in a similar manner to a household window roller blind. Channels formed by front surface of core **1376D**, opening **1374D** in spacer **1372D** and back surface (not shown) of front plate **1370D** guide the sides of the unrolled portion of shade **1386D** and keep the unrolled portion of shade **1386D** substantially flat, such that when proximal end **1382D** of shade **1386D** is lowered, shade covers opening **1378D** of core **1376D** and the coating of adhesive on front surface **1364D** of membrane **1362D**. Shade **1386D** is thin and flexible to roll tightly and remain substantially flat when unrolled, and may be made from a variety of materials including sheet plastic, molded plastic and paper. In some embodiments, roll portion **1394D** of shade **1386D** may have a center shaft (not shown) that provides a solid form around which the distal end of shade **1386D** is rolled and imparts stiffness to roll portion **1394D**. In some embodiments, the center shaft (not shown) may have ends that extend beyond roll ends **1396D** of roll portion **1394D** and turn freely in recesses (not shown) at the ends of roll recess **1380D**, thereby providing roll portion **1394D** of shade **1386D** with a more positive location and reduced friction when shade **1386D** is unrolled. In some embodiments, a spring mechanism (not shown) within core **1376D** or within the center shaft (not shown) may provide torsion to reroll

the unrolled portion of shade **1386D** when proximal end **1382D** is raised as well as provide tension to aid in keeping the unrolled portion substantially flat.

[325] Other configurations are contemplated that reveal insect-trapping adhesive when insect trap **1310D** is in use and cover the adhesive and dead insects when trap portion **1314C** is being removed and replaced. In some embodiments, an array of pivoting slats (not shown) positioned in front of opening **1368D** in front plate **1370D** and configured to open and close together may replace shade **1386D**.

[326] Figure **52** is a cross-sectional view of insect trap **1310D**, and Figure **53** is an enlarged portion of Figure **52**. Insect trap **1310D** includes a removable trap portion **1314D** and a base portion **1312D** with a housing **1356D**. Trap portion **1314D** is shown partially removed from base portion **1312D** in this view. Knob **1390D** of shade **1386D** is configured to engage with housing **1356D** and to lower proximal end **1382D** of shade **1386D**, thereby covering the insect-attracting adhesive and dead insects trapped on the adhesive when trap portion **1314D** is removed from base portion **1312D**. Knob **1390D** also prevents shade **1386D** from being lowered below bottom edge of opening **1368D** of front plate **1370D**. In some embodiments, knob **1390D** may also be configured to engage with housing **1356D** and to raise proximal end **1382D** of shade **1386D**, thereby exposing the adhesive when trap portion **1314D** is mounted in base portion **1312D**, as well as to prevent shade **1386D** from being raised below top edge of opening **1368D** of front plate **1370D**. Accordingly, shade **1386D** of trap portion **1314D** automatically closes when trap portion **1314D** is removed from base portion **1312D**, thereby preventing the user from touching the insect-trapping adhesive and from seeing or touching dead insects while removing and replacing trap portion **1314D**.

[327] Figure **54** is a front perspective view and Figure **55** is a rear perspective view of an example of the thirteenth embodiment of an insect trap, indicated generally at **1310E**. Insect trap **1310E** includes a base portion **1312E** and a removable trap portion **1314E**. Trap portion **1314E** is shown partially removed from base portion **1312E**. Base portion **1312E** includes a front portion **1316E** with at least one opening **1318E**, a rear portion **1320E**, side channels **1358E** between front portion **1316E** and rear portion **1320E**, and a bottom portion **1322E** with a plurality of electrically conductive prongs **1326E** protruding from its rear surface **1328E**. Side channels **1358E** are adapted to receive trap portion **1314E** and guide it into place when trap portion **1314E** is mounted in base portion **1312E**. Trap portion **1314E**

includes a frame **1360E** and a membrane **1362E** with a coating of insect-trapping adhesive on its front surface **1364E**. Frame **1360E** includes a tab **1366E** and at least one opening **1368E**. Tab **1366E** is configured to protrude above housing **1356E** when trap portion **1314E** is mounted in base portion **1312E**. Membrane **1362E** is mounted to frame **1360E** such that front surface **1364E** of membrane **1362E** is recessed within frame **1360E** and the coating of adhesive is exposed through opening **1368E** in frame **1360E**. As shown, frame **1360E** surrounds the entire periphery of membrane **1362E**, although frame **1360E** may surround only a portion (e.g., one, two or three sides) of the periphery of membrane **1362E**. Membrane **1362E** may be constructed from transparent or translucent materials such as paper, paperboard or plastic. Frame **1360E** may be of varying thickness and may be made of a variety of sheet materials including corrugated cardboard, polystyrene foam and paperboard, as well as of molded or thermoformed plastic. Trap portion **1314E** may be removed from base portion **1312E** by grasping and lifting tab **1366E**. Trap portion **1314E** is mounted in base portion **1312E** by grasping tab **1366E**, inserting trap portion **1314E** into side channels **1358E** and lowering trap portion **1314E** into place.

[328] Figure **56** is a cross-sectional view of insect trap **1310E.** Bottom portion **1322E** of base portion **1312E** includes an opening **1330E**, a circuit board **1332E** electrically connected to conductive prongs **1326E**, only one of which is shown, and a lighting element such as one or more LEDs **1324E**, only one of which is shown. For clarity, not all electrical connections are shown. Circuit board **1332E** includes electronic circuitry to receive ordinary household current from conductive prongs **1326E**, only one of which is shown, and provide power to illuminate LEDs **1324E**. Trap portion **1314E** is held between rear portion **1320E** of base portion **1312E** and front portion **1316E** of base portion **1312E** by side channels **1358E** (not shown in this view). Rear portion **1320E** of base portion **1312E** includes an inside surface **1334E** configured to reflect light from LEDs **1324E** and direct it toward membrane **1362E** of trap portion **1314E**. In some embodiments, rear portion **1320E** includes a window (not shown) positioned adjacent to membrane **1362E** of trap portion **1314E** when trap portion **1314E** is mounted in base portion **1312E**, to protect LEDs **1324E** and inside surface **1334E** of rear portion **1320E** from dust and insect debris when trap portion **1314E** is removed from base portion **1312E**.

[329] In the operation of insect trap **1310E**, conductive prongs **1326E** are inserted into a wall electrical socket. LEDs **1324E** emit light, which transmits through opening **1330E** bottom portion **1322E**, onto inside surface **1334E** of rear portion **1320E**, and is reflected onto membrane **1362E** of trap portion **1314E**. A portion of light from LEDs **1324E** emits directly onto membrane **1362E**. The light transmits through membrane **1362E** and adhesive on front surface **1364E** and then through opening **1318E** in front portion **1316E** and into the area where insect trap **1310E** is installed. Insects are attracted to the light transmitted through adhesive and through opening **1318E**, and fly or crawl through opening **1318E** and onto adhesive, where they become trapped. The user may observe trapped insects by looking through opening **1318E**. When a sufficient number of insects have been trapped, the user may easily remove trap portion **1314E** by grasping tab **1366E** and lifting trap portion **1314E** out of base portion **1312E** and may discard the entire used trap portion **1314E** without touching trapped insects, insect debris or adhesive, and replace it with a new trap portion **1314E**. The new trap portion **1314E** has fresh adhesive-coated surfaces, ensuring that insect trap **1310E** will continue to efficiently and effectively attract and trap insects.

[330] Figure **57** is a rear perspective view of an example of the thirteenth embodiment of an insect trap, indicated generally at **1310F**. Insect trap **1310F** includes a base portion **1312F** and a removable trap portion **1314F**. Base portion **1312F** includes a front portion **1316F** with at least one opening **1318F**, a rear portion **1320F**, side channels **1358F** between front portion **1316F** and rear portion **1320F**, and a bottom portion **1322F** with an opening **1330F**, a lighting element such as one or more LEDs **1324F**, and a plurality of electrically conductive prongs **1326F** protruding from its rear surface **1328F**. Rear portion **1320F** includes a window **1338F** that protects LEDs **1324F** from dust and insect debris when trap portion **1314F** is removed from base portion **1312F**. Window **1338F** is shown partially cut away in this view. On a rear surface of window **1338F** is a heating element such as one or more heating wires **1340F** mounted on its rear surface. Heating wires **1340F** may be configured in a uniform pattern to produce heat in response to electric power. Heating wires **1340F** are connected to a plurality of busses **1342F**, which, in turn, are electrically connected to a corresponding plurality of connecting wires **1344F**. In some embodiments, connecting wires **1344F** are electrically connected to busses **1342F** with solder. In some

embodiments, heating wires **1340F** may be made of resistance wires glued or otherwise affixed to the rear surface of window **1338F** in a uniformly-spaced pattern and configured to produce heat in response to electric current. In some embodiments, heating wires **1340F** may be of conductive polymer or other conductive material applied directly to the rear surface of window **1338F**. In some embodiments, heating wires **1340F** may be of a self-correcting conductive polymer or other self-correcting conductive material that increases its internal resistance at higher temperatures and transfers electrical power from warmer regions to cooler ones, thereby improving temperature uniformity across heating wires **1340F** and window **1338F**. In some embodiments busses **1342F** may be made of highly conductive metal such as copper. In some embodiments, heating wires **1340F** and busses **1342F** both may be made of conductive polymer. In some embodiments, heating wires **1340F** may be of a transparent or translucent material. In some embodiments, heating wires **1340F** are replaced by a thin, transparent layer of metal oxide (not shown) on the rear surface of window **1338F** that is electrically connected at opposite sides of the rear surface of window **1338F** and produces heat in response to electric current. In general, the heat generated may increase and maintain the temperature of at least a portion of adhesive to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. In some embodiments, heat alone or heat and scent alone are used as an attractant, and light sources are not used in insect trap **1310F**.

[331] Side channels **1358F** are adapted to receive trap portion **1314F** and guide it into place when trap portion **1314F** is mounted in base portion **1312F**. Trap portion **1314F** includes a frame **1360F** and a membrane **1362F**. Frame **1360F** includes a tab **1366F**, configured to protrude above housing **1356F** when trap portion **1314F** is mounted in base portion **1312F**. Membrane **1362F** may be constructed from transparent or translucent materials such as paper, paperboard or plastic. Frame **1360F** may be of varying thickness and may be made of a variety of sheet materials including corrugated cardboard, polystyrene foam and paperboard, as well as of molded or thermoformed plastic. Trap portion **1314F** may be removed from base portion **1312F** by grasping and lifting tab **1366F**. Trap portion **1314F** is mounted in base portion **1312F** by grasping tab **1366F**, inserting

trap portion **1314F** into side channels **1358F** and lowering trap portion **1314F** into place.

[332] Figure **58** is a cross-sectional view of insect trap **1310F**, and Figure **59** is an enlarged view of a portion of Figure **58**. Bottom portion **1322F** of base portion **1312F** includes a circuit board **1332F** electrically connected to conductive prongs **1326F**, only one of which is shown, LEDs **1324F**, only one of which is shown, and connecting wires **1344F**, only one of which is shown. For clarity, not all electrical connections are shown. Circuit board **1332F** includes electronic circuitry to receive ordinary household current from conductive prongs **1326F** and provide power to illuminate LEDs **1324F**, which emit light, and to connecting wires **1344F**, which, in turn, provide power to buses **1342F** (not shown in this view), which, in turn, provide power to heating wires **1340F.** Trap portion **1314F** is held between rear portion **1320F** of base portion **1312F** and front portion **1316F** of base portion **1312F** by side channels **1358F** (not shown in this view). Frame **1360F** includes an opening **1368F**. Membrane **1362F** includes a front surface **1364F** with a coating of insect-trapping adhesive. Membrane **1362F** is mounted to frame **1360F** such that front surface **1364F** of membrane **1362F** is recessed within frame **1360F** and the coating of adhesive is exposed through opening **1368F** in frame **1360F**. As shown, frame **1360F** surrounds the entire periphery of membrane **1362F**, although frame **1360F** may surround only a portion (e.g., one, two or three sides) of the periphery of membrane **1362F**. Rear portion **1320F** of base portion **1312F** includes an inside surface **1334F** configured to reflect light from LEDs **1324F** and direct it toward membrane **1362F** of trap portion **1314F**.

[333] In the operation of insect trap **1310F**, conductive prongs **1326F** are inserted into a wall electrical socket, LEDs **1324F** emit light, and heating wires **1340F** generate heat and warm window **1338F**, which warms membrane **1362F**, which, in turn, warms adhesive. In some embodiments, circuit board **1332F** is configured to monitor the current through connecting wires **1344F** and respond to temperature-related changes in resistance through heating wires **1340F** by increasing or decreasing voltage through heating wires **1340F**, thereby warming adhesive to a steady, uniform temperature. Light from LEDs **1324F** transmits through opening **1330F** in base portion **1312F**, onto inside surface **1334F** of rear portion **1320F**, and is reflected onto membrane **1362F** of trap portion **1314F**. A portion of light from LEDs **1324F** emits directly onto membrane **1362F**. The light

transmits through membrane **1362F** and adhesive on front surface **1364F** and through opening **1318F** in front portion **1316F** and into the area where insect trap **1310F** is installed. Insects are attracted to the light and heat transmitted through the adhesive, and fly or crawl through opening **1318F** and onto the adhesive, where they become trapped. The user may observe trapped insects by looking through opening **1318F**. When a sufficient number of insects have been trapped, the user may easily remove trap portion **1314F** by grasping tab **1366F** and lifting trap portion **1314F** out of base portion **1312F** and may discard the entire used trap portion **1314F** without touching trapped insects, insect debris or adhesive, and replace it with a new trap portion **1314F**. The new trap portion **1314F** has fresh adhesive-coated surfaces, ensuring that insect trap **1310F** will continue to efficiently and effectively attract and trap insects.

[334] Figure **60** is a front perspective view of a fourteenth embodiment of an insect trap, indicated generally at **1410**. Insect trap **1410** includes a base portion **1412** and a removable trap portion **1414**. Trap portion **1414** is shown partially cut away and removed from base portion **1412** in this view. Insect trap **1410** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1410** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1410** protrudes from the wall, is the smallest of the three overall dimensions. Base portion **1412** includes a top surface **1432**, at least one light source **1424** and at least one opening **1430,** through which light source **1424** is exposed.

[335] In some embodiments, light source **1424** uses electroluminescent (EL) technology, although other lighting technologies or combination of lighting technologies may be adapted for use. In some embodiments, light source **1424** emits both UV and visible light. In some embodiments, light source **1424** emits both UV and blue light to better attract a wide variety of insect species. In some embodiments, light source **1424** emits a combination of wavelengths to mimic sunlight. In some embodiments, light source **1424** emits infrared (IR) light to better attract certain species of insects including mosquitos and fleas. On the perimeter of top surface **1432** may be an upwardly directed rim or protrusions **1434**. Trap portion **1414** includes a front housing **1418** with at least one opening **1420** in a front surface **1416**, and a transparent or translucent back plate **1426**. Opening **1420** in front housing **1418** may be configured to admit a wide variety of

insects into insect trap **1410**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1420** is configured to prevent a user's fingers from penetrating opening **1420** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1414**. In some embodiments, opening **1420** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1420**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1420**. Opening **1420** may be of uniform or of varying width, shape and orientation, and if trap portion **1414** has more than one opening **1420**, they may be of identical or of differing widths, shapes and orientations. Opening **1420** may be configured to attract one or more individual insect species or a variety of insect species. Front housing **1418** and back plate **1426** form an enclosure **1444**. As shown, back plate **1426** is substantially planar, although it may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[336] Back plate **1426** includes a front surface **1442**, which may be coated with a transparent or translucent adhesive **1440**. Back plate **1426** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, front housing **1418** is coated with transparent, translucent or opaque adhesive (not shown) on its inside surface (not shown) to provide additional insect trapping efficiency and capacity. In some embodiments, front housing **1418** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **1418** and back plate **1426** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1418** and back plate **1426** are constructed by injection molding or by other suitable manufacturing techniques.

[337] In some embodiments, front housing **1418** and back plate **1426** are joined together where they intersect or engage with an adhesive, although they may also

be joined together by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. The materials of trap portion **1414** may also be impregnated with one or more insect attractants. For example, trap portion **1414** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **1410**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an inside surface of enclosure **1444** or on front surface **1416** of front housing **1418** or through an opening in front housing **1418** or back plate **1426**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1410**.

[338] Figure **61** is a cross-sectional view of insect trap **1410**. Protruding from a rear surface **1428** of base portion **1412** are a plurality of electrically conductive prongs **1422** (only one of which is shown), adapted to mount insect trap **1410** to a wall and provide power to insect trap **1410** by inserting conductive prongs **1422** into a standard household electrical wall socket. Alternatively, conductive prongs **1422** may be adapted to swivel to allow insect trap **1410** to remain upright when conductive prongs **1422** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1412** may be configured to sit or hang

wherever desired and receive power from batteries (not shown) mounted in base portion **1412**. While an electrical socket and batteries have been described as providing power to insect trap **1410**, any suitable power source may be used. In some embodiments, base portion **1412** includes a circuit board **1448** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1422** (only one of which is shown) and light source **1424**. For clarity, however, not all of the electrical connections are shown. Circuit board **1448** may include electronic circuitry to receive ordinary household current from conductive prongs **1422** and provide power to illuminate light source **1424**. Circuit board **1448** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to light source **1424**, although it may also provide a varying voltage to light source **1424** to provide a flickering light which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1448** may provide power to light source **1424** to provide both UV and/or visible and/or IR light, although it may be configured to provide power to only the UV light source **1424** or to only the visible light source **1424** or to only the IR light source, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1448** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1412** to emit an insect-attracting sound. In some embodiments, the transmitter of transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is

in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1410**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1410**. Circuit board **1448** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1412** and into trap portion **1414**, to attract some insect species, including fleas and mosquitoes. Alternatively, at least one of light source **1424** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1414** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[339] As shown, rim or protrusions **1434** on top surface **1432** of base portion **1412** engage with trap portion **1414** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **1414** to be securely but removably mounted on base portion **1412**. Bottom surface **1446** of base portion **1412** may be substantially flat or concave to allow insect trap **1410** to sit upright on a floor, desk, table or shelf when insect trap **1410** is unplugged. Alternatively, bottom surface **1446** of base portion **1412** may have two or more protrusions (not shown) or legs that allow insect trap **1410** to sit upright when insect trap **1410** is unplugged.

[340] In the operation of insect trap **1410**, conductive prongs **1422** are inserted into a wall electrical socket, circuit board **1448** may provide current to light source **1424**, and light source **1424** emits light, represented by arrows, which transmit directly onto and through back plate **1426**, through adhesive **1440** on front surface **1442**, and into enclosure **1444**. In some embodiments, light is not manipulated in base portion **1412** and is emitted directly into trap portion **1414**. In some

embodiments, the light is further evenly distributed by the light-diffusing properties of back plate **1426**, or adhesive **1440**, or by a combination of the two.

[341] Thereafter, a portion of the light entering enclosure **1444** continues through opening **1420** in front housing **1418** and into the surrounding area where insect trap **1410** is installed. Insects are attracted to the light transmitted through adhesive **1440** and through opening **1420**, and fly or crawl into opening **1420** and onto adhesive **1440**, where they become trapped. A user may observe trapped insects by looking through opening **1420** in front housing **1418**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire trap portion **1414** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1414**, and replace it with a new trap portion **1414**. The new trap portion **1414** has fresh adhesive-coated surfaces, ensuring that insect trap **1410** will continue to efficiently and effectively attract and trap insects.

[342] In some embodiments, insect trap **1410** is configured such that when insect trap **1410** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1410** protrudes from the wall, is smaller than its overall height and its overall width.

[343] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[344] Insect trap **1410** of this configuration may accommodate a variety of different trap portions **1414** that may be removably mounted to base portion **1412**, each trap portion **1414** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **1414**, and the size, shape, location and orientation of opening **1420** in front housing **1418** of trap portion **1414**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **1414** is approximately 20mm to 600mm wide, 20mm

to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1414** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1414** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[345] In some embodiments, base portion **1412** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1412** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1412** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[346] As provided herein, opening **1420** may be a variety of shapes and/or sizes. For example, opening **1420** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1420** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1420** is circular, opening **1420** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1420** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1420** is approximately 0.5mm to 15mm in diameter. When opening **1420** is slot shaped, opening **1420** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1420** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1420** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[347] In some embodiments, opening **1420** covers all or a portion of front housing **1418**. For example, opening **1420** may cover a range of approximately 1% to 75% of the surface area of front housing **1418**. In some embodiments, opening **1420** covers approximately 5% to 50% of the surface area of front housing **1418**. In some embodiments, opening **1420** covers approximately 10% to 30% of the surface area of front housing **1418**.

[348] Figure **62** is a front perspective view of a fifteenth embodiment of an insect trap, indicated generally at **1510**. Insect trap **1510** includes a base portion **1512** and a removable trap portion **1514**. Trap portion **1514** is shown removed from base portion **1512** in this view. Insect trap **1510** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1510** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1510** protrudes from the wall, is the smallest of the three overall

dimensions. Trap portion **1514** includes a front housing **1518** with a tab slot **1568** and at least one opening **1520** in a front surface **1516**. Trap portion **1514** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **1514** is mounted in insect trap **1510**, and insect trap **1510** is mounted to a wall, the overall depth of trap portion **1514**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1514**. Opening **1520** in front housing **1518** may be configured to admit a wide variety of insects into insect trap **1510**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1520** is configured to prevent user's fingers from penetrating opening **1520** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1514**. In some embodiments, opening **1520** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1520**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1520**. Opening **1520** may be of uniform or of varying width, shape and orientation, and if trap portion **1514** has more than one opening **1520**, they may be of identical or of differing widths, shapes and orientations. Opening **1520** may be configured to attract one or more individual insect species or a variety of insect species. As shown, protruding from tab slot **1568** in front housing **1518** in trap portion **1514** is a grip end **1562** of a removable tab **1554**. Protruding from a rear surface **1572** (shown in Figure **65**) of base portion **1512** are a plurality of electrically conductive prongs **1522**, adapted to mount insect trap **1510** to a wall and provide power to insect trap **1510** by inserting conductive prongs **1522** into a standard household electrical wall socket. Alternatively, conductive prongs **1522** may be adapted to swivel to allow insect trap **1510** to remain upright when conductive prongs **1522** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1512** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1512**. While an electrical socket and batteries have been described as providing power to insect trap **1510**, any suitable power source may be used. Base portion **1512** includes a top surface **1526** and at least one LED **1524**. In some embodiments, LED **1524** includes at least one that emits ultraviolet (UV) light and at least one that emits visible light. In some embodiments, LED **1524** includes at least one that emits UV light and at least one

that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LED **1524** includes at least one that emits IR light to better attract certain species of insects including mosquitos and fleas. Mounted in top surface **1526** of base portion **1512** may be a transparent or translucent window **1528**, shown partially cut away to reveal LED **1524**. Window **1528** protects LED **1524** from dust and insect debris, and allows base portion **1512** to be easily cleaned. In top surface **1526** may be a slot **1530**, and on the perimeter of the top surface **1526** is a rim or upwardly directed protrusions **1532**.

[349] Figure **63** is a front perspective view of insect trap **1510**. Insect trap **1510** is shown partially cut away in this view. As shown, an upwardly-facing cup **1556** is mounted on a bottom inside surface **1570** of front housing **1518**. Cup **1556** may have a lip **1558** protruding from the perimeter of its open end. Cup **1556** may be constructed of any material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein. Removable tab **1554** may have a sealing end **1560** and a web **1564** between grip end **1562** and sealing end **1560**, and may be constructed of any flexible and durable material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein. As shown, sealing end **1560** is configured to cover the open end of cup **1556**, and may be affixed to lip **1558** with an adhesive to create an airtight seal, thereby maintaining the freshness of any insect-attracting substances (not shown) inside cup **1556**, as well as holding removable tab **1554** in place until it is removed by a user. Web **1564** may be folded over sealing end **1560** of removable tab **1554** and extend to tab slot **1568** of front housing **1518**. Grip end **1562** of removable tab **1554** protrudes through tab slot **1568** and may be folded downwards over an outside portion of front housing **1518**.

[350] Figure **64** is a front perspective view of insect trap **1510**. Trap portion **1514** is shown partially cut away and removable tab **1554** partially removed in this view. A user may grasp removable tab **1554** at grip end **1562** and pull removable tab **1554** away from trap portion **1514**, and thereby breaking the seal between lip **1558** of cup **1556** and sealing end **1560** of removable tab **1554**. Inside cup **1556** is a carrier material **1566** impregnated with one or more insect-attracting substances. Carrier material **1566** inside cup **1556** may be a solid, a liquid, a gel, or any combination thereof. For example, carrier material **1566** may be impregnated

with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of the insect trap. Alternatively, carrier material **1566** may be impregnated with water in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded in carrier material **1566** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded in carrier material **1566** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, the insect-attracting substances may be contained in cup **1556** without a carrier material **1566**. Breaking the seal between cup **1556** and sealing end **1560** of removable tab **1554** releases the insect-attracting scent or scents through opening **1520** of front housing **1518** and into the surrounding area where insect trap **1510** is installed. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1510**.

[351] Figure **65** is a cross-sectional view of insect trap **1510**. Removable tab **1554** (not shown) has been completely removed in this view. Trap portion **1514** includes a divider **1534** with a front surface **1538**, and a rear housing **1540** with an inside surface **1542**. In some embodiments, divider **1534** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **1536** on front surface **1538**. In some embodiments, divider **1534** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **1534** and the material and thickness of adhesive **1536** are selected to transmit a substantial proportion of the UV and/or visible

and/or IR light, for example greater than 60% of the light is transmitted through divider **1534** and adhesive **1536**. In some embodiments, inside surface **1542** of rear housing **1540** has a reflective coating. Alternatively, the material and surface finish of rear housing **1540** may be configured to reflect and disperse UV and/or visible light without a reflective coating. Rear housing **1540** may include an opening **1544** on its bottom surface, or alternatively opening **1544** may be replaced by a transparent or translucent window (not shown).

[352] In some embodiments, front housing **1518** and rear housing **1540** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1518** and rear housing **1540** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **1534** has a rear surface **1552**, and may be substantially planar, and may be configured to be parallel to, or at an angle to, the primary direction (not shown) of the light produced by LED **1524**. In some embodiments, divider **1534** may be formed into a convex, concave or saddle-shaped contour (not shown), or a combination of contours to optimize the even distribution of light. In some embodiments, divider **1534** may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[353] In some embodiments, front housing **1518** is coated with transparent, translucent or opaque adhesive (not shown) on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1518** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **1518**, divider **1534** and rear housing **1540** are joined together at where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or by any other suitable assembly method. The materials of trap portion **1514** (e.g., front housing **1518**, rear housing **1540**, divider **1534** and adhesive **1536**) may also be

impregnated with one or more insect attractants. Divider **1534** separates trap portion **1514** into a front enclosure **1546** and a rear enclosure **1548**.

[354] In some embodiments, base portion **1512** includes a circuit board **1550** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1522** (only one of which is shown) and LED **1524**. For clarity, however, not all of the electrical connections are shown. Circuit board **1550** may include electronic circuitry to receive ordinary household current from conductive prongs **1522** and provide power to illuminate LED **1524**. Circuit board **1550** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LED **1524**, although it may also provide a varying voltage to LED **1524** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1550** may provide power to LED **1524** to provide UV and/or visible and/or IR light although it may be configured to provide power to only UV LED **1524** or to only visible light LED **1524** or to only IR LED **1524**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1550** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1512** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is

desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1510**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1510**. Circuit board **1550** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1512** and into trap portion **1514**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LED **1524** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LED **1524** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1514** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide. In some embodiments, heat alone or heat and scent alone are used as attractants, and light sources are not used in insect trap **1510**.

[355] As shown, slot **1530** in top surface **1526** of base portion **1512** and rim or protrusions **1532** on top surface **1526** of base portion **1512** engage with trap portion **1514** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **1514** to be securely but removably mounted on base portion **1512**. A bottom surface **1574** of the base portion **1512** may be substantially flat or concave to allow the insect trap **1510** to sit upright on a floor, desk, table or shelf when the insect trap **1510** is unplugged. Alternatively, the bottom surface **1574** of the base portion **1512** may have two or more protrusions (not shown) or legs that allow the insect trap **1510** to sit upright when the insect trap **1510** is unplugged.

[356] In the operation of insect trap **1510**, conductive prongs **1522** (only one of which is shown) are inserted into a wall electrical socket, and removable tab **1554** (not shown) is pulled from trap portion **1514** and removed, thereby breaking the

seal between cup **1556** and removable tab **1554** and exposing carrier material **1566** and insect-attracting substance or substances to the air and releasing an insect-attracting scent or scents into trap portion **1514** and into the surrounding area where insect trap **1510** is installed. Cup **1556**, carrier material **1566** and the insect-attracting substance or substances may be configured to release an insect-attracting scent or scents for a predetermined amount of time to correspond with the expected useful life of trap portion **1514**, which may be e.g., a week, a month or three months. Alternatively, cup **1556**, carrier material **1566** and the insect-attracting substance or substances may be configured to preferentially release one insect-attracting scent or group of scents earlier in the useful life of trap portion **1514** and another insect-attracting scent or group of scents later in the useful life of trap portion **1514** to attract more insects or a wider variety of insects with a changing scent, or to provide a stronger scent later in the useful life of trap portion **1514**, to compensate for the reduced light emitted from trap portion **1514** when many insects are caught in adhesive **1536**. Alternatively, cup **1556** and carrier material **1566** may be configured to release additional scents that may mask the insect-attracting scent or scents or mask or eliminate components of the insect-attracting scent or scents that humans may find objectionable, or that children or non-intended animals (e.g., pets) may find attractive, without substantially reducing their attractiveness to insects. LED **1524** emits light, represented by arrows, which transmits through window **1528** in base portion **1512**, through opening **1544** in rear housing **1540** of trap portion **1514**, into rear enclosure **1548**, and directly onto inside surface **1542** of rear housing **1540** and rear surface **1552** of divider **1534**. Because the light from LED **1524** enters rear enclosure **1548** through opening **1544** in a bottom face of rear housing **1540** (e.g., in a face that is substantially parallel to the overall depth of trap portion **1514**), the light can travel the entire length of rear enclosure **1548** and can diverge over the entire length of rear enclosure **1548**, and therefore can be more evenly distributed throughout rear enclosure **1548**. In some embodiments, light is not manipulated in base portion **1512** and is emitted directly into trap portion **1514**. Inside surface **1542** of rear housing **1540** may include a concave shape and may be configured to reflect and disperse the UV and visible light from LED **1524** to distribute the light evenly onto rear surface **1552** of divider **1534**, although inside surface **1542** of rear housing **1540** may have a convex shape or a saddle shape or a combination of

shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **1552** of divider **1534**, may be mounted to rear housing **1540** at or near opening **1544** or to base portion **1512** at or near window **1528**, and may replace or augment the role of inside surface **1542** of rear housing **1540**. In some embodiments, the light from LED **1524** may directly strike rear surface **1552** of divider **1534** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across divider **1534**, and may replace or augment the role of inside surface **1542** of rear housing **1540** or of the lens or lenses mounted to rear housing **1540**.

[357] Thereafter, light transmits through divider **1534** and adhesive **1536** on front surface **1538**, and into front enclosure **1546**. Light may be further evenly distributed by the light-diffusing properties of divider **1534**, adhesive **1536** on front surface **1538**, or both. A portion of the light entering front enclosure **1546** continues through opening **1520** in front housing **1518** and is emitted into the surrounding area where insect trap **1510** is installed. Insects are attracted to the light emitted through adhesive **1536** and through opening **1520** in front housing **1518**. Insects are also attracted to the scents and/or pheromones released from carrier material **1566** in cup **1556**. In addition, heat generated by circuit board **1550** may warm carrier material **1566**, and may thereby increase the release of insect-attracting scents and/or pheromones. Insects fly or crawl into opening **1520** and onto adhesive **1536**, where they become trapped. A user may observe trapped insects by looking through opening **1520** in front housing **1518**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1514** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1514**, and replace it with a new trap portion **1514**. The new trap portion **1514** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1510** will continue to efficiently and effectively attract and trap insects.

[358] In some embodiments, because trap portion **1514** mounts on top of, and not in front of, base portion **1512**, insect trap **1510** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes

minimally into the home environment. In some embodiments, insect trap **1510** is configured such that when insect trap **1510** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1510** protrudes from the wall, is smaller than its overall height and its overall width.

[359] It should be appreciated that a benefit of insect trap **1510** is the manipulation of light within trap portion **1514**. In some embodiments, light manipulation occurs solely within trap portion **1514**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1542**, divider **1534** and adhesive **1536**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1536**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1536** or within trap portion **1514**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[360] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[361] Insect trap **1510** of this configuration may accommodate a variety of different trap portions **1514** that may be removably mounted to base portion **1512**, each trap portion **1514** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **1514**, the size, shape, location and orientation of opening **1520** in front housing **1518** of trap portion **1514**, and the scent or scents impregnated in carrier material **1566**, front housing **1518**, divider **1534**, adhesive **1536** or rear housing **1540**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect.

[362] For example, in some embodiments, trap portion **1514** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1514** is approximately 20mm to 200mm wide, 20mm

to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1514** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[363] In some embodiments, base portion **1512** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1512** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1512** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[364] As provided herein, opening **1520** may be a variety of shapes and/or sizes. For example, opening **1520** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1520** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1520** is circular, opening **1520** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1520** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1520** is approximately 0.5mm to 15mm in diameter. When opening **1520** is slot shaped, opening **1520** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1520** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1520** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[365] In some embodiments, opening **1520** covers all or a portion of front housing **1518**. For example, opening **1520** may cover a range of approximately 1% to 75% of the surface area of front housing **1518**. In some embodiments, opening **1520** covers 5approximately 5% to 50% of the surface area of front housing **1518**. In some embodiments, opening **1520** covers approximately 10% to 30% of the surface area of front housing **1518**.

[366] It should be appreciated that a variety of configurations to store and deliver insect-attracting substances are contemplated. Figure **66** is a front perspective view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510A**. As shown, insect trap **1510A** includes a base portion **1512A** and a trap portion **1514A**. Trap portion **1514A** includes a front housing **1518A** with a cap **1556A** attached to its front surface **1516A**. Cap **1556A** and front surface **1516A** of front housing **1518A** form an enclosure (not shown) containing a carrier material (not shown) impregnated with one or more insect-attracting

substances (not shown). Alternatively, cap **1556A** may be sealed on its back surface (not shown) by a membrane (not shown) of foil or other barrier material. Cap **1556A** includes openings **1576A** through its front surface **1578A**, and a removable tab **1554A** configured to cover openings **1576A** is affixed to front surface **1578A** with an adhesive to create a seal. Removing tab **1554A** from cap **1556A** releases the insect-attracting substances into the room where insect trap **1510A** is installed. An added benefit of this configuration is that the carrier material (not shown), which is visible to the user, may be formulated to change color when the insect-attracting substances are depleted, thereby providing a visual cue indicating that the trap portion **1514A** should be removed and replaced with a fresh one.

[367] Other configurations are contemplated that provide a visual cue indicating that the insect-attracting substances are depleted. Figure **67** is a cross-sectional view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510B**, and Figure **68** is an enlarged view of a portion of Figure **67**. As shown, insect trap **1510B** includes a base portion **1512B** and a removable trap portion **1514B**. Trap portion **1514B** includes a front housing **1518B** with a bottom inside surface **1570B**, an upwardly-facing cup **1556B** mounted on bottom inside surface **1570B** of front housing **1518B**, a plurality of electrical trap contacts **1576B** and a plurality of electrical trap wires **1578B**. Cup **1556B** contains a carrier material **1566B** impregnated with one or more insect-attracting substances (not shown). Alternatively, cup **1556B** may contain one or more insect-attracting substances and not a carrier material **1566B**. On an inside bottom surface **1580B** of cup **1556B** are a plurality of electrodes **1582B** that contact carrier material **1566B**. Trap wires **1578B** are electrically connected to electrodes **1582B** and trap contacts **1576B**. A removable tab that seals the open end of cup **1556B** has been removed in this view. Base portion **1512B** includes a plurality of electrically conductive prongs **1522B** (only one of which is shown), at least one LED **1524B**, a plurality of electrical base contacts **1584B**, and a circuit board **1550B** having a programmable processor or chip (not shown) for executing commands and electrically connected to conductive prongs **1522B**, LED **1524B** and base contacts **1584B**. For clarity, however, not all of the electrical connections are shown. While two sets of base contacts **1584B**, trap contacts **1576B**, trap wires **1578B** and electrodes **1582B** are shown, any suitable number of sets may be used. Base

contacts **1584B** are configured to provide an electrical connection with their corresponding trap contacts **1576B** when trap portion **1514B** is removably mounted to base portion **1512B**. Circuit board **1550B** may include electronic circuitry to receive ordinary household current from conductive prongs **1522B**, provide power to LED **1524B**, and provide power to base contacts **1584B**, which, in turn, provide power to trap contacts **1576B**, when trap portion **1514B** is removably mounted to base portion **1512B**.

[368] In use, as the insect attracting substances (not shown) evaporate from carrier material **1566B**, the electrical resistance of carrier material **1566B** changes. Circuit board **1550B** is configured to monitor the electrical resistance across electrodes **1582B**. In some embodiments, circuit board **1550B** is configured to measure the resistance across electrodes **1582B** by maintaining a constant voltage across electrodes **1582B** and measuring the resulting current across electrodes **1582B**. In some embodiments, circuit board **1550B** is configured to measure the resistance across electrodes **1582B** by maintaining a constant current across electrodes **1582B** and measuring the resulting voltage across electrodes **1582B**. In some embodiments, circuit board **1550B** is configured to signal that the insect-attracting substances are depleted by causing LED **1524B** to flash on and off when the resistance across electrodes **1582B** exceeds or drops below a threshold value. Alternatively, circuit board **1550B** may be configured to cause LED **1524B** to flash on and off when the rate of change in resistance (e.g., the change in resistance over an established period of time) across electrodes **1582B** exceeds or drops below a threshold value. Alternatively, circuit board **1550B** may be configured to cause LED **1524B** to flash on and off when the resistance across electrodes **1582B** increases by a threshold value above, or decreases by a threshold value below the resistance measured when trap portion **1514B** was mounted to base portion **1512B** (e.g., when insect-attracting substances impregnated in carrier material **1566B** were fresh). Alternatively, circuit board **1550B** may be configured to respond to a changes in or threshold values of capacitance across electrodes **1582B**, or changes in or threshold values of impedance across electrodes **1582B**, or changes in or threshold values of any other measurable electrical property that is affected by the depletion of insect-attracting substances, or of carrier material **1566B**, or of both. Alternatively, circuit board **1550B** may be configured to signal that the insect-attracting substances are

depleted by causing a speaker (not shown) such as a piezoelectric speaker to create an audible noise such as a beeping sound, or to change the color of the visible light illuminating insect trap **1510B** by illuminating a different colored LED **1524B**, or by any other configuration or combination of configurations providing a visual and / or audible signal or signals.

[369] In addition, the application of heat can enhance the release of insect-attracting substances. Figure **69** is a front perspective view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510C**. As shown, insect trap **1510C** includes a base portion **1512C** and a trap portion **1514C**. Trap portion **1514C** is shown partially cut away in this view. Trap portion **1514C** includes a front housing **1518C** with a front surface **1516C** and a bottom inside surface **1570C**, a tab slot **1568C** in front surface **1516C**, an upwardly facing cup **1556C** holding a carrier material **1566C** impregnated with one or more insect-attracting substances, a removable tab **1554C** sealing its open end (not shown) and protruding through tab slot **1568C**, and a heating element **1576C** mounted on bottom inside surface **1570C** and underneath cup **1556C**. In some embodiments, cup **1556C** may contain an insect-attracting substance or substances without carrier material **1566C**. Although heating element **1576C** is shown as a single electrical resistance coil mounted under cup **1556C**, it may also be a combination of one or more resistors, infrared LEDs (not shown), Peltier or Thompson effect devices (not shown), conductive ink circuits printed directly on cup **1556C**, or any other element or combination of elements that provides heat to cup **1556C** and carrier material **1566C**. In some embodiments, heating element **1576C** may be mounted directly to the underside (not shown) or any other area on the inside or outside of cup **1556C**.

[370] Figure **70** is a cross-sectional view of insect trap **1510C**, and Figure **71** is an enlarged view of a portion of Figure **70**. Removable tab **1554C** (not shown) has been completely removed in this view. Base portion **1512C** includes a plurality of electrically conductive prongs **1522C**, only one of which is shown, at least one LED **1524C**, only one of which is shown, a plurality of base contacts **1578C**, and a circuit board **1550C** electrically connected to prongs **1522C**, LED **1524C** and base contacts **1578C**. For clarity, not all electrical connections are shown. In some embodiments, trap portion **1514C** includes cup supports **1580C** that attach to bottom inside surface **1570C** of front housing **1518C** and hold cup **1556C** over

heating element **1576C**. In some embodiments, heating element **1576C** may be directly mounted to cup **1556C**, thereby eliminating the need for cup supports **1580C**. In some embodiments, bottom inside surface **1570C** of front housing **1518C** may have protrusions (not shown) that hold cup **1556C** over heating element **1576C**, thereby eliminating the need for cup supports **1580C**.

[371] Trap portion **1514C** also includes a plurality of trap contacts **1582C**, electrically connected to heating element **1576C** and configured to make electrical contact with their corresponding base contacts **1578C** in base portion **1512C** when trap portion **1514C** is removably mounted to base portion **1512C**. While two sets of base contacts **1578C** and trap contacts **1582C** are shown, any suitable number may be used. Circuit board **1550C** includes electronic circuitry to receive ordinary household current from conductive prongs **1522C**, provide power to LEDs **1524C** and to base contacts **1578C**, which, in turn, provide power to trap contacts **1582C** and heating element **1576C** when trap portion **1514C** is mounted to base portion **1512C**. Heating element **1576C** produces heat in response to power from circuit board **1550C**, which warms cup **1556C** and in turn, carrier material **1566C** by radiation, conduction, or convection, or any combination thereof. Increasing the temperature of carrier material **1566C** may increase the release of insect-attracting substances, and may enable a more complete release of insect-attracting substances. In some embodiments, increasing the temperature of carrier material **1566C** may enable the release of some insect-attracting substances that cannot release at ordinary room temperature. In some embodiments, heating element **1576C** may also be configured to attract heat-sensing insects such as mosquitos. In some embodiments, heat and scent alone are used as attractants, and light sources are not used in insect trap **1510C**.

[372] It should be appreciated that a variety of configurations to store and deliver insect-attracting substances from a removable container are contemplated. Figure **72** is a front perspective view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510D**. As shown, insect trap **1510D** includes a base portion **1512D,** a removable and replaceable trap portion **1514D**, and a removable and replaceable scent cartridge **1560D**. Trap portion **1514D** is shown partially cut away, and trap portion **1514D** and scent cartridge **1560D** are shown removed from base portion **1512D** in this view. Base portion **1512D** includes an opening **1562D** in a front surface **1564D** configured to accept scent cartridge

1560D, and at least one opening **1568D** in a top front surface **1570D**. Trap portion **1514D** includes a front housing **1518D** with at least one opening **1520D** in its front surface **1516D** and at least one opening **1572D** in its bottom surface **1574D**. Opening **1572D** is configured to align with opening **1568D** in top front surface **1570D** of base portion **1512D** when trap portion **1514D** is mounted to base portion **1512D**. Scent cartridge **1560D** includes an upwardly facing cup **1556D** with a lid **1576D** sealing its open end (not shown), and a removable tab **1554D**, shown partially removed in this view to reveal at least one opening **1578D** in lid **1576D**. Removable tab **1554D**, lid **1576D** and cup **1556D** are configured to seal contents of scent cartridge **1560D** until removable tab **1554D** is removed from lid **1576D**. Opening **1578D** in lid **1576D** is configured to align with opening **1568D** in top front surface **1570D** of base portion **1512D** when scent cartridge **1560D** is inserted into opening **1562D** of base portion **1512D**.

[373] Figure **73** is a cross-sectional view of insect trap **1510D**, and Figure **74** is an enlarged view of Figure **73**. Trap portion **1514D** is shown mounted on base portion **1512D**, removable tab **1554D** has been removed and scent cartridge **1560D** is inserted into base portion **1512D** in this view. For clarity, support features that hold scent cartridge **1560D** in place inside base portion **1512D** are not shown. Cup **1556D** contains a carrier material **1566D** impregnated with one or more insect-attracting substances. In some embodiments, cup **1556D** may contain an insect-attracting substance or substances without carrier material **1566D**. Scent cartridge **1560D** includes a tab **1580D** configured to protrude from base portion **1512D** when scent cartridge **1560D** is inserted into base portion **1512D**, allowing the user to remove and replace scent cartridge **1560D** when insect-attracting substances in carrier material **1566D** are depleted. Base portion **1512D** includes a plurality of electrically conductive prongs **1522D** (only one of which is shown), at least one LED **1524D** (only one of which is shown), a circuit board **1550D**, and a heating element **1582D** mounted on circuit board **1550D** and positioned underneath scent cartridge **1560D**. Although heating element **1582D** is shown as a single electrical resistance coil mounted under scent cartridge **1560D**, it may also be made up of a combination of one or more resistors, infrared LEDs (not shown), Peltier or Thompson effect devices (not shown), or any other element or combination of elements that provides heat to scent cartridge **1560D** and carrier material **1566D**. Circuit board **1550D** is electrically connected to prongs **1522D**,

LED **1524D** and heating element **1582D**. For clarity, not all electrical connections are shown. Circuit board **1550D** includes electronic circuitry to receive ordinary household current from conductive prongs **1522D**, provide power to LED **1524D** and to heating element **1582D**. Heating element **1582D** produces heat in response to power from circuit board **1550D**, which warms cup **1556D** and carrier material **1566D** by radiation, conduction, or convection, or any combination thereof. Increasing the temperature of carrier material **1566D** may increase the release of insect-attracting substances, and may enable a more complete release of insect-attracting substances. In some embodiments, increasing the temperature of carrier material **1566D** may enable the release of some insect-attracting substances that cannot release at ordinary room temperature. In some embodiments, heating element **1582D** also provides heat to other components of trap portion to better attract certain species of insects including mosquitos. In some embodiments, base portion **1512D** does not include heating element **1582D**, and insect-attracting substances are released from carrier material **1566D** at room temperature or as a result of heat generated by circuit board **1550D**. Lid **1576D** of scent cartridge **1560D** contacts underside of top front surface **1570D** of base portion **1512D**. The insect attracting substances released by carrier material **1566D** proceed through opening **1578D** in scent cartridge **1560D**, through opening **1568D** in base portion **1512D**, and through opening **1572D** and opening **1520D** in front housing **1518D**, and on into the surrounding area where insect trap **1510D** is installed. In some embodiments, heat and scent alone are used as attractants, and light sources are not used in insect trap **1510D**.

[374] Additional configurations to store and deliver insect-attracting substances, including evaporable liquids, from a removable container are contemplated. Figure **75** is a front perspective view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510E**. Insect trap **1510E** includes a base portion **1512E**, a removable trap portion **1514E**, and a removable scent cartridge **1560E**. Scent cartridge **1560E** and trap portion **1514E** are shown removed from base portion **1512E**, and trap portion is shown partially cut away in this view. Base portion **1512E** includes a port **1558E** with an opening **1562E** (shown in Figure **76**) in a bottom surface **1564E** (shown in Figure **76**) configured to accept scent cartridge **1560E**, and at least one opening **1568E** in a top front surface **1570E**. Trap portion **1514E** includes a front housing **1518E** with at least one

opening **1520E** in its front surface **1516E** and at least one opening **1572E** in its bottom surface **1574E**. Opening **1572E** in trap portion **1514E** is configured to align with opening **1568E** in top front surface **1570E** of base portion **1512E** when trap portion **1514E** is mounted to base portion **1512E**. Scent cartridge **1560E,** which may be similar in configuration to those found in plug-in room air freshener refills, includes a container portion **1556E** holding a liquid **1566E**, an attachment portion **1576E** and a wick **1554E** with an open end **1578E** protruding from attachment portion **1576E**. Attachment portion **1576E** is configured to securely but removably attach scent cartridge **1560E** to base portion **1512E**. Container portion **1556E** may be molded of glass or of a plastic that resists penetration by, and acts as a barrier to, an insect-attracting substance or substances, and may be transparent or translucent to allow the user to observe the amount of liquid **1566E** remaining in container portion **1556E**. In some embodiments, scent cartridge **1560E** may have a protective cap (not shown) that engages with attachment portion **1576E** and is configured to seal contents of scent cartridge **1560E** before scent cartridge **1560E** is installed in base portion **1512E**.

[375] Figure **76** is a cross-sectional view of insect trap **1510E**, and Figure **77** is an enlarged portion of Figure **76**. Trap portion **1514E** is shown mounted on base portion **1512E** and scent cartridge **1560E** is shown inserted into base portion **1512E** in this view. Liquid **1566E** in container portion **1556E** of scent cartridge **1560E**, which may include a liquid carrier material and / or an insect-attracting substance or substances, and is configured to evaporate, thereby releasing the insect-attracting substance or substances into the air. Open end **1578E** of wick **1554E** protrudes through attachment portion **1576E** and into the interior of base portion **1512E,** and the remainder of wick **1554E** extends into liquid **1566E** and to the bottom of container portion **1556E**. Wick **1554E** may be manufactured of fibers of polyester or other natural or manufactured materials, and is configured to absorb and, via capillary action, pull liquid **1566E** up open end **1578E** of wick **1554E**, where liquid **1566E** is exposed to the air and evaporates, releasing the insect-attracting substance or substances into the air. Base portion **1512E** includes a plurality of electrically conductive prongs **1522E** (only one of which is shown), at least one LED **1524E** (only one of which is shown), a circuit board **1550E**, and a heating element **1582E** mounted on circuit board **1550D** and configured to surround open end **1578E** of wick **1554E**. Heating element **1582E** may be similar

in configuration to those found in plug-in room air fresheners. Although heating element **1582E** is shown as a single electrical resistance coil, it may also be made up of a combination of one or more resistors (not shown), infrared LEDs (not shown), Peltier or Thompson effect devices (not shown), or any other element or combination of elements that provides heat to open end **1578E** of wick **1554E**. Circuit board **1550E** is electrically connected to prongs **1522E**, LED **1524E** and heating element **1582E**. For clarity, not all electrical connections are shown. Circuit board **1550E** includes electronic circuitry to receive ordinary household current from conductive prongs **1522E** and provide power to LEDs **1524E** and to heating element **1582E**. Heating element **1582E** produces heat in response to power from circuit board **1550E**, which warms open end **1578E** of wick **1554E**, and liquid **1566E** in open end **1578E** of wick **1554E** by radiation, conduction, or convection, or any combination thereof. In some embodiments, heating element **1582E** may heat metal particles (not shown) impregnated in open end **1578E** of wick **1554E** by induction. In some embodiments, circuit board **1550E** may be configured to maintain a constant temperature in heating element **1582E**, or heating element **1582E** may include self-regulating materials that increase their electrical resistance when their temperature increases, or any combination of feature or features to regulate the temperature of heating element **1582E**. Increasing the temperature of liquid **1566E** may increase the release of insect-attracting substances, and may enable a more complete release of insect-attracting substances. In some embodiments, increasing the temperature of liquid **1566E** may enable the release of some insect-attracting substances that cannot release at ordinary room temperature. In some embodiments, heating element **1582E** also provides heat to other components of trap portion to better attract certain species of insects including mosquitos. In some embodiments, base portion **1512E** does not include heating element **1582E**, and insect-attracting substances are released from liquid **1566E** at room temperature or as a result of heat generated by circuit board **1550E**. In some embodiments, heat alone or heat and scent alone are used as attractants, and light sources are not used in insect trap **1510E**.

[376] The insect attracting substances released by liquid **1566E** at open end **1578E** of wick **1554E** proceed through opening **1568E** in base portion **1512E**, and through opening **1572E** and opening **1520E** in front housing **1518E**, and on into the surrounding area where insect trap **1510E** is installed.

[377] An added benefit of insect trap **1510E** is that scent cartridge **1560E** may include a built-in life indicator. In some embodiments, the amount of liquid **1566E** remaining in container portion **1556E** may be visible to the user. In some embodiments, liquid **1566E** may be tinted or colored to enhance its visibility in container portion **1556E**. In some embodiments, a marking or markings (not shown) on container portion **1556E** may indicate the level of liquid **1566E** when liquid **1566E** is partially and/or fully depleted, thereby providing a visual cue indicating that trap portion **1514E** should be removed and replaced with a fresh trap portion **1514E**.

[378] It should be appreciated that the configuration of insect trap **1510E** may be adapted to store and deliver two or more insect-attracting substances. Figure **78** is a front perspective view of an example of the fifteenth embodiment of an insect trap, indicated generally at **1510F**. Insect trap **1510F** includes a base portion **1512F**, a removable trap portion **1514F**, and a scent cartridge **1560F**. Scent cartridge **1560F** is shown removed from base portion **1512F** in this view. Scent cartridge **1560F** may be similar in configuration to those found in plug-in room air freshener refills. As shown, scent cartridge **1560F** includes two or more attachment portions **1576F**, two or more wicks **1554F** with open ends **1578F**, and a multiple container portion **1556F**, configured to hold two or more different liquids **1566F**. Alternatively, two or more individual scent cartridges (not shown), each containing a single liquid (not shown), may be used in place of scent cartridge **1560F**. Base portion **1512F** includes two or more ports **1572F** to engage with two or more attachment portions **1576F** of scent cartridge **1560F**. Inside base portion **1512F** are two or more heating elements (not shown) to warm two or more wicks **1554F**. Heating elements (not shown) may be similar in configuration to those found in plug-in room air fresheners. In some embodiments, heating elements may be configured to operate at different temperatures from one another. In some embodiments, heating elements may be configured to operate at different times from one another.

[379] Insect trap **1510F** may provide a number of advantages. In some embodiments, a combination of insect attracting substances that cannot be formulated into a single liquid may be delivered. In some embodiments, a combination of insect-attracting substances that require heating to different temperatures may be delivered. In some embodiments, different insect-attracting

substances may be delivered at daytime and nighttime, to better attract and trap different types of insects that are more active during the day or during the night. In some embodiments, one substance delivered may be an insect attractant with an unpleasant odor to humans, while another substance delivered separately may neutralize the unpleasant odor without diminishing the effectiveness of the insect attractant. In some embodiments, delivery of different insect attractants is alternated over time to better attract insects that may respond to changing attractants. In some embodiments, one or more of substances delivered may be pleasant to humans, such as natural scents or nature-inspired scents.

[380] Figure **79** is a front perspective view of a sixteenth embodiment of an insect trap, indicated generally at **1610**. Insect trap **1610** includes a base portion **1612** and a removable trap portion **1614**. Trap portion **1614** is shown removed from the base portion **1612** in this view. Insect trap **1610** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1610** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1610** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **1614** includes a front housing **1618** with at least one opening **1620** in a front surface **1660**. Trap portion **1614** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **1614** is mounted in insect trap **1610**, and insect trap **1610** is mounted to a wall, the overall depth of trap portion **1614**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1614**. Opening **1620** in front housing **1618** may be configured to admit a wide variety of insects into insect trap **1610**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1620** is configured to prevent user's fingers from penetrating opening **1620** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1614**. In some embodiments, opening **1620** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1620**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1620**. Opening **1620** may be of uniform or of varying width, shape and orientation, and if trap portion **1614** has more than one opening **1620**, they may be of identical or of differing widths, shapes and orientations. Opening **1620** may be configured to attract one or more

individual insect species or a variety of insect species. Protruding from a rear surface **1662** (shown in Figure **80**) of base portion **1612** may be a plurality of electrically conductive prongs **1622**, adapted to mount insect trap **1610** to a wall and provide power to insect trap **1610** by inserting conductive prongs **1622** into a standard household electrical wall socket. Alternatively, conductive prongs **1622** may be adapted to swivel to allow insect trap **1610** to remain upright when conductive prongs **1622** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1612** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1612**. While an electrical socket and batteries have been described as providing power to insect trap **1610**, any suitable power source may be used. Base portion **1612** includes a lighting element such as one or more LEDs **1624**. In some embodiments, LEDs **1624** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1624** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **1624** include at least one that emits IR light to better attract certain species of insects including mosquitos and fleas. In a top surface **1626** of base portion **1612** is an opening **1652**, which may be covered by a transparent or translucent window **1628**, shown partially cut away to reveal LEDs **1624**. Window **1628** protects LEDs **1624** from dust and insect debris, and allows base portion **1612** to be easily cleaned. Mounted in a second opening **1654** in top surface **1626** is an electromechanical actuator **1656**, preferably a transmitter or transceiver such as a piezoelectric speaker. Also in top surface **1626** may be a slot **1630**, and on the perimeter of top surface **1626** is a rim or upwardly directed protrusions **1632**.

[381] Figure **80** is a cross-sectional view of insect trap **1610**. Trap portion **1614** includes a divider **1634** with a front surface **1638**, and a rear housing **1640** with an inside surface **1642**. In some embodiments, divider **1634** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **1636** on front surface **1638**. In some embodiments, divider **1634** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, inside surface **1642** of

rear housing **1640** is coated with a reflective material. In some embodiments, the material and surface finish of rear housing **1640** may be configured to reflect and disperse UV and/or visible light without a reflective coating. In some embodiments, the material and thickness of divider **1634** and the material and thickness of adhesive **1636** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **1634** and adhesive **1636**. Rear housing **1640** may include an opening **1644** on its bottom surface, or alternatively opening **1644** may be replaced by a transparent or translucent window.

[382] In some embodiments, front housing **1618** and rear housing **1640** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1618** and rear housing **1640** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **1634** may be substantially planar, and may be configured to be parallel to, or at an angle to the primary direction of the light (not shown) produced by LEDs **1624**. Alternatively, divider **1634** may be formed into a convex, concave or saddle-shaped contour (not shown), or a combination of contours to optimize the even distribution of light. In some embodiments, divider **1634** has ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[383] In some embodiments, front housing **1618** is coated with transparent, translucent or opaque adhesive (not shown) on an inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1618** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[384] In some embodiments, front housing **1618**, divider **1634** and rear housing **1640** are joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable

assembly method. As shown, divider **1634** separates the trap portion **1614** into a front enclosure **1646** and a rear enclosure **1648**.

[385] In some embodiments, base portion **1612** includes a circuit board **1650** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1622**, only one of which is shown, and LEDs **1624**. For clarity, however, not all of the electrical connections are shown. Circuit board **1650** may include electronic circuitry to receive ordinary household current from conductive prongs **1622** and provide power to illuminate LEDs **1624**. Circuit board **1650** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **1624**, although it may also provide a varying voltage to LEDs **1624** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1650** may provide power to LEDs **1624** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **1624** or to only visible light LEDs **1624** or to only IR light LEDs **1624**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1650** may also be configured to drive actuator **1656**, mounted in opening **1654** in base portion **1612**, to emit an insect-attracting sound. In some embodiments, actuator **1656** emits recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter

distance from insect trap **1610**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1610**. Circuit board **1650** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1612** and into trap portion **1614**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1624** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1624** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1614** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals.

[386] As shown, slot **1630** in top surface **1626** of base portion **1612** and rim or protrusions **1632** on top surface **1626** of base portion **1612** engage with trap portion **1614** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **1614** to be securely but removably mounted on base portion **1612**. Bottom surface **1616** of base portion **1612** may be substantially flat or concave to allow insect trap **1610** to sit upright on a floor, desk, table or shelf when insect trap **1610** is unplugged. Alternatively, bottom surface **1616** of base portion **1612** may have two or more protrusions (not shown) or legs that allow insect trap **1610** to sit upright when insect trap **1610** is unplugged.

[387] In the operation of insect trap **1610**, conductive prongs **1622**, only one of which is shown, are inserted into a wall electrical socket. Circuit board **1650** provides power to LEDs **1624** and to actuator **1656**. LEDs **1624** emit light, represented by arrows, which transmits through window **1628** in base portion **1612**, through opening **1644** in rear housing **1640** of trap portion **1614**, into rear enclosure **1648**, and directly onto inside surface **1642** of rear housing **1640** and onto a rear surface **1658** of divider **1634**. Because the light from LEDs **1624**

enters rear enclosure **1648** through opening **1644** in a bottom face of rear housing **1640** (e.g., in a face that is substantially parallel to the overall depth of trap portion **1614**), the light can travel the entire length of rear enclosure **1648** and can diverge over the entire length of rear enclosure **1648**, and therefore can be more evenly distributed throughout rear enclosure **1648**. In some embodiments, light is not manipulated in base portion **1612** and is emitted directly into trap portion **1614**. Inside surface **1642** of rear housing **1640** may include a concave shape and may be configured to reflect and disperse the light from LEDs **1624** to further distribute the light evenly onto rear surface **1658** of divider **1634**, although inside surface **1642** of rear housing **1640** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **1658** of divider **1634**, may be mounted to rear housing **1640** at or near opening **1644** or to base portion **1612** at or near window **1628**, and may replace or augment the role of inside surface **1642** of rear housing **1640**. In some embodiments, the light from LEDs **1624** may directly strike rear surface **1658** of divider **1634** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across divider **1634**, and may replace or augment the role of inside surface **1642** of rear housing **1640** or of the lens or lenses mounted to rear housing **1640**.

[388] Thereafter, light transmits through divider **1634** and adhesive **1636** on front surface **1638**, and into front enclosure **1646**. Light may be further evenly distributed by the light-diffusing properties of divider **1634**, adhesive **1636**, or both. A portion of the light entering front enclosure **1646** continues through opening **1620** in front housing **1618** and is emitted into the surrounding area where insect trap 1610 is installed. Actuator **1656** produces insect-attracting vibrations which travel through front housing **1618** of trap portion **1614**, into front enclosure **1646** of trap portion **1614**, and out through opening **1620** of trap portion **1614**. In addition, actuator **1656** may induce front housing **1618** of trap portion **1614** to vibrate and project insect-attracting sounds or vibrations into the room. Insects are attracted to the light transmitted through adhesive **1636** and through opening **1620** in front housing **1618**. Insects are also attracted to the sounds or

vibrations produced by actuator **1656** in base portion **1612** and traveling through front housing **1618** in trap portion **1614**. Insects fly or crawl into opening **1620** and onto adhesive **1636**, where they become trapped. A user may observe trapped insects by looking through opening **1620** in front housing **1618**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1614** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1614**, and replace it with a new trap portion **1614**. New trap portion **1614** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1610** will continue to efficiently and effectively attract and trap insects.

[389] In some embodiments, because trap portion **1614** mounts on top of, and not in front of, base portion **1612**, insect trap **1610** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1610** is configured such that when insect trap **1610** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1610** protrudes from the wall, is smaller than its overall height and its overall width.

[390] It should be appreciated that a benefit of insect trap **1610** is the manipulation of light within trap portion **1614**. In some embodiments, light manipulation occurs solely within trap portion **1614**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1642**, divider **1634** and adhesive **1636**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1636**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1636** or within trap portion **1614**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[391] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of

approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[392] Insect trap **1610** of this configuration may accommodate a variety of different trap portions **1614** that may be removably mounted to base portion **1612**, each trap portion **1614** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **1614**, the size, shape, location and orientation of opening **1620** in front housing **1618** of trap portion **1614**, and the natural frequency and sound amplifying properties of trap portion **1614** may be uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, in some embodiments, trap portion **1614** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1614** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1614** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[393] In some embodiments, base portion **1612** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1612** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1612** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[394] As provided herein, opening **1620** may be a variety of shapes and/or sizes. For example, opening **120** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1620** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1620** is circular, opening **1620** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1620** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1620** is approximately 0.5mm to 15mm in diameter. When opening **1620** is slot shaped, opening **1620** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1620** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1620** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[395] In some embodiments, opening **1620** covers all or a portion of front housing **1618**. For example, opening **1620** may cover a range of approximately 1% to 75% of the surface area of front housing **1618**. In some embodiments, opening **1620** covers approximately 5% to 50% of the surface area of front housing **1618**. In some embodiments, opening **1620** covers approximately 10% to 30% of the surface area of front housing **1618**.

[396] Figure **81** is a rear perspective view of a seventeenth embodiment of an insect trap, indicated generally at **1710**. Insect trap **1710** includes a base portion **1712** and a removable trap portion **1714**. Trap portion **1714** is shown partially cut away and removed from base portion **1712** in this view. Insect trap **1710** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1710** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1710** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **1714** includes a front housing **1718** with at least one opening **1720** in a front surface **1716**, a rear housing **1740**, and a divider **1734** with a rear surface **1752**. Trap portion **1714** may have an overall length, an overall width and an overall depth, and may be configured such that when Trap portion **1714** is mounted in insect trap **1710**, and insect trap **1710** is mounted to a wall, the overall depth of trap portion **1714**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1714**. Opening **1720** in front housing **1718** may be configured to admit a wide variety of insects into insect trap **1710**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1720** is configured to prevent user's fingers from penetrating opening **1720** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1714**. In some embodiments, opening **1720** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1720**, and has a size and shape such that a sphere 1mm in diameter may pass through any portion of opening **1720**. Opening **1720** may be of uniform or of varying width, shape and orientation, and if trap portion **1714** has more than one opening **1720**, they may be of identical or of differing widths, shapes and orientations. Opening **1720** may be configured to attract one or more individual insect species or a variety of insect species. Affixed to rear surface **1752** of divider **1734** is an electromechanical actuator **1754**, preferably a transmitter or transceiver such as a piezoelectric

actuator. Attached to actuator **1754** are electric trap wires **1756**. While two trap wires **1756** are shown attached to actuator **1754**, any suitable number may be used. Rear housing **1740** may include an opening **1744** on its bottom surface, or alternatively opening **1744** may be replaced by a transparent or translucent window (not shown).

[397] Protruding from a rear surface **1768** of base portion **1712** are a plurality of electrically conductive prongs **1722**, adapted to mount insect trap **1710** to a wall and provide power to insect trap **1710** by inserting conductive prongs **1722** into a standard household electrical wall socket. Alternatively, conductive prongs **1722** may be adapted to swivel to allow insect trap **1710** to remain upright when conductive prongs **1722** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1712** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1712**. While an electrical socket and batteries have been described as providing power to insect trap **1710**, any suitable power source may be used. Base portion **1712** includes a lighting element such as one or more LEDs **1724**. In some embodiments, LEDs **1724** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1724** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **1724** include at least one that emits infrared (IR) to better attract certain species of insects including mosquitos. A top surface **1726** of base portion **1712** includes an opening **1766**, which may be covered by a transparent or translucent window **1728**, shown partially cut away to reveal LEDs **1724**. Window **1728** protects LEDs **1724** from dust and insect debris, and allows base portion **1712** to be easily cleaned. Mounted in one or more additional openings **1758** in top surface **1726** of base portion **1712** are a plurality of electrical base contacts **1760**. While two base contacts **1760** are shown, any suitable number may be used. In top surface **1726** may be a slot **1730**, and on the perimeter of top surface **1726** is a rim or upwardly directed protrusions **1732**.

[398] Figure **82** is a cross-sectional view of insect trap **1710** showing the interiors of base portion **1712** and trap portion **1714**, and Figure **83** is an enlarged view of a portion of Figure **82**. In some embodiments, rear housing **1740** includes a

reflective-coated inside surface **1742**. Alternatively, the material and surface finish of rear housing **1740** may be configured to reflect UV and/or visible and/or IR light without a reflective coating. In some embodiments, divider **1734** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **1736** on its front surface **1738**. In some embodiments, divider **1734** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **1734** and the material and thickness of adhesive **1736** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **1734** and adhesive **1736**.

[399] In some embodiments, front housing **1718** and rear housing **1740** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1718** and rear housing **1740** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **1734** is substantially planar, and may be configured to be parallel to, or at an angle to the primary direction of the light produced by LEDs **1724**. In some embodiments, divider **1734** may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. In some embodiments, divider **1734** may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[400] In some embodiments, front housing **1718** may also be coated with transparent, translucent or opaque adhesive on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1718** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **1718**, divider **1734** and rear housing **1740** are joined together at where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may

also be permanently or removably joined together by gluing or by any other suitable assembly method. The materials of trap portion **1714** may also include one or more insect attractants. For example, trap portion **1714** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that further increases the insect-attracting efficiency of insect trap **1710**. In such embodiments, the insect attractant is integral to trap portion **1714**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of front housing **1718** or through opening **1720** in front housing **1718** or on front surface **1716** of front housing **1718** or on front surface **1738** of divider **1734**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances.

[401] It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1710**. Divider **1734** separates trap portion **1714** into a front enclosure **1746** and a rear enclosure **1748**. Rear housing **1740** includes a plurality of electrical trap contacts **1762** (only one of which is shown) that correspond to base contacts **1760** in base portion **1712**. Trap contacts **1762** are electrically connected to trap wires **1756** and are configured to create an electrical contact with base contacts **1760** (only one of which is shown), when trap portion **1714** is mounted to base portion **1712**. In some embodiments, base portion **1712** includes a circuit board **1750**, having a programmable processor

or chip (not shown) for executing commands, electrically connected to conductive prongs **1722** (only one of which is shown), LEDs **1724** (only one of which is shown), and a plurality of electric base wires **1764** (only one of which is shown), that correspond to base contacts **1760**. Circuit board **1750** may be electrically connected to conductive prongs **1722** (only one of which is shown), LEDs **1724** (only one of which is shown), and base wires **1764**, which, in turn, may be electrically connected to their corresponding base contacts **1760**. Accordingly, actuator **1754**, mounted on rear surface **1752** of divider **1734**, may be electrically connected to circuit board **1750** when trap portion **1714** is mounted to base portion **1712**. For clarity, however, not all of the electrical connections are shown. Circuit board **1750** may include electronic circuitry to receive ordinary household current from conductive prongs **1722** and provide power to illuminate LEDs **1724**. Circuit board **1750** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **1724**, although it may also provide a varying voltage to LEDs **1724** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1750** may provide power to LEDs **1724** to provide both UV and visible light, although it may be configured to provide power to only UV LEDs **1724** or to only visible light LEDs **1724**, or to only IR LEDs **1724**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1750** may also be configured to power actuator **1754** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency

detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1710**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1710**. Circuit board **1750** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1712** and into trap portion **1714**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1724** may generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1724** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1714** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[402] As shown, slot **1730** in top surface **1726** of base portion **1712** and rim or protrusions **1732** on top surface **1726** of base portion **1712** engage with trap portion **1714** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **1714** to be securely but removably mounted on base portion **1712**. A bottom surface **1770** of base portion **1712** may be substantially flat to allow insect trap **1710** to sit upright on a floor, desk, table or shelf when insect trap **1710** is unplugged. Alternatively, bottom surface **1770** of base portion **1712** may have two or more protrusions (not shown) or legs that allow insect trap **1710** to sit upright when insect trap **1710** is unplugged.

[403] In the operation of insect trap **1710**, conductive prongs **1722** are inserted into a wall electrical socket, and circuit board **1750** provides power to LEDs **1724** and to

actuator **1754**. LEDs **1724** emit light, represented by arrows, which transmits through window **1728** in base portion **1712**, through opening **1744** in rear housing **1740** of trap portion **1714**, into rear enclosure **1748**, and directly onto inside surface **1742** of rear housing **1740** and rear surface **1752** of divider **1734**. Because the light from LEDs **1724** enters rear enclosure **1748** through opening **1744** in a bottom face of rear housing **1740** (e.g., in a face that is substantially parallel to the overall depth of trap portion **1714**), the light can travel the entire length of rear enclosure **1748** and can diverge over the entire length of rear enclosure **1748**, and therefore can be more evenly distributed throughout rear enclosure **1748**. In some embodiments, light is not manipulated in base portion **1712** and is emitted directly into trap portion **1714**. Inside surface **1742** of rear housing **1740** may include a concave shape and may be configured to light from LEDs **1724** to distribute the light evenly onto rear surface **1752** of divider **1734**, although the shape of inside surface **1742** of rear housing **1740** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens or any other lens or combination of lenses (not shown) configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **1752** of divider **1734**, may be mounted to rear housing **1740** at or near opening **1744**or to base portion **1712** at or near opening **1766**, and may replace or augment the role of inside surface **1742** of rear housing **1740**. In some embodiments, the light from LEDs **1724** may directly strike rear surface **1752** of divider **1734** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across divider **1734**, and may replace or augment the role of inside surface **1742** of rear housing **1740** or of the lens or lenses mounted to rear housing **1740**.

[404] Thereafter, light transmits through divider **1734** and adhesive **1736** on front surface **1738**, and into front enclosure **1746**. The light may be further evenly distributed by the light-diffusing properties of divider **1734**, adhesive **1736** on front surface **1738**, or both. A portion of the light entering front enclosure **1746** continues through opening **1720** in front housing **1718** and emits into the surrounding area where the trap is installed. Actuator **1754** produces insect-attracting vibrations which are amplified by divider **1734**, and transmit through front enclosure **1746** of trap portion **1714**, and out through opening **1720** of trap

portion **1714**. Insects are attracted to the light transmitted through adhesive **1736** and through opening **1720** in front housing **1718**. Insects are also attracted to the insect-attracting vibrations produced by actuator **1754**. Insects fly or crawl into opening **1720** and onto adhesive **1736**, where they become trapped. A user may observe trapped insects by looking through opening **1720** in front housing **1718**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1714** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1714**, and replace it with a new trap portion **1714**. New trap portion **1714** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1710** will continue to efficiently and effectively attract and trap insects.

[405] In some embodiments, because trap portion **1714** mounts on top of, and not in front of, base portion **1712**, insect trap **1710** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1710** is configured such that when insect trap **1710** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1710** protrudes from the wall, is smaller than its overall height and its overall width.

[406] It should be appreciated that a benefit of insect trap **1710** is the manipulation of light within trap portion **1714**. In some embodiments, light manipulation occurs solely within trap portion **1714**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1742**, divider **1734** and adhesive **1736**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1736**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1736** or within trap portion **1714**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[407] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of

approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[408] Insect trap **1710** of this configuration may accommodate a variety of different trap portions **1714** that may be removably mounted to base portion **1712**, each trap portion **1714** being uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, the overall size and shape of trap portion **1714**, the size, shape, location and orientation of openings **1720** in front housing **1718** of trap portion **1714**, the vibration-producing properties of actuator **1754**, and the natural frequency and sound amplifying properties of trap portion **1714** may be uniquely configured to attract and trap a specific species or multiple species of flying insect.

[409] For example, in some embodiments, trap portion **1714** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1714** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1714** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[410] In some embodiments, base portion **1712** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1712** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1712** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[411] As provided herein, opening **1720** may be a variety of shapes and/or sizes. For example, opening **1720** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **1720** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1720** is circular, opening **1720** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1720** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1720** is approximately 0.5mm to 15mm in diameter. When opening **1720** is slot shaped, opening **1720** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1720** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1720** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[412] In some embodiments, opening **1720** covers all or a portion of front housing **1718**. For example, opening **1720** may cover a range of approximately 1% to 75% of the surface area of front housing **1718**. In some embodiments, opening **1720** covers approximately 5% to 50% of the surface area of front housing **1718**. In some embodiments, opening **1720** covers approximately 10% to 30% of the surface area of front housing **1718**.

[413] Figure **84** is a front perspective view of an example of the seventeenth embodiment of an insect trap, indicated generally at **1710A**. Insect trap **1710A** includes a base portion **1712A** and a removable trap portion **1714A**. Trap portion **1714A** is shown partially cut away and removed from base portion **1712A** in this view. Trap portion **1714A** includes a front housing **1718A** with at least one opening **1720A**, a divider **1734A**, and a rear housing **1740A**. Affixed to a rear surface of divider **1734A** is a heating element such as one or more heating wires **1754A** mounted on its rear surface. Heating wires **1754A** may be configured in a uniform pattern to produce heat in response to electric power. Heating wires **1754A** are connected to a plurality of busses **1770A,** which, in turn, are electrically connected to a corresponding plurality of trap wires **1756A**. While two trap wires **1756A** and two busses **1770A** are shown, any suitable number may be used. In some embodiments, trap wires **1756A** are electrically connected to busses **1770A** with solder. In some embodiments, heating wires **1754A** may be made of resistance wires glued or otherwise affixed to the rear surface of divider **1734A** in a uniformly-spaced pattern and configured to produce heat in response to electric current. In some embodiments, heating wires **1754A** may be of conductive polymer or other conductive material applied directly to the rear surface of divider **1734A**. In some embodiments, heating wires **1754A** may be of a self-correcting conductive polymer or other self-correcting conductive material that increases its internal resistance at higher temperatures and transfers electrical power from warmer regions to cooler ones, thereby improving temperature uniformity across heating wires **1754A** and divider **1734A**. In some embodiments busses **1770A** may be made of highly conductive metal such as copper. In some embodiments, heating wires **1754A** and busses **1770A** both may be made of conductive polymer. In some embodiments, heating wires **1754A** may be of a transparent or translucent material. In some embodiments, heating wires **1754A** are replaced by a thin, transparent layer of metal oxide (not shown) on the rear surface of divider **1743A**

that is electrically connected at opposite sides of the rear surface of divider **1734A** and produces heat in response to electric current. In general, the heat generated may increase and maintain the temperature of at least a portion of adhesive to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. In some embodiments, heat alone is used as an attractant, and a light source is not used in insect trap **1710A**.

[414] Rear housing **1740A** may include an opening **1744A** on its bottom surface, or alternatively opening **1744A** may be replaced by a transparent or translucent window (not shown). Protruding from a rear surface **1768A** of base portion **1712A** are a plurality of electrically conductive prongs **1722A**, adapted to mount insect trap **1710A** to a wall and provide power to insect trap **1710A** by inserting conductive prongs **1722A** into a standard household electrical wall socket. Base portion **1712A** includes a lighting element such as one or more LEDs **1724A**. A top surface **1726A** of base portion **1712A** includes an opening **1766A**. Mounted in one or more additional openings **1758A** in top surface **1726A** of base portion **1712A** are a plurality of electrical base contacts **1760A**. While two base contacts **1760A** are shown, any suitable number may be used.

[415] Figure **85** is a cross-sectional, cut-away view of insect trap **1710A** showing the interiors of base portion **1712A** and trap portion **1714A**, and Figure **86** is an enlarged view of a portion of Figure **85**. Divider **1734A** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive n its front surface **1738A**. In some embodiments, front housing **1718A** and rear housing **1740A** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1718A** and rear housing **1740A** are constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, front housing **1718A**, divider **1734A** and rear housing **1740A** are joined together at where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or by any other suitable assembly method. Divider **1734A** separates trap portion **1714A** into a front enclosure **1746A** and a rear

enclosure **1748A**. Rear housing **1740A** includes an inside surface **1742A** and a plurality of electrical trap contacts **1762A** (only one of which is shown) that correspond to base contacts **1760A** (only one of which is shown) in base portion **1712A**. Trap contacts **1762A** are electrically connected to trap wires **1756A** (only one of which is shown) and are configured to create an electrical contact with base contacts **1760A** when trap portion **1714A** is mounted to base portion **1712A**. In some embodiments, base portion **1712A** includes a circuit board **1750A**, having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1722A** (only one of which is shown), LEDs **1724A** (only one of which is shown), and a plurality of electric base wires **1764A** (only one of which is shown), that correspond to base contacts **1760A**. Circuit board **1750A** may be electrically connected to conductive prongs **1722A**, LEDs **1724A**, and base wires **1764A**, which, in turn, may be electrically connected to their corresponding base contacts **1760A**. Accordingly, heating wires **1754A** may be electrically connected to circuit board **1750A** when trap portion **1714A** is mounted to base portion **1712A**. For clarity, however, not all of the electrical connections are shown. Circuit board **1750A** may include electronic circuitry to receive ordinary household current from conductive prongs **1722A** and provide power to illuminate LEDs **1724A** and to activate heating wires **1754A**.

[416] In the operation of insect trap **1710A**, conductive prongs **1722A** are inserted into a wall electrical socket, and circuit board **1750A** provides power to LEDs **1724A** and to heating wires **1754A**. Heating wires **1754A** generate heat and warm divider **1734A**, which, in turn, warms adhesive. In some embodiments, circuit board **1750F** is configured to monitor the current through heating wires **1754A** and respond to temperature-related changes in resistance by increasing or decreasing voltage through heating wires **1754A**, thereby warming adhesive to a steady, uniform temperature. LEDs **1724A** emit light, which transmits through opening **1766A** in base portion **1712A**, through opening **1744A** in rear housing **1740A** of trap portion **1714A**, into rear enclosure **1748A**, and directly onto inside surface **1742A** of rear housing **1740A** and rear surface of divider **1734A**. Thereafter, light transmits through divider **1734A** and adhesive on front surface **1738A**, and into front enclosure **1746A**. Heating wires **1754A** are sufficiently thin to obstruct only a small fraction of the light transmitting through adhesive. A portion of the light entering front enclosure **1746A** continues through opening

1720A in front housing **1718A** and emits into the surrounding area where the trap is installed. Insects are attracted to the light and heat transmitted through adhesive and through opening **1720A** in front housing **1718A**. Insects fly or crawl into opening **1720A** and onto adhesive **1736A**, where they become trapped. A user may observe trapped insects by looking through opening **1720A** in front housing **1718A**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1714A** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1714A**, and replace it with a new trap portion **1714A**. New trap portion **1714A** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1710A** will continue to efficiently and effectively attract and trap insects.

[417] Figure **87** is a front perspective view of an eighteenth embodiment of an insect trap, indicated generally at **1810**. Trap portion **1814** is shown partially cut away in this view. Insect trap **1810** includes a base portion **1812** and a removable trap portion **1814**. Base portion **1812** may be identical or similar to the base portions of other embodiments described previously. Trap portion **1814** may have a front housing **1816** with at least one opening **1818** in a front surface **1830**, a rear housing **1820**, and a transparent or translucent divider **1822** with a front surface **1824**. Opening **1818** in front housing **1816** may be configured to admit a wide variety of insects into insect trap **1810**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1818** is configured to prevent user's fingers from penetrating opening **1820** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1814**. In some embodiments, opening **1818** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1818**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1820**. Opening **1818** may be of uniform or of varying width, shape and orientation, and if trap portion **1814** has more than one opening **1818**, they may be of identical or of differing widths, shapes and orientations. Opening **1818** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, divider **1822** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In

some embodiments, a text or graphics **1826** is applied to front surface **1824** of divider **1822**, although text or graphics **1826** may be applied instead to the rear surface (not shown) of divider **1822**, or it may be applied to both sides of divider **1822**. Text or graphics **1826** may be applied by traditional printing, hot stamping, silk screening, inkjet printing, or any method or process by which text or graphics **1826** may be applied to front surface **1824** and/or rear surface (not shown) of divider **1822**. Alternatively, a thin transparent or translucent film with the text or graphics applied to its front or rear surface or to both surfaces may be affixed to front surface **1824** of divider **1822**. Alternatively, text or graphics **1826** may be embossed or raised on front surface **1824** or the rear surface (not shown) of divider **1822** by embossing, engraving or molding, such that text or graphics **1826** appears darker or lighter than the surrounding area when light is transmitted through divider **1822**. A transparent or translucent coating of adhesive **1828** is applied over front surface **1824** of divider **1822** and over text or graphics **1826**. Text or graphics **1826** may be visible through adhesive **1828** either in ordinary ambient light or when illuminated from behind or both. Alternatively, text or graphics **1826** may be applied in fluorescent pigments, which appear to glow when illuminated by ultraviolet light. Text or graphics **1826** may be in the form of a repeated message or brand name or company logo such that text or graphics **1826** may appear repeatedly on front surface **1824** of divider **1822**, thereby eliminating alignment and printing registration issues during manufacture. Because text or graphics **1826** is visible through opening **1818** in front housing **1816**, text or graphics **1826** may not be fully visible or legible unless it is viewed from a short distance, such as when a user may look closely through opening **1818** to observe insects trapped in adhesive **1828**, or when the user may remove trap portion **1814** from base portion **1812** for disposal and replacement, both of which may be opportunities to remind the user of the brand name and /or logo of the insect trap, of use or disposal instructions, or of any other message or messages. Because text or graphics **1826** may not be fully visible or legible when viewed from a distance, text or graphics **1826** may not affect the appearance of the room in which insect trap **1810** is installed. When insect trap **1810** is in operation, divider **1822** and text or graphics **1826** are illuminated from behind, and text or graphics **1826** may appear as sharp light/dark contrast areas, which are highly visible to a wide variety of insects and may be more attractive to them. Text or

graphics **1826** applied to front surface **1824** of divider **1822** may be visible when illuminated from behind as well as when not illuminated from behind, whereas text or graphics **1826** applied to the rear surface of divider **1822** may only be visible when illuminated from behind. Accordingly, when text or graphics **1826** are applied to both sides of divider **1822**, different messages or graphics or combinations of messages or graphics may be displayed when insect trap **1810** is in operation and divider **1822** is illuminated from behind and when insect trap **1810** is not in operation.

[418] Figure **88** is a front perspective view and Figure **89** is a rear perspective view of a nineteenth embodiment of an insect trap, indicated generally at **1910**. Insect trap **1910** includes a base portion **1912** and a removable trap portion **1914**. Trap portion **1914** is shown removed from base portion **1912** in both views. Insect trap **1910** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **1910** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1910** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **1914** includes a front housing **1918** with at least one opening **1920** and a rear housing **1940**. Trap portion **1914** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **1914** is mounted in insect trap **1910**, and insect trap **1910** is mounted to a wall, the overall depth of trap portion **1914**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **1914**. Trap portion **1914** and base portion **1912** is configured such that trap portion **1914** engages with a top surface **1926** of base portion **1912** when trap portion **1914** is mounted to base portion **1912**. Trap portion **1914** includes a front housing **1918** with at least one opening **1920** in a front surface **1916**, and a rear housing **1940**. Opening **1920** in front housing **1918** may be configured to admit a wide variety of insects into insect trap **1910**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **1920** is configured to prevent the user's fingers from penetrating opening **1920** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **1914**. In some embodiments, opening **1920** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **1920**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **1920**. Opening

1920 may be of uniform or of varying width, shape and orientation, and if trap portion **1914** has more than one opening **1920**, they may be of identical or of differing widths, shapes and orientations. Opening **1920** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, front housing **1918** has one or more ribs or other relief features (not shown) to provide increased stiffness and strength, particularly around opening **1920**.

[419] In some embodiments, base portion **1912** may have a substantially flat or concave surface (not shown) or one or more protrusions (not shown) on its bottom surface to enable insect trap **1910** to remain upright when insect trap **1910** placed on a flat, horizontal surface such as the floor or on a shelf for storage. Protruding from a rear surface **1962** (shown in Figure **89**) of base portion **1912** are a plurality of electrically conductive prongs **1922**, adapted to mount insect trap **1910** to a wall and provide power to insect trap **1910** by inserting conductive prongs **1922** into a standard household electrical wall socket. Alternatively, conductive prongs **1922** may be adapted to swivel to allow insect trap **1910** to remain upright when conductive prongs **1922** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **1912** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **1912**. While an electrical socket and batteries have been described as providing power to insect trap **1910**, any suitable power source may be used. Base portion **1912** includes a top surface **1926** and a lighting element such as one or more LEDs **1924**. In some embodiments, base portion **1912** includes an array of LEDs **1924**. As shown, LEDs **1924** are configured in a 2 by 3 array of blue and UV LEDS **1924**, although different array configurations with different numbers and arrangements (e.g., a 3 by 2 array or a 4 by 3 array or a 1 by 2 array, for example) of LEDs **1924**, LEDs **1924** emitting different wavelengths of light, and different combinations of LEDs **1924** emitting different wavelengths of light, could also be used. In some embodiments, LEDs **1924** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **1924** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **1924** include at least one that emits IR light to better attract

certain species of insects including mosquitos. Mounted in top surface **1926** of base portion **1912** may be a transparent or translucent window **1928**, shown partially cut away to reveal LEDs **1924**. Window **1928** protects LEDs **1924** from dust and insect debris, and allows base portion **1912** to be easily cleaned. In some embodiments, top surface **1926** has one or more snap protrusions **1956**, preferably on the front and rear portions of top surface **1926**, although snap protrusions **1956** may be located anywhere on top surface **1926**. In some embodiments, snap protrusions **1956** are configured such that at least a portion of their distal portions are larger in width and/or depth than at least a portion of their proximal portions, thereby creating features known as undercuts. Front housing **1918** and/or rear housing **1940** of trap portion **1914** may have one or more snap recesses **1958** that correspond in size, shape and location to snap protrusions **1956** on base portion **1912**, except that the undercuts on snap recesses **1958** may be configured such that at least a portion of their proximal portions are larger in width and/or depth than at least a portion of their distal portions. When trap portion **1914** is mounted to base portion **1912**, the undercuts on snap protrusions **1956** and the undercuts on snap recesses **1958** engage to create a secure but removable attachment known as a snap fit. The snap fit between base portion **1912** and trap portion **1914** may provide a positive tactile and audible cue to reassure a user that trap portion **1914** is properly engaged with base portion **1912**. The snap fit between base portion **1912** and trap portion **1914** may allow trap portion **1914** to be securely but removably mounted to base portion **1912** when insect trap **1910** is in use, and may allow the user to easily remove trap portion **1914** from base portion **1912** without damaging trap portion **1914** or base portion **1912** and without the user contacting trapped insects. In some embodiments, the snap fit between base portion **1912** and trap portion **1914** is configured to allow the user to easily remove and replace trap portion **1914** from base portion **1912** using only one hand, while base portion **1912** remains securely but removably plugged into an electrical wall socket. In some embodiments, the snap fit between base portion **1912** and trap portion **1914** is configured to allow trap portion **1914** to be mounted to base portion **1912** with a downward force of not greater than e.g., 50 Newtons, and to allow trap portion **1914** to be removed from base portion **1912** with an upward force of not greater than e.g., 50 Newtons.

[420] Although a snap fit may be preferred, other features or combinations of features may be contemplated to securely but removably attach trap portion **1914** to base portion **1912**. Figure **90** is a front perspective view and Figure **91** is a rear perspective view of an example of the nineteenth embodiment of an insect trap, indicated generally at **1910A.** Insect trap **1910A** includes a base portion **1912A** and a removable trap portion **1914A**. Trap portion **1914A** is shown removed from base portion **1912A** in these views. Base portion **1912A** includes a top surface **1926A**, at least one snap protrusion **1956A** on a front portion of top surface **1926A** and at least one hook protrusion **1964A** on a rear portion of top surface **1926A**. Trap portion **1914A** includes a front housing **1918A**, a rear housing **1940A**, at least one snap recess **1958A** on front housing **1918A**, and at least one hook recess **1966A** on rear housing **1940A**. Snap recess **1958A** corresponds in size, shape and location to snap protrusion **1956A** on base portion **1912A**, and snap recess **1958A** and hook recess **1966A** are configured to engage with snap protrusion **1956A** and hook protrusion **1964A**, respectively, when trap portion **1914A** is mounted on base portion **1912A.**

[421] Figure **92** is a left side view of insect trap **1910A**. Trap portion **1914A** is shown partially mounted on base portion **1912A** in this view. To mount trap portion **1914A** on base portion **1912A**, trap portion **1914A** is first tilted back (e.g., counterclockwise in this view) slightly and lowered onto base portion, so that hook recess **1966A** on trap portion **1914A** is engaged with hook protrusion **1964A** on base portion **1912A**, as shown. Then trap portion **1914A** is tilted forward (e.g., clockwise in this view), thereby engaging snap recess **1958A** (not shown in this view) onto snap protrusion **1956A** and providing a positive tactile and audible cue to assure the user that trap portion **1914A** is properly engaged with base portion **1912A**. To remove trap portion **1914A** from base portion **1912A**, trap portion **1914A** is tilted back (e.g., counterclockwise in this view), thereby disengaging snap recess **1958A** from snap protrusion **1956A**, and then pulling trap portion **1914A** slightly forward and lifting it from base portion **1912A**. Because user can hold and apply force to the top portion of trap portion **1914A** to tilt it forward, thereby engaging snap recess **1958A** on snap protrusion **1956A**, and to tilt it backward, thereby disengaging snap recess **1958A** from snap protrusion **1956A**, and because the distance from the top portion of trap portion **1914A** to hook recess **1966A** is larger than the distance between hook protrusion **1964A** and snap

protrusion **1956A**, the force required to tilt trap portion **1914A** forward and mount trap portion **1914A** on base portion **1912A** and the force required to tilt trap portion **1914A** backward and unmount trap portion **1914A** from base portion **1912A** is significantly reduced. Alternatively, this mechanical advantage could allow for a more robust attachment of trap portion **1914A** onto base portion **1912A** without increasing the force needed to remove and replace trap portion **1914A**.

[422] Figure **93** is a front perspective view of an example of the nineteenth embodiment of an insect trap, indicated generally at **1910B**. Insect trap **1910B** includes a base portion **1912B** with a top surface **1926B** and a removable trap portion **1914B** with a bottom surface **1964B** and side flanges **1966B** (only one of which is shown). Trap portion **1914B** is shown partially removed from base portion **1912B** in this view. Base portion **1914B** includes two side rails **1968B** protruding upward from each side of base portion **1912B** roughly the length of trap portion **1914B**. Each of side rails **1968B** includes a distal end **1970B** and an inner surface **1972B** (only one of which is shown) with a channel **1974B** (only one of which is shown) that extends from top surface **1926B** of base portion **1912B** through the distal end **1970B** of side rail **1968B**. Channels **1974B** are configured to receive side flanges **1966B** of trap portion **1914B** such that trap portion **1914B** may slide freely up and down side rails **1968B**.

[423] To mount trap portion **1914B** on base portion **1912B**, side flanges **1966B** near bottom surface **1964B** of trap portion **1914B** are aligned with channels **1974B** at distal ends **1970B** of side rails **1968B** on base portion **1912B**, then trap portion **1914B** is released, allowing trap portion **1914B** to slide down side rails **1968B** until bottom surface **1964B** of trap portion **1914B** contacts top surface **1926B** of base portion **1912B**. To remove trap portion **1914B** from base portion **1912B**, trap portion **1914B** is lifted upward, allowing trap portion **1914B** to slide up side rails **1968B** until side flanges **1966B** disengage with channels **1974B**. Accordingly, removing and replacing trap portion **1914B** is simple and intuitive.

[424] Other configurations are contemplated to securely but removably attach trap portion **1914B** to base portion **1912B**. In some embodiments, a magnet or magnets (not shown) in base portion **1912B** may attract a ferrous metal component or components (not shown) in trap portion **1914B** to securely but removably attach trap portion **1914B** to base portion **1912B**. In some embodiments, an

electromagnet or electromagnets (not shown) in base portion **1912B** may replace the role of magnet or magnets.

[425] Figure **94** is a front view of an example of the nineteenth embodiment of an insect trap, indicated generally at **1910C**. Insect trap **1910C** includes a base portion **1912C** and a removable trap portion **1914C**. Base portion **1912C** and trap portion **1914C** include one or more grip features **1976C**. Grip features **1976C** may enhance the user's grip on base portion **1912C** and / or trap portion **1914C** when installing insect trap **1910C** and / or when removing and replacing trap portion **1914C**. As shown, both base portion **1912C** and trap portion **1914C** include grip features **1976C.** In some embodiments, only trap portion **1914C** may include grip features **1976C**, or only base portion **1912C** may include grip features **1976C**. Grip features **1976C** are shown as side recesses configured to conform to the fingers of the user, although grip features **1976C** may also take the form of ribs, bumps, waves or any other positive or negative shape of any size and on any part of base portion **1912C** or trap portion **1914C**. Grip features **1976C** may be molded, thermoformed, cut, machined or stamped directly into base portion **1912C** and trap portion **1914C** components prior to assembly, during assembly or after assembly. Grip features **1976C** may allow for easier installation of insect trap **1910C** and easier removal and replacement of trap portion **1914C** on base portion **1912C**. Alternatively, grip features **1976C** may allow for a more secure removable attachment between base portion **1912C** and trap portion **1914C** without compromising ease of removing and replacing trap portion **1914C**.

[426] Returning now to insect trap **1910**, Figure **95** is a cross-sectional view of insect trap **1910**. In some embodiments, the light emitted from each of LEDs **1924** has a primary direction **1954**. Trap portion **1914** includes a divider **1934** with a front surface **1938**. In some embodiments, divider **1934** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **1936** on front surface **1938**. In some embodiments, divider **1934** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **1934** and the material and thickness of adhesive **1936** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through

divider **1934** and adhesive **1936**. In some embodiments, rear housing **1940** includes a reflective-coated inside surface **1942.** Alternatively, the material and surface finish of rear housing **1940** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. Rear housing **1940** may include an opening **1944** on its bottom surface, or alternatively opening **1944** may be replaced by a transparent or translucent window (not shown).

[427] In some embodiments, front housing **1918** and rear housing **1940** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **1918** and rear housing **1940** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **1934** is substantially planar, and may be configured to be parallel to, or at an angle **1952** to primary direction **1954** of the light produced by LEDs **1924**. Angle **1952** may preferably be an acute angle to assist in distributing the light evenly over divider **1934**, and may preferably be from 0° to 45°. In some embodiments, divider **1934** may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. In some embodiments, divider **1934** may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[428] In some embodiments, front housing **1918** may also be coated with transparent, translucent or opaque adhesive (not shown) on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **1918** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[429] In some embodiments, front housing **1918**, divider **1934** and rear housing **1940** are joined together where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or any other suitable assembly method. The materials of trap portion **1914** may also include one or more insect attractants. For example, trap portion **1914** may be impregnated with one or more of insect-

attracting substances known in the art, including sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **1910**. In such embodiments, the insect attractant is integral to trap portion **1914**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that mounts on an inside surface of front housing **1918** or through an opening in front housing **1918** or on front surface **1916** of front housing **1918** or on front surface **1938** of divider **1934**. Alternatively, water may be embedded or contained in the separate piece or container in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece or container in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece or container in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1910**. Divider **1934** separates trap portion **1914** into a front enclosure **1946** and a rear enclosure **1948**. In some embodiments, base portion **1912** includes a circuit board **1950** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **1922**, only one of which is shown, and LEDs **1924**, only one of which is shown. For clarity, however, not all of the electrical connections are shown. Circuit board **1950** may include electronic circuitry to receive ordinary household current from conductive prongs **1922** and provide power to illuminate LEDs **1924**. Circuit board **1950** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **1924**, although it may also provide a varying

voltage to LEDs **1924** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **1950** may provide power to LEDs **1924** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **1924** or to only visible light LEDs **1924** or to only IR LEDs **1924**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **1950** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **1912** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **1910**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **1910**. Circuit board **1950** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **1912** and into trap portion **1914**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **1924** may

generate heat, to replace or augment the heat generated by the one or more electrical elements. Alternatively, one or more of LEDs **1924** may be replaced or augmented by one or more incandescent light bulbs to generate both heat and light. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **1914** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[430] In the operation of insect trap **1910**, conductive prongs **1922** are inserted into a wall electrical socket, and trap portion **1914** is mounted to base portion **1912** by engaging snap recesses **1958** (not shown) of trap portion **1914** with their corresponding snap protrusions **1956** (not shown) on base portion **1912**. LEDs **1924** emit light, represented by arrows, which transmit through window **1928** in base portion **1912**, through opening **1944** in rear housing **1940** of trap portion **1914**, into rear enclosure **1948**, and directly onto inside surface **1942** of rear housing **1940** and onto a rear surface **1960** of divider **1934**. For clarity, the arrows representing the light are only shown emitted from one of LEDs **1924**. Because the light from LEDs **1924** enters rear enclosure **1948** through opening **1944** in a bottom face of rear housing **1940** (e.g., in a face that is substantially parallel to the overall depth of trap portion **1914**), the light can travel the entire length of rear enclosure **1948** and can diverge over the entire length of rear enclosure **1948**, and therefore can be more evenly distributed throughout rear enclosure **1948**. In some embodiments, light is not manipulated in base portion **1912** and is emitted directly into trap portion **1914**. Inside surface **1942** of rear housing **1940** may include a concave shape and may be configured to reflect and disperse the UV and visible light from LEDs **1924** to distribute the light evenly onto rear surface **1960** of divider **1934**, although the shape of inside surface **1942** of rear housing **1940** may have a convex shape or a saddle shape or a combination of shapes (not shown), or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **1960** of divider **1934**, may be mounted to rear housing **1940** at or near

opening **1944** or to base portion **1912** at or near window **1928**, and may replace or augment the role of inside surface **1942** of rear housing **1940**. In some embodiments, the light from LEDs **1924** may directly strike rear surface **1960** of divider **1934** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider **1934**, and may replace or augment the role of inside surface **1942** of rear housing **1940** or of the lens or lenses mounted to rear housing **1940**.

[431] Thereafter, light transmits through divider **1934** and adhesive **1936** on front surface **1938**, and into front enclosure **1946**. The light may be further evenly distributed by the light-diffusing properties of divider **1934**, adhesive **1936** on front surface **1938**, or both. A portion of the light entering front enclosure **1946** continues through opening **1920** in front housing **1918** and into the area where the trap is installed. Insects are attracted to the UV and/or visible light transmitted through adhesive **1936** and through opening **1920** in front housing **1918**, and fly or crawl into opening **1920** and onto adhesive **1936**, where they become trapped. A user may observe trapped insects by looking through opening **1920** in front housing **1918**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **1914** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **1914**, and replace it with a new trap portion **1914**. New trap portion **1914** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **1910** will continue to efficiently and effectively attract and trap insects.

[432] In some embodiments, because trap portion **1914** mounts on top of, and not in front of, base portion **1912**, insect trap **1910** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **1910** is configured such that when insect trap **1910** is mounted to a wall, its overall depth, defined by the overall distance insect trap **1910** protrudes from the wall, is smaller than its overall height and its overall width.

[433] It should be appreciated that a benefit of insect trap **1910** is the manipulation of light within trap portion **1914**. In some embodiments, light manipulation occurs solely within trap portion **1914**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **1942**,

divider **1934** and adhesive **1936**). In some embodiments, light manipulation produces an even distribution of light on adhesive **1936**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **1936** or within trap portion **1914**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[434] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[435] Insect trap **1910** of this configuration may accommodate a variety of different trap portions **1914** that may be removably mounted to base portion **1912**, each trap portion **1914** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **1914**, and the size, shape, location and orientation of openings **1920** in front housing **1918** of trap portion **1914**, may be uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect.

[436] For example, in some embodiments, trap portion **1914** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **1914** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **1914** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[437] In some embodiments, base portion **1912** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **1912** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **1912** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[438] As provided herein, opening **1920** may be a variety of shapes and/or sizes. For example, opening **1920** may be circular, square, rectangular, polygonal and/or

elliptical in shape. Alternatively, opening **1920** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **1920** is circular, opening **1920** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **1920** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **1920** is approximately 0.5mm to 15mm in diameter. When opening **1920** is slot shaped, opening **1920** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **1920** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **1920** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[439] In some embodiments, opening **1920** covers all or a portion of front housing **1918**. For example, opening **1920** may cover a range of approximately 1% to 75% of the surface area of front housing **1918**. In some embodiments, opening **1920** covers approximately 5% to 50% of the surface area of front housing **1918**. In some embodiments, opening **1920** covers approximately 10% to 30% of the surface area of front housing **1918**.

[440] Figure **96** is a front perspective view of a twentieth embodiment of an insect trap, indicated generally at **2010**. Insect trap **2010** may include a base portion **2012** and a removable trap portion **2014**. Trap portion **2014** is shown partially cut away and removed from base portion **2012** in this view. Insect trap **2010** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **2010** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2010** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **2014** includes a divider **2034** and a front housing **2018** with at least one opening **2020** in a front surface **2016**. Trap portion **2014** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **2014** is mounted in insect trap **2010**, and insect trap **2010** is mounted to a wall, the overall depth of trap portion **2014**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **2014**. Opening **2020** in front housing **2018** may be configured to admit a wide variety of insects into insect trap **2010**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2020** is configured to prevent user's fingers from penetrating opening **2020** and inadvertently touching

trapped insects or adhesive when removing and replacing trap portion **2014**. In some embodiments, opening **2020** may preferably have a size and shape such that a sphere 25mm in diameter cannot pass through opening **2020**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2020**. Opening **2020** may be of uniform or of varying width, shape and orientation, and if trap portion **2014** has more than one opening **2020**, they may be of identical or of differing widths, shapes and orientations. Opening **2020** may be configured to attract one or more individual insect species or a variety of insect species. The front housing **2018** may also include a window **2060**, although an opening may take the place of window **2060**. In some embodiments, divider **2034** is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive **2036** on a front surface **2038**. During use, one or more trapped insects **2058** may adhere to adhesive **2036** on front surface **2038** of divider **2034**. In some embodiments, divider **2034** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. Protruding from a rear surface **2064** (shown in Figure **97** of base portion **2012** may be a plurality of electrically conductive prongs **2022**, adapted to mount insect trap **2010** to a wall and provide power to insect trap **2010** by inserting conductive prongs **2022** into a standard household electrical wall socket. Alternatively, conductive prongs **2022** may be adapted to swivel to allow insect trap **2010** to remain upright when conductive prongs **2022** are inserted into a horizontal outlet. Alternatively, base portion **2012** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **2012**. While an electrical socket and batteries have been described as providing power to insect trap **2010**, any suitable power source may be used. Base portion **2012** includes a lighting element such as one or more LEDs **2024**. In some embodiments, LEDs **2024** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2024** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2024** include at least one that emits IR light to better attract certain species of insects including mosquitos and fleas. In a top surface **2026** of base portion **2012**

is an opening **2052**, which may be covered by a transparent or translucent window **2028**, shown partially cut away to reveal LEDs **2024**. One of ordinary skill in the art would realize that openings and windows (e.g., **2052** and **2028**) as described herein or depicted in the accompanying drawings may vary in size and/or positioning, without departing from the scope of the disclosure. Window **2028** protects LEDs **2024** from dust and insect debris, and may allow base portion **2012** to be easily cleaned. In some embodiments, at least a portion of window **2028** and at least a portion of LEDs **2024** protrude from top surface **2026** of base portion **2012** and into trap portion **2014** when trap portion **2014** is mounted to base portion **2012**. In some embodiments, base portion does not include window **2028**, and at least a portion of LEDs **2024** protrude from top surface **2026** of base portion **2012** and into trap portion **2014** when trap portion **2014** is mounted to base portion **2012**. In some embodiments, mounted in an opening **2054** of top surface **2026** is a photosensor **2056**, preferably a photoresistor, although a photovoltaic cell, a photodiode, a phototransistor, or any sensor that detects light and responds by changing its electrical characteristics may be used. Also in top surface **2026** may be a slot **2030**, and on the perimeter of top surface **2026** is a rim or upwardly directed protrusions **2032**.

[441] Figure **97** is a cross-sectional view of insect trap **2010**. Trap portion **2014** includes a rear housing **2040** with an inside surface **2042**. In some embodiments, inside surface **2042** has a reflective coating. In some embodiments, the material and surface finish of rear housing **2040** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating. In some embodiments, the material and thickness of divider **2034** and the material and thickness of adhesive **2036** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **2034** and adhesive **2036**. Rear housing **2040** may include an opening **2044** on its bottom face, or alternatively opening **2044** may be replaced by a transparent or translucent window (not shown).

[442] In some embodiments, front housing **2018** and rear housing **2040** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may also be used. In some embodiments, front housing **2018** and

rear housing **2040** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **2034** is substantially planar, and may be configured to be parallel to, or at an angle to the primary direction of the light (not shown) produced by LEDs **2024**. Alternatively, divider **2034** may be formed into a convex, concave or saddle-shaped contour (not shown), or a combination of contours to optimize the even distribution of light. In some embodiments, divider **2034** has ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[443] In some embodiments, front housing **2018** is coated with transparent, translucent or opaque adhesive (not shown) on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **2018** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness.

[444] In some embodiments, front housing **2018**, divider **2034** and rear housing **2040** are joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or RF sealing, or any other suitable assembly method. As shown, divider **2034** may separate trap portion **2014** into a front enclosure **2046** and a rear enclosure **2048**. In some embodiments, base portion **2012** includes a circuit board **2050** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **2022**, only one of which is shown, and LEDs **2024**. For clarity, however, not all of the electrical connections are shown. Circuit board **2050** may include electronic circuitry to receive ordinary household current, for example, from conductive prongs **2022** and provide power to illuminate LEDs **2024**. Circuit board **2050** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **2024**, although it may also provide a varying voltage to LEDs **2024** to provide a flickering light which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the

lighting element may be configured to flicker within this range. Circuit board **2050** may provide power to LEDs **2024** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only the UV LEDs **2024** or to only the visible light LEDs **2024** or to only the IR LEDs **2024**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2050** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2012** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2010**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2010**. Circuit board **2050** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2012** and into trap portion **2014**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of light sources **2024** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2014** to between approximately 30 degrees C and 45 degrees C, and

to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals.

[445] As shown, slot **2030** in top surface **2026** of base portion **2012** and rim or protrusions **2032** on top surface **2026** of base portion **2012** engage with trap portion **2014** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **2014** to be securely but removably mounted on base portion **2012**. Bottom surface **2066** of base portion **2012** may be substantially flat or concave to allow insect trap **2010** to sit upright on a floor, desk, table or shelf when insect trap **2010** is unplugged. Alternatively, bottom surface **2066** of base portion **2012** may have two or more protrusions (not shown) or legs that allow the insect trap **2010** to sit upright when insect trap **2010** is unplugged.

[446] In the operation of insect trap **2010**, conductive prongs **2022**, only one of which is shown, are inserted into a wall electrical socket. Circuit board **2050** provides power to LEDs **2024** and to photosensor **2056**. LEDs **2024** emit light, represented by arrows, which transmits through window **2028** in base portion **2012**, through opening **2044** in rear housing **2040** of trap portion **2014**, into rear enclosure **2048**, and directly onto inside surface **2042** of rear housing **2040** and a rear surface **2062** of divider **2034**. Because the light from LEDs **2024** enters rear enclosure **2048** through opening **2044** in a bottom face of rear housing **2040** (e.g., in a face that is substantially parallel to the overall depth of trap portion **2014**), the light can travel the entire length of rear enclosure **2048** and can diverge over the entire length of rear enclosure **2048**, and therefore can be more evenly distributed throughout rear enclosure **2048**. In some embodiments, light is not manipulated in base portion **2012** and is emitted directly into trap portion **2014**. Inside surface **2042** of rear housing **2040** may include a concave shape and may be configured to reflect and disperse the UV and visible light from LEDs 2024 to distribute the light evenly onto rear surface **2062** of divider **2034**, although the shape of inside surface **2042** of rear housing **2040** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **2062** of divider **2034**, may

be mounted to rear housing **2040** at or near opening **2044**or to base portion **2012** at or near opening **2052**, and may replace or augment the role of inside surface **2042** of rear housing **2040**. In some embodiments, the light from LEDs 2024 may directly strike rear surface **2062** of divider **2034** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider **2034**, and may replace or augment the role of inside surface **2042** of rear housing **2040** or of the lens or lenses mounted to rear housing **2040**.

[447] Thereafter, the light transmits through divider **2034** and adhesive **2036** on front surface **2038**, and into front enclosure **2046**. The light-diffusing properties of divider 2034, adhesive 2036, or both may further evenly distribute the light. A portion of the light entering front enclosure **2046** continues through opening **2020** in front housing **2018** and emits into the surrounding area where insect trap **2010** is installed. Insects are attracted to the UV and/or visible light transmitted through adhesive **2036** and through opening **2020** in front housing **2018**, and fly or crawl into opening **2020** and onto adhesive **2036**, where they become trapped. Trapped insects **2058** reduce the amount light transmitted into front enclosure **2046**. Photosensor **2056** detects this reduction in light and responds by changing its electrical properties. Circuit board **2050** responds to changes in electrical properties that exceed a predetermined threshold by causing LEDs 2024 to blink on and off, thereby providing an indicator feature signaling that trap portion **2014** may need to be replaced. Alternatively, other visual indicator features, such as a change in the color of the light (e.g., to yellow, orange or red) or an audible indicator feature such as a tone, chime or voice, may augment or replace the blinking light indicator feature. In some embodiments, circuit board **2050** is configured to avoid responding inadvertently to changes in the ambient light levels by periodically pulsing or varying the light emitting from LEDs 2024, preferably at a faster rate than is distinguishable by the human eye, detecting the changes in electrical properties of photosensor **2056** resulting from the periodic pulses of light, and responding to the changes that exceed a predetermined threshold by causing LEDs **2024** to blink on and off. A user may notice the blinking light emitting from insect trap **2010** and observe trapped insects **2058** by looking through opening **2020** in front housing **2018**. The user may easily remove and discard the entire used trap portion **2014** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2014**, and

replace it with a new trap portion **2014**. The new trap portion **2014** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **2010** will continue to efficiently and effectively attract and trap insects.

[448] In some embodiments, because trap portion **2014** mounts on top of, and not in front of, base portion **2012**, insect trap **2010** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2010** is configured such that when insect trap **2010** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2010** protrudes from the wall, is smaller than its overall height and its overall width.

[449] It should be appreciated that a benefit of insect trap **2010** is the manipulation of light within trap portion **2014**. In some embodiments, light manipulation occurs solely within trap portion **2014**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **2042**, divider **2034** and adhesive **2036**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2036**. In some embodiments, light is manipulated to produce a predetermined pattern on the adhesive **2036** or within trap portion **2014**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[450] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[451] An insect trap **2010** of this configuration may accommodate a variety of different trap portions **2014** that may be removably mounted to base portion **2012**, each trap portion **2014** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **2014**, the size, shape, location and orientation of opening **2020** in front housing **2018** of trap portion **2014**, and the natural

frequency and sound amplifying properties of trap portion **2014** may be uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, in some embodiments, trap portion **2014** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **2014** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **2014** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[452] In some embodiments, base portion **2012** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **2012** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **2012** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[453] As provided herein, opening **2020** may be a variety of shapes and/or sizes. For example, opening **2020** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **2020** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **2020** is circular, opening **2020** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **2020** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **2020** is approximately 0.5mm to 15mm in diameter. When opening **2020** is slot shaped, opening **2020** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **2020** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **2020** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[454] In some embodiments, opening **2020** covers all or a portion of front housing **2018**. For example, opening **2020** may cover a range of approximately 1% to 75% of the surface area of front housing **2018**. In some embodiments, opening **2020** covers approximately 5% to 50% of the surface area of front housing **2018**. In some embodiments, opening **2020** covers approximately 10% to 30% of the surface area of front housing **2018**.

[455] Figure **98** is a rear perspective view of a twenty-first embodiment of an insect trap, indicated generally at **2110**. Insect trap **2110** includes a base portion **2112** and a removable trap portion **2114**. Trap portion **2114** is shown partially cut away

and removed from base portion **2112** in this view. Insect trap **2110** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **2110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2110** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **2114** includes a front housing **2118** with at least one opening **2120** in its front surface **2116** (shown in Figure **99**), a rear housing **2140**, and a divider **2134** with a rear surface **2152**. Trap portion **2114** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **2114** is mounted in insect trap **2110**, and insect trap **2110** is mounted to a wall, the overall depth of trap portion **2114**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **2114**. Affixed to rear surface **2152** of divider **2134** is an electromechanical actuator **2154**, preferably a transmitter or transceiver such as a piezoelectric actuator. Attached to actuator **2154** are electric trap wires **2156**. While two trap wires **2156** are shown attached to actuator **2154**, any suitable number may be used. Rear housing **2140** may include an opening **2144** on its bottom surface, or alternatively opening **2144** may be replaced by a transparent or translucent window (not shown).

[456] Protruding from a rear surface **2172** of base portion **2112** are a plurality of electrically conductive prongs **2122**, adapted to mount insect trap **2110** to a wall and provide power to insect trap **2110** by inserting conductive prongs **2122** into a standard household electrical wall socket. Alternatively, conductive prongs **2122** may be adapted to swivel to allow insect trap **2110** to remain upright when conductive prongs **2122** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **2112** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **2112**. While an electrical socket and batteries have been described as providing power to insect trap **2110**, any suitable power source may be used. Base portion **2112** includes a lighting element such as one or more LEDs **2124**. In some embodiments, LEDs **2124** include at least one that emits UV light and at least one emits visible light. In some embodiments, LEDs **2124** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs

2124 include at least one that emits IR light to better attract certain species of insects such as mosquitos and fleas. A top surface 2126 of base portion 2112 includes an opening 2166, which may be covered by a transparent or translucent window 2128, shown partially cut away to reveal LEDs 2124. Window 2128 protects LEDs 2124 from dust and insect debris, and allows base portion 2112 to be easily cleaned. In some embodiments, at least a portion of window 2128 and at least a portion of LEDs 2124 protrude from top surface 2126 of base portion 2112, and protrude into trap portion 2114 when trap portion 2114 is mounted to base portion 2112. In some embodiments, base portion 2112 does not include a window 2128, and at least a portion of LEDs 2124 protrude from top surface 2126 of base portion 2112 and protrude into trap portion 2114 when trap portion 2114 is mounted to base portion 2112. Mounted in one or more additional openings 2158 in top surface 2126 of base portion 2112 is a plurality of electrical base contacts 2160. While two base contacts 2160 are shown, any suitable number may be used. In top surface 2126 may be a slot 2130, and on the perimeter of top surface 2126 is a rim or upwardly directed protrusions 2132.

[457] Figure 99 is a front perspective view of insect trap 2110. Trap portion 2114 is shown partially cut away and removed from base portion 2112 in this view. Opening 2120 in front housing 2118 may be configured to admit a wide variety of insects into insect trap 2110, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening 2120 is configured to prevent user's fingers from penetrating opening 2120 and inadvertently touching trapped insects or adhesive when removing and replacing trap portion 2114. In some embodiments, opening 2120 has a size and shape such that a sphere 25mm in diameter cannot pass through opening 2120, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening 2120. Opening 2120 may be of uniform or of varying width, shape and orientation, and if trap portion 2114 has more than one opening 2120, they may be of identical or of differing widths, shapes and orientations. Opening 2120 may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, divider 2134 is constructed from or includes a transparent or translucent material and may be coated with a transparent or translucent adhesive 2136 on its front surface 2138. During use, trapped insects 2170 may adhere to adhesive 2136 on front surface 2138 of divider 2134. In some

embodiments, the material and thickness of divider **2134** and the material and thickness of adhesive **2136** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **2134** and adhesive **2136**.

[458] In some embodiments, divider **2134** may also be configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, mounted on the inside bottom of front housing **2118** is an insert **2168** configured to reflect and polarize light in an orientation similar to that of light reflecting from the surface of water to better attract a variety of insect species, especially those that breed near water. Insert **2168** may be configured of material that reflects and polarizes light, and may have ridges or other surface or subsurface features to enhance its reflecting and/or polarizing properties, thereby further attracting insects.

[459] Figure **100** is a cross-sectional view of insect trap and Figure **101** is an enlarged view of a portion of Figure **100**. In some embodiments, rear housing **2140** may have a reflective-coated inside surface **2142**. Alternatively, the material and surface finish of rear housing **2140** may be configured to reflect and disperse UV and/or visible and/or IR light without a reflective coating.

[460] In some embodiments, front housing **2118** and rear housing **2140** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may be used. In some embodiments, front housing **2118** and rear housing **2140** are constructed by injection molding or by other suitable manufacturing techniques. As shown, divider **2134** is substantially planar, and may be configured to be parallel to, or at an angle to the primary direction of the light produced by LEDs **2124**. In some embodiments, divider **2134** may be formed into a convex, concave or saddle-shaped contour, or a combination of contours to optimize the even distribution of light. In some embodiments, divider **2134** may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[461] In some embodiments, front housing **2118** may also be coated with transparent, translucent or opaque adhesive on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **2118** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **2118**, divider **2134** and rear housing **2140** are joined together where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or any other suitable assembly method. Divider **2134** separates trap portion **2114** into a front enclosure **2146** and a rear enclosure **2148**. Rear housing **2140** includes a plurality of electrical trap contacts **2162** (only one of which is shown) that correspond to base contacts **2160** in base portion **2112**. Trap contacts **2162** are electrically connected to their corresponding trap wires **2156** and are configured to create an electrical contact with base contacts **2160** (only one of which is shown) when trap portion **2114** is mounted to base portion **2112**. In some embodiments, base portion **2112** includes a circuit board **2150**, having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **2122** (only one of which is shown), LEDs **2124** (only one of which is shown), and a plurality of electric base wires **2164**, that correspond to, and are electrically connected to, base contacts **2160**. Accordingly, actuator **2154**, mounted on rear surface **2152** of divider **2134**, may be electrically connected to circuit board **2150** when trap portion **2114** is mounted to base portion **2112**. For clarity, however, not all of the electrical connections are shown. Circuit board **2150** may include electronic circuitry to receive ordinary household current from conductive prongs **2122** and provide power to illuminate LEDs **2124**. Circuit board **2150** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **2124**, although it may also provide a varying voltage to LEDs **2124** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **2150** may provide power to

LEDs **2124** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **2124** or to only visible light LEDs **2124** or to only IR LEDs 2124, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2150** may also be configured to power actuator **2154** mounted on rear surface **2152** of divider **2134** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2110**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2110**. Circuit board **2150** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2112** and into trap portion **2114**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **2124** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2114** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals.

[462] As shown, slot **2130** in top surface **2126** of base portion **2112** and rim or protrusions **2132** on top surface **2126** of base portion **2112** engage with trap portion **2114** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **2114** to be securely but removably mounted on base portion **2112**. Bottom surface **2174** of base portion **2112** may be substantially flat or concave to allow insect trap **2110** to sit upright on a floor, desk, table or shelf when insect trap **2110** is unplugged. Alternatively, bottom surface **2174** of base portion **2112** may have two or more protrusions (not shown) or legs that allow insect trap **2110** to sit upright when insect trap **2110** is unplugged.

[463] In the operation of insect trap **2110**, conductive prongs **2122** are inserted into a wall electrical socket. Circuit board **2150** provides power to LEDs **2124** and to actuator **2154**. LEDs **2124** emit light, represented by arrows, which transmits through window **2128** in base portion **2112**, through opening **2144** in rear housing **2140** of trap portion **2114**, into the rear enclosure **2148**, and directly onto inside surface **2142** of rear housing **2140** and rear surface **2152** of divider **2134**. Because the light from LEDs **2124** enters rear enclosure **2148** through opening **2144** in a bottom face of rear housing **2140** (e.g., in a face that is substantially parallel to the overall depth of trap portion **2114**), the light can travel the entire length of rear enclosure **2148** and can diverge over the entire length of rear enclosure **2148**, and therefore can be more evenly distributed throughout rear enclosure **2148**. In some embodiments, light is not manipulated in base portion **2112** and is emitted directly into trap portion **2114**. Inside surface **2142** of rear housing **2140** may include a concave shape and may be configured to reflect and disperse the UV and visible light from LEDs **2124** to distribute the light evenly onto rear surface **2152** of divider **2134**, although the shape of inside surface **2142** of rear housing **2140** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens or any other lens or combination of lenses (not shown) configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **2152** of divider **2134**, may be mounted to rear housing **2140** at or near opening **2144** or to base portion **2112** at or near opening **2166**, and may replace or augment the role of inside surface **2142** of rear housing **2140**. In some

embodiments, the light from LEDs **2124** directly strikes rear surface **2152** of divider **2134** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and spreads across divider **2134**, and may replace or augment the role of inside surface **2142** of rear housing **2140** or of the lens or lenses mounted to rear housing **2140** or to base portion **2112**.

[464] Thereafter, the light transmits through divider **2134** and adhesive **2136** on front surface **2138**, and into front enclosure **2146**. The light may be further evenly distributed by the light-diffusing properties of divider **2134**, adhesive **2136** on front surface **2138**, or both. A portion of the light entering front enclosure **2146** continues through opening **2120** in front housing **2118** and into the area where the trap is installed. Actuator **2154** produces insect-attracting vibrations, which are amplified by divider **2134**, and transmit through front enclosure and out through opening **2120**. Insects are attracted to the UV and/or visible light transmitted through adhesive **2136** and through opening **2120** in front housing **2118**. Insects are also attracted to the insect-attracting vibrations produced by actuator **2154**. Insects fly or crawl into opening **2120** and onto adhesive **2136**, where they become trapped. A user may observe trapped insects by looking through opening **2120** in front housing **2118**. In some embodiments, circuit board **2150** periodically sends electrical pulses to actuator **2154**, causing divider **2134** to vibrate. The vibrations in divider **2134** in turn cause actuator **2154** to create electrical response signals such as changes of voltage, resistance or charge. When trapped insects **2170** become stuck in adhesive **2136**, they change the vibration characteristics of divider **2134**, and thereby change the electrical response signals from actuator **2154**. Circuit board **2150** is configured such that when a sufficient number of trapped insects **2170** are stuck in adhesive **2136**, circuit board **2150** responds to the change in electrical response signals exceeding a predetermined threshold from actuator **2154** and cause LEDs **2124** to blink on and off, indicating that trap portion **2114** may need to be replaced. Alternatively, other visual indicator features, such as a change in the color of the light (e.g., to yellow, orange or red) or an audible indicator feature such as a tone, chime or voice, may augment or replace the blinking light indicator feature. The user may easily remove and discard the entire used trap portion **2114** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2114**, and replace it with a new trap portion **2114**. The new trap portion **2114** has

fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **2110** will continue to efficiently and effectively attract and trap insects.

[465] In some embodiments, because trap portion **2114** mounts on top of, and not in front of, base portion **2112**, insect trap **2110** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2110** is configured such that when insect trap **2110** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2110** protrudes from the wall, is smaller than its overall height and its overall width.

[466] It should be appreciated that a benefit of insect trap **2110** is the manipulation of light within trap portion **2114**. In some embodiments, light manipulation occurs solely within trap portion **2114**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **2142**, divider **2134** and adhesive **2136**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2136**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2136** or within trap portion **2114**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[467] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[468] Insect trap **2110** of this configuration may accommodate a variety of different trap portions **2114** that may be removably mounted to base portion **2112**, each trap portion **2114** being uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, the overall size and shape of trap portion **2114**, the size, shape, location and orientation of opening **2120** in front housing **2118** of trap portion **2114**, the vibration-producing properties of actuator **2154**, the natural frequency and sound amplifying properties

of trap portion **2114** and the electrical response signals from actuator **2154** may be uniquely configured to attract and trap a specific species or multiple species of flying or non-flying insect. For example, in some embodiments, trap portion **2114** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **2114** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **2114** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[469] In some embodiments, base portion **2112** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **2112** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **2112** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[470] As provided herein, opening **2120** may be a variety of shapes and/or sizes. For example, opening **2120** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **2120** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **2120** is circular, opening **2120** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **2120** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **2120** is approximately 0.5mm to 15mm in diameter. When opening **2120** is slot shaped, opening **2120** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **2120** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **2120** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[471] In some embodiments, opening **2120** covers all or a portion of front housing **2118**. For example, opening **2120** may cover a range of approximately 1% to 75% of the surface area of front housing **2118**. In some embodiments, opening **2120** covers approximately 5% to 50% of the surface area of front housing **2118**. In some embodiments, opening **2120** covers approximately 10% to 30% of the surface area of front housing **2118**.

[472] Figure **102** is a front perspective view of a twenty-second embodiment of an insect trap, indicated generally at **2210**. Insect trap **2210** includes a base portion **2212** and a removable trap portion **2214**. Trap portion **2214** is shown removed

from base portion **2212** in this view. Insect trap **2210** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **2210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2210** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **2214** includes a front housing **2218** with a tab slot **2268** and at least one opening **2220** in a front surface **2216**. Trap portion **2214** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **2214** is mounted in insect trap **2210**, and insect trap **2210** is mounted to a wall, the overall depth of trap portion **2214**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **2214**. Opening **2220** in front housing **2218** may be configured to admit a wide variety of insects into insect trap **2210**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2220** is configured to prevent user's fingers from penetrating opening **2220** and inadvertently touching dead insects or adhesive when removing and replacing trap portion **2214**. In some embodiments, opening **2220** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **2220**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2220**. Opening **2220** may be of uniform or of varying width, shape and orientation, and if trap portion **2214** has more than one opening **2220**, they may be of identical or of differing widths, shapes and orientations. Opening **2220** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, front housing **2218** is configured with ribs or reliefs **2270** surrounding opening **2220** to confer stiffness and strength to trap portion **2210** and to enable front housing **2218** to be made of thinner material. As shown, protruding from tab slot **2268** in front housing **2218** in trap portion **2214** is a removable tab **2254**. Protruding from a rear surface **2278** (shown in Figure **105**) of base portion **2212** are a plurality of electrically conductive prongs **2222**, adapted to mount insect trap **2210** to a wall and provide power to insect trap **2210** by inserting conductive prongs **2222** into a standard household electrical wall socket. Alternatively, conductive prongs **2222** may be adapted to swivel to allow insect trap **2210** to remain upright when conductive prongs **2222** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **2212** may be

configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **2212**. While an electrical socket and batteries have been described as providing power to insect trap **2210**, any suitable power source may be used. Base portion **2212** includes a top surface **2226** and a lighting element such as one or more LEDs **2224**. In some embodiments, LEDs **2224** includes at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2224** includes at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2224** include at least one that emits infrared (IR) light to better attract certain species of insects such as mosquitos and fleas. Mounted in top surface **2226** of base portion **2212** may be a transparent or translucent window **2228**, shown partially cut away to reveal LEDs **2224**. Window **2228** protects LEDs **2224** from dust and insect debris, and allows base portion **2212** to be easily cleaned. In some embodiments, at least a portion of window **2228** and at least a portion of LEDs **2224** protrude from top surface **2226** of base portion **2212** and into trap portion **2214** when trap portion **2214** is mounted to the base portion **2212**. Alternatively, base portion **2212** may not include window **2228**, and at least a portion of LEDs **2224** protrude from top surface **2226** of base portion **2212**, and into trap portion **2214** when trap portion **2214** is mounted to base portion **2212**. In top surface **2226** may be a slot **2230**, and on the perimeter of top surface **2226** is a rim or upwardly directed protrusions **2232**.

[473] Figure **103** is a front perspective view of insect trap **2210**. Trap portion **2214** is shown partially cut away in this view. In some embodiments, trap portion **2214** includes a divider **2234**, constructed from or including a transparent or translucent material and coated with a transparent or translucent adhesive **2236** on its front surface **2238**. In some embodiments, divider **2234** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **2234** and the material and thickness of adhesive **2236** are selected to transmit a substantial proportion of the UV and/or visible and/or IR light, for example greater than 60% of the light is transmitted through divider **2234** and adhesive **2236**. Divider **2234** may include a

divider slot **2272** and one or more perforations **2274**. In some embodiments, the regions on front surface **2238** of divider **2234** immediately around divider slot **2272** and perforations **2274** are not coated with adhesive **2236**. Trap portion **2214** includes a rear housing **2240** with an inside surface **2242** and a bottom inside surface **2276**. As shown, an upwardly-facing cup **2256** is mounted on bottom inside surface **2276** of rear housing **2240**. Cup **2256** may have a lip **2258** protruding from the perimeter of its open end. Cup **2256** may be constructed of any material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein. Removable tab **2254** includes a sealing end **2260** and a web **2264** between sealing end **2260** and a grip end **2262**, and may be made of any flexible and durable material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein. As shown, sealing end **2260** is configured to cover the open end of cup **2256**, and is affixed to lip **2258** of cup **2256** with an adhesive to create an airtight seal, thereby maintaining the freshness of any insect-attracting substances (not shown) inside cup **2256**, as well as holding removable tab **2254** in place until it is removed by a user. Web **2264** may be folded over sealing end **2260** of removable tab **2254** and extends through divider slot **2272** in divider **2234** to tab slot **2268** in front housing **2218**. Grip end **2262** of removable tab **2254** protrudes through tab slot **2268** and may be folded downwards over an outside portion of front housing **2218**.

[474] Figure **104** is a front perspective view of insect trap **2210**. Trap portion **2214** is shown partially cut away and removable tab **2254** partially removed in this view. A user may grasp removable tab **2254** at grip end **2262** and may pull removable tab **2254** away from trap portion **2214**, thereby breaking the seal between lip **2258** of cup **2256** and sealing end **2260** of removable tab **2254**. Inside cup **2256** is a carrier material **2266** impregnated with one or more of insect-attracting substances. Carrier material **2266** inside cup **2256** may be a solid, a liquid, a gel, or any combination thereof. For example, carrier material **2266** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including

codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2210**. Alternatively, carrier material **2266** may be impregnated with water in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded in carrier material **2266** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded in carrier material **2266** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, the insect-attracting substances may be contained in cup **2256** without a carrier material **2266**. Breaking the seal between cup **2256** and removable tab **2254** releases the insect-attracting scent or scents from the carrier material **2266**. The materials of trap portion **2214** (e.g., front housing **2218**, rear housing **2240**, divider **2234** and adhesive **2236**) may also be impregnated with one or more insect attractants. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2210**.

[475] Figure **105** is a cross-sectional view of insect trap **2210**. Removable tab **2254** has been completely removed in this view. In some embodiments, inside surface **2242** of rear housing **2240** has a reflective coating. Alternatively, the material and surface finish of rear housing **2240** may be configured to reflect and disperse UV and/or visible light without a reflective coating. Rear housing **2240** may include an opening **2244** in its bottom face, or alternatively opening **2244** may be replaced by a transparent or translucent window (not shown).

[476] In some embodiments, front housing **2218** and rear housing **2240** are thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may be used. In some embodiments, front housing **2218** and rear housing **2240** are made by injection molding or by other suitable manufacturing techniques. As shown, divider **2234** has a rear surface **2252**, and is substantially planar, and may be configured to be parallel to, or at an angle to, the primary

direction (not shown) of the light produced by LEDs **2224**. In some embodiments, divider **2234** may be formed into a convex, concave or saddle-shaped contour (not shown), or a combination of contours to optimize the even distribution of light. In some embodiments, divider **2234** may have ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[477] In some embodiments, front housing **2218** is coated with transparent, translucent or opaque adhesive (not shown) on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **2218** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **2218**, divider **2234** and rear housing **2240** are joined together where they intersect or engage by ultrasonic welding or high frequency welding, although they may also be permanently or removably joined together by gluing or any other suitable assembly method. Divider **2234** separates trap portion **2214** into a front enclosure **2246** and a rear enclosure **2248**.

[478] In some embodiments, base portion **2212** includes a circuit board **2250** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **2222** (only one of which is shown) and LEDs **2224** (only one of which is shown). For clarity, not all of the electrical connections are shown. Circuit board **2250** may include electronic circuitry to receive ordinary household current from conductive prongs **2222** and provide power to illuminate LEDs **2224**. Circuit board **2250** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides steady voltage to LEDs **2224**, although it may also provide a varying voltage to LEDs **2224** to provide a flickering light that mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **2250** may provide power to LEDs **2224** to provide UV and/or visible and/or IR light, although it may be configured to

provide power to only the UV LEDs **2224** or to only the visible light LEDs **2224** or to only the IR LEDs **2224**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2250** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2212** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2210**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2210**.

[479] Circuit board **2250** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2212** and into trap portion **2214**, to attract some insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **2224** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2214** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[480] As shown, slot **2230** in top surface **2226** of base portion **2212** and rim or protrusions **2232** on top surface **2226** of base portion **2212** engage with trap portion **2214** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **2214** to be securely but removably mounted on base portion **2212**. Bottom surface **2280** of base portion **2212** may be substantially flat or concave to allow insect trap **2210** to sit upright on a floor, desk, table or shelf when insect trap **2210** is unplugged. Alternatively, bottom surface **2280** of base portion **2212** may have two or more protrusions (not shown) or legs that allow insect trap **2210** to sit upright when insect trap **2210** is unplugged.

[481] In the operation of insect trap **2210**, conductive prongs **2222** (only one of which is shown), are inserted into a wall electrical socket, and removable tab **2254** (not shown) is pulled from trap portion **2214** and removed, thereby breaking the seal between cup **2256** and removable tab **2254**, and exposing carrier material **2266** and the insect-attracting substance or substances to the air and releasing an insect-attracting scent or scents through perforations **2274** (not shown in this view) in divider **2234**, through opening **2220** in front housing **2218** and into the surrounding area where insect trap **2210** is installed. Cup **2256**, carrier material **2266** and the insect-attracting substance or substances may be configured to release an insect-attracting scent or scents for a predetermined amount of time to correspond with the expected useful life of trap portion **2214**, which may be e.g., a week, a month or three months, or another length of time. Alternatively, cup **2256**, carrier material **2266** and the insect-attracting substance or substances may be configured to preferentially release one insect-attracting scent or group of scents earlier in the useful life of trap portion **2214** and another insect-attracting scent or group of scents later in the useful life of trap portion **2214** to attract more insects or a wider variety of insects with a changing scent, or to provide a stronger scent later in the useful life of trap portion **2214** to compensate for the reduced light emitted from trap portion **2214** when many insects are caught in adhesive **2236**. Alternatively, cup **2256** and carrier material **2266** may be configured to release additional scents that may mask the insect-attracting scent or scents or mask or eliminate components of the insect-attracting scent or scents that humans may find objectionable, or that children or non-intended animals (e.g., pets) may find attractive, without substantially reducing their attractiveness to insects. LEDs

2224 emit light, represented by arrows, which transmits through window 2228 in base portion 2212, through opening 2244 in rear housing 2240 of trap portion 2214, into rear enclosure 2248, and directly onto inside surface 2242 of rear housing 2240 and rear surface 2252 of divider 2234. Because the light from LEDs 2224 enters rear enclosure 2248 through opening 2244 through bottom inside surface 2276 of rear housing 2240 (e.g., in a face that is substantially parallel to the overall depth of trap portion 2214), the light can travel the entire length of rear enclosure 2248 and can diverge over the entire length of rear enclosure 2248, and therefore can be more evenly distributed throughout rear enclosure 2248. In some embodiments, light is not manipulated in base portion 2212 and is emitted directly into trap portion 2214. Inside surface 2242 of rear housing 2240 may include a concave shape and may be configured to reflect and disperse the UV and visible light from LEDs 2224 to distribute the light evenly onto rear surface 2252 of divider 2234, although inside surface 2242 of rear housing 2240 may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface 2252 of divider 2234, may be mounted to rear housing 2240 at or near opening 2244 or to base portion 2212 at or near window 2228, and may replace or augment the role of inside surface 2242 of rear housing 2240. Alternatively, the UV and visible light from the one or more LEDs 2224 may directly strike rear surface 2252 of divider 2234 at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider 2234, and may replace or augment the role of inside surface 2242 of rear housing 2240 or of the lens or lenses mounted to rear housing 2240.

[482] Thereafter, the light transmits through divider 2234 and adhesive 2236 on its front surface 2238, and into front enclosure 2246. The light may be further evenly distributed by the light-diffusing properties of divider 2234, adhesive 2236, or both. A portion of the light entering front enclosure 2246 continues through opening 2220 in front housing 2218 and emits into the surrounding area where insect trap 2210 is installed. Insects are attracted to the light transmitted through adhesive 2236 and through opening 2220 in front housing 2218. Insects are also

attracted to the scents and/or pheromones released from carrier material **2266** in cup **2256**. In addition, heat generated by circuit board **2250** may warm carrier material **2266**, and may thereby increase the release of insect-attracting scents and/or pheromones. Insects fly or crawl into opening **2220** and onto adhesive **2236**, where they become trapped. A user may observe trapped insects by looking through opening **2220** in front housing **2218**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **2214** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2214**, and replace it with a new trap portion **2214**. The new trap portion **2214** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **2210** will continue to efficiently and effectively attract and trap insects.

[483] In some embodiments, because trap portion **2214** mounts on top of, and not in front of, base portion **2212**, insect trap **2210** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2210** is configured such that when insect trap **2210** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2210** protrudes from the wall, is smaller than its overall height and its overall width.

[484] It should be appreciated that a benefit of insect trap **2210** is the manipulation of light within trap portion **2214**. In some embodiments, light manipulation occurs solely within trap portion **2214**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **2242**, divider **2234** and adhesive **2236**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2236**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2236** or within trap portion **2214**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[485] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately

0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[486] An insect trap **2210** of this configuration may accommodate a variety of different trap portions **2214** that may be removably mounted to base portion **2212**, each trap portion **2214** being uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, the overall size and shape of trap portion **2214**, the size, shape, location and orientation of opening **2220** in front housing **2218**, and the scent or scents impregnated in carrier material **2266**, front housing **2218**, divider **2234**, adhesive **2236** or rear housing **2240**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect.

[487] For example, in some embodiments, trap portion **2214** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **2214** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **2214** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[488] In some embodiments, base portion **2212** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **2212** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **2212** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[489] As provided herein, opening **2220** may be a variety of shapes and/or sizes. For example, opening **2220** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **2220** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **2220** is circular, opening **2220** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **2220** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **2220** is approximately 0.5mm to 15mm in diameter. When opening **2220** is slot shaped, opening **2220** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **2220** is approximately 2mm to 20mm wide and

5mm to 200mm long. In some embodiments, slot shaped opening **2220** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[490] In some embodiments, opening **2220** covers all or a portion of front housing **2218**. For example, opening **2220** may cover a range of approximately 1% to 75% of the surface area of front housing **2218**. In some embodiments, opening **2220** covers 5approximately 5% to 50% of the surface area of front housing **2218**. In some embodiments, opening **2220** covers approximately 10% to 30% of the surface area of front housing **2218**.

[491] Other features or combinations of features are contemplated to deliver insect-attracting scent in an insect trap. Figure **106** is a front perspective view of an example of the twenty-second embodiment of an insect trap, indicated generally at **2210A**. Insect trap **2210A** includes a base portion **2212A** and a removable trap portion **2214A** with a protective cap **2216A.** Insect trap **2210A** may have an upside-down orientation as compared to other described embodiments. (e.g., base portion above the trap portion when plugged into a wall). In this view, base portion **2212A** is shown tilted to reveal its underside, trap portion **2214A** is shown removed from base portion **2212A**, and protective cap **2216A** is shown removed from trap portion. Base portion **2212A** includes a bottom rear surface **2218A** with one or more light openings **2220A** and at least one scent attachment opening **2222A**, and a bottom front surface **2224A** with one or more front scent openings **2226A**. Alternatively, light openings **2220A** in base portion **2212A** may be replaced by transparent or translucent windows (not shown). Trap portion **2214A** includes a front housing **2228A** with openings **2232A** on its front surface **2230A** and one or more front scent openings **2236A** on its top surface **2234A**, and a rear housing **2238A** with one or more windows **2242A** and at least one scent protrusion **2244A** on its top surface **2240A,** with the free end **2248A** of a wick **2246A** protruding from scent protrusion **2244A**. Wick **2246A** configuration may be similar to those found in plug-in room air freshener refills.

[492] Figure **107** is a cross-sectional view of insect trap **2210A**. Protective cap **2216A** has been removed and trap portion **2214A** has been mounted onto base portion **2212A**. Base portion **2212A** may include a plurality of electrically conductive prongs **2250A** and a base enclosure **2252A** with a circuit board **2254A**, one or more LEDs (not shown) adjacent to light openings **2220A**, and a heating element **2256A** inside base enclosure **2252A** and adjacent to scent attachment

opening **2222A**. Circuit board **2254A** is electrically connected to conductive prongs **2250A**, LEDs and heating element **2256A**. For clarity, not all electrical connections are shown. Heating element **2256A** is configured to coil around free end **2248A** of wick **2246A**, receive power from circuit board **2254A**, and provide heat to free end **2248A** of wick **2246A**. Heating element **2256A** may be similar in configuration to those found in plug-in room air fresheners.

[493] Trap portion **2214A** includes a divider **2258A**, constructed from or including a transparent or translucent material and coated with a transparent or translucent adhesive on its front surface **2260A**. Rear housing **2238A** and divider **2258A** are sealed together by heat sealing, ultrasonic welding, high-frequency welding or adhesive boding to form a rear enclosure **2264A**. Rear enclosure **2264A** contains a liquid **2266A**, which may include a liquid carrier material and / or an insect-attracting substance or substances. In some embodiments, rear enclosure **2264A** may also contain a transparent or translucent bladder (not shown), which contains liquid **2266A**. Free end **2248A** of wick **2246A** protrudes through an opening **2268A** in scent protrusion **2244A** and into base portion **2212A,** and the remainder of wick **2246A** extends into liquid **2266A** and to the bottom of rear enclosure **2264A**. Wick **2246A** may be manufactured of fibers of polyester or other natural or manufactured materials, and is configured to absorb and, via capillary action, pull liquid **2266A** up the length of wick **2246A** to free end **2248A**, where liquid **2266A** is exposed to the air. Heating element **2256A** heats free end **2248A** of wick **2246A** and liquid **2266A** at free end **2248A** of wick **2246A**. Liquid **2266A** at free end **2248A** of wick **2246A** evaporates into base enclosure **2252A**, through front scent openings **2226A** in base **2212A**, through corresponding front scent openings **2236A** in front housing **2228A** of trap portion **2214A**, on through openings **2232A** of front housing **2228A**, and into the room where insect trap **2210A** has been installed. LEDs (not shown) illuminate, projecting light through light openings **2220A** of base portion **2212A** and through windows **2242A** of rear housing **2238A**, and into rear enclosure **2264A** and through liquid **2266A**. In some embodiments, a portion of light from LEDs (not shown) reflects against an inside surface **2270A** of rear housing **2238A**. Light from LEDs projects through liquid **2266A**, through divider **2258A**, through adhesive **2262A**, through openings **2232A** in front surface **2230A** of front housing **2228A**, and on into room where

insect trap **2210A** has been installed. In some embodiments, heat and scent alone are used as attractants, and light sources are not used in insect trap **2210A**.

[494] An added benefit of insect trap **2210A** is that trap portion **2214A** may include a built-in life indicator. In some embodiments, light from the LEDs projecting through liquid **2266A** may show a visible horizontal line through divider **2258A**, corresponding to the amount of liquid **2266A** remaining in rear enclosure **2264A**. In some embodiments, liquid **2266A** may be tinted or colored to enhance the visibility of the horizontal line showing through divider **2258A**. In some embodiments, a marking or markings on divider **2258A** may indicate the position of the horizontal line showing through divider **2258A** when liquid **2266A** is partially and/or fully depleted, thereby providing a visual cue indicating that trap portion **2214A** should be removed and replaced with a fresh trap portion **2214A**.

[495] Figure **108** is a front perspective view of a twenty-third embodiment of an insect trap, indicated generally at **2310**, and Figure **109** is an enlarged view of a portion of Figure **108**. Insect trap **2310** includes a base portion **2312** and a removable trap portion **2314**. Insect trap **2310** may have an overall length, an overall width and an overall depth, and may be configured such that when insect trap **2310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2310** protrudes from the wall, is the smallest of the three overall dimensions. Trap portion **2314** is shown partially cut away and removed from base portion **2312** in Figure **108**. Trap portion **2314** may have an overall length, an overall width and an overall depth, and may be configured such that when trap portion **2314** is mounted in insect trap **2310**, and insect trap **2310** is mounted to a wall, the overall depth of trap portion **2314**, which is measured in the direction perpendicular to the wall, is the smallest of the three overall dimensions of trap portion **2314**. Trap portion **2314** includes a front housing **2318** with at least one opening **2320** in a front surface **2316**. Opening **2320** in front housing **2318** may be configured to admit a wide variety of insects into insect trap **2310**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2320** is configured to prevent user's fingers from penetrating opening **2320** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **2314**. In some embodiments, opening **2320** has a size and shape such that a sphere 25mm in diameter cannot pass

through opening **2320**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2320**. Opening **2320** may be of uniform or of varying width, shape and orientation, and if trap portion **2314** has more than one opening **2320**, they may be of identical or of differing widths, shapes and orientations. Opening **2320** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, front housing **2318** is configured with ribs or reliefs **2370** surrounding opening **2320** to confer stiffness and strength to trap portion **2314** and to enable front housing **2318** to be made of thinner material. Trap portion **2314** includes a divider **2334**, constructed from or including a transparent or translucent material and coated with a transparent or translucent adhesive **2336** on its front surface **2338** (shown in Figure **110**). In some embodiments, divider **2334** is configured to polarize light transmitted through it in an orientation similar to that of daylight to further attract flying insects, a wide variety of which are known to detect polarized light. In some embodiments, the material and thickness of divider **2334** and the material and thickness of adhesive **2336** are selected to transmit a substantial proportion of the light, for example greater than 60% of the light is transmitted through divider **2334** and adhesive **2236**. Divider **2334** includes one or more perforations **2374**. In some embodiments, the regions on front surface **2338** of divider **2334** immediately around perforations **2374** are not coated with adhesive **2336**. Trap portion **2314** includes a rear housing **2340** with an inside surface **2342** and a bottom inside surface **2376**, and a downwardly-facing cup **2356**. Cup **2356** may have a lip **2358** protruding from the perimeter of its open end, and may be made of any material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein.

[496] Protruding from a rear surface **2354** (shown in Figure **110**) of base portion **2312** may be a plurality of electrically conductive prongs **2322**, adapted to mount insect trap **2310** to a wall and provide power to insect trap **2310** by inserting conductive prongs **2322** into a standard household electrical wall socket. Alternatively, conductive prongs **2322** may be adapted to swivel to allow insect trap **2310** to remain upright when conductive prongs **2322** are inserted into a horizontally oriented electrical wall socket. Alternatively, base portion **2312** may be configured to sit or hang wherever desired and receive power from batteries (not shown) mounted in base portion **2312**. While an electrical socket and

batteries have been described as providing power to insect trap **2310**, any suitable power source may be used. Base portion **2312** includes a top surface **2326** and a lighting element such as one or more LEDs **2324**. In some embodiments, LEDs **2324** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2324** includes at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2324** include at least one that emits IR light to better attract certain species of insects including mosquitos and fleas. Mounted in top surface **2326** of base portion **2312** may be a transparent or translucent window **2328**, shown partially cut away to reveal LEDs **2324**. Window **2328** protects LEDs **2324** from dust and insect debris, and allows base portion **2312** to be easily cleaned. In some embodiments, at least a portion of window **2328** and at least a portion of LEDs **2324** protrude from top surface **2326** of base portion **2312** and into trap portion **2314** when trap portion **2314** is mounted to base portion **2312**. Alternatively, base portion **2312** may not include window **2328**, and at least a portion of LEDs **2324** protrude from top surface **2326** of base portion **2312** and into trap portion **2314** when trap portion **2314** is mounted to the base portion **2312**. In top surface **2326** may be a slot **2330**, and on the perimeter of top surface **2326** is a rim or upwardly directed protrusions **2332**. As shown, protruding from top surface **2326** of base portion **2312** is a punch **2378** with an angled top surface **2380** and one or more axial grooves **2382** that extend through angled top surface **2380**, but do not extend to the bottom of punch **2378**. Angled top surface **2380** of punch **2378** forms a point at the distal end of punch **2378**. In some embodiments, the sides of punch **2378** are tapered such that punch **2378** has a larger cross section at its proximal end than at its distal end.

[497] Figure **110** is a cross-sectional view of insect trap **2310** and Figure **111** is an enlarged view of a portion of Figure **110**. Trap portion **2314** is raised above base portion **2312** in this view. A lid **2360** configured to cover the open end and lip **2358** of cup **2356**, is affixed to lip **2358** of cup **2356** with an adhesive to create an airtight seal, thereby maintaining the freshness of any substances (not shown) inside sealed cup **2356**. Lid **2360** may be made of a thin, durable, but puncturable material or combination of materials that may act as a barrier to any of the insect-attracting substances mentioned herein. Cup **2356** is mounted on at least one

support post **2362,** configured to mount cup **2356** and lid **2360** above bottom inside surface **2376** of rear housing **2340**. In some embodiments, support post **2362** is replaced by at least one protrusion (not shown) in bottom inside surface **2376** of rear housing **2340**. Inside cup **2356** is a carrier material **2366** impregnated with one or more insect-attracting substances. For example, carrier material **2366** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2310**. Carrier material **2366** inside cup **2356** may be a solid, a liquid, a gel, or any combination thereof. Alternatively, carrier material **2366** may be impregnated with water in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded in carrier material **2366** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded in carrier material **2366** in addition to, or in place of, the one or more insect-attracting substances. Alternatively, the insect-attracting substances may be contained in cup **2356** without a carrier material **2366**. The materials of trap portion **2314** (e.g., front housing **2318**, rear housing **2340**, divider **2334** and adhesive **2336**) may also be impregnated with one or more insect attractants. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2310**.

[498] In some embodiments, inside surface **2342** of rear housing **2340** has a reflective coating. Alternatively, the material and surface finish of rear housing **2340** may be configured to reflect and disperse UV and/or visible light without a reflective coating. Rear housing **2340** may include an opening **2344** on its bottom face, or alternatively opening **2344** may be replaced by a transparent or

translucent window (not shown). In some embodiments, front housing **2318** and rear housing **2340** are thermoformed from sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may be used. In some embodiments, front housing **2318** and rear housing **2340** are made by injection molding or by other suitable manufacturing techniques. As shown, divider **2334** has a rear surface **2352**, and is substantially planar, and may be configured to be parallel to, or at an angle to, the primary direction (not shown) of the light produced by LEDs **2324**. In some embodiments, divider **2334** is formed into a convex, concave or saddle-shaped contour (not shown), or a combination of contours to optimize the even distribution of light. In some embodiments, divider **2334** has ribs or other features (not shown) that increase adhesive surface area and create regions of light/dark contrast, which are highly visible to a wide variety of insects and may be more attractive to them.

[499] In some embodiments, front housing **2318** is coated with transparent, translucent or opaque adhesive (not shown) on its inside surface to provide additional insect trapping efficiency and capacity. In addition, front housing **2318** may also have a reflective coating (not shown) underneath the adhesive coating on its inside surface to enhance its attraction to insects and further improve the insect trapping efficiency and effectiveness. In some embodiments, front housing **2318**, divider **2334** and rear housing **2340** are joined together where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or any other suitable assembly method. Divider **2334** separates trap portion **2314** into a front enclosure **2346** and a rear enclosure **2348**.

[500] In some embodiments, base portion **2312** includes a circuit board **2350** having a programmable processor or chip (not shown) for executing commands, electrically connected to conductive prongs **2322** (only one of which is shown) and LEDs **2324** (only one of which is shown). For clarity, not all of the electrical connections are shown. Circuit board **2350** may include electronic circuitry to receive ordinary household current from conductive prongs **2322** and provide power to illuminate LEDs **2324**. Circuit board **2350** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that provides

steady voltage to LEDs **2324**, although it may also provide a varying voltage to LEDs **2324** to provide a flickering light, which mimics movement that some insect species, including mosquitoes, may find attractive. For example, light flickering frequencies in the approximate range of 0.05 Hz (e.g., to mimic the breathing rate of large mammals) to 250Hz (e.g., the highest flicker frequency to attract male houseflies), may be desirable and the lighting element may be configured to flicker within this range. Circuit board **2350** may provide power to LEDs **2324** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **2324** or to only visible light LEDs **2324** or to only IR LEDs **2324**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2350** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2312** to emit an insect-attracting sound. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects such as mosquitoes, midges, moths and flies, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2310**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2310**.

[501] Circuit board **2350** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2312** and into trap portion **2314**, to attract some

insect species, including fleas and mosquitoes. Alternatively, one or more of LEDs **2324** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2314** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[502] In some embodiments, a bottom surface **2364** of base portion **2312** may be substantially flat or concave to allow the insect trap **2310** to sit upright on a floor, desk, table or shelf when the insect trap **2310** is unplugged. Alternatively, the bottom surface **2364** of the base portion **2312** may have two or more protrusions (not shown) or legs that allow the insect trap **2310** to sit upright when the insect trap **2310** is unplugged.

[503] Figure **112** is a cross-sectional view of insect trap **2310** and Figure **113** is an enlarged view of a portion of Figure **112**. Trap portion **2314** is shown mounted to base portion **2312** in this view. As shown, slot **2330** in top surface **2326** of base portion **2312** and rim or protrusions **2332** on top surface **2326** of base portion **2312** engage with trap portion **2314** to secure it in place during use, although any other form of attachment may be substituted that may allow trap portion **2314** to be securely but removably mounted on base portion **2312**. Mounting trap portion **2314** to base portion **2312** causes the pointed distal end of punch **2378** to break through the bottom surface of rear housing **2340** and lid **2360**. The portion or portions of lid **2360** corresponding to axial grooves **2382** in punch **2378** deform to create clearance between lid **2360** and punch **2378** and release the insect-attracting scent or scents through axial grooves **2382,** into rear enclosure **2348** of trap portion **2314**, shown by arrows, and on through perforations **2374** in divider **2334** and opening **2320** in front housing **2318**, and on into the surrounding area where insect trap **2310** is installed. Because axial grooves **2382** do not extend to the proximal end of punch **2378**, punch **2378** itself plugs the opening in the bottom of rear housing **2340** where punch **2378** has broken through, thereby ensuring that the insect-attracting scent or scents are released only through the one or more perforations **2374** in divider **2334**.

[504] In the operation of insect trap **2310**, conductive prongs **2322** (only one of which is shown) are inserted into a wall electrical socket, and trap portion **2314** is mounted to base portion **2312**, thereby breaking the sealed lid **2360** and releasing an insect-attracting scent or scents through perforations **2374** in divider **2334** and through opening **2320** in front housing **2318** and into the surrounding area where insect trap **2310** is installed. Cup **2356**, carrier material **2366** and the insect-attracting substance or substances may be configured to release an insect-attracting scent or scents for a predetermined amount of time to correspond with the expected useful life of trap portion **2314**, which may be e.g., a week, a month or three months, or another length of time. Alternatively, cup **2356**, carrier material **2366** and the insect-attracting substance or substances may be configured to preferentially release one insect-attracting scent or group of scents earlier in the useful life of trap portion **2314** and another insect-attracting scent or group of scents later in the useful life of trap portion **2314** to attract more insects or a wider variety of insects with a changing scent, or to provide a stronger scent later in the useful life of trap portion **2314** to compensate for the reduced light emitted from trap portion **2314** when many insects are caught in adhesive **2336**. Alternatively, cup **2356** and carrier material **2366** may be configured to release additional scents that may mask the insect-attracting scent or scents or mask or eliminate components of the insect-attracting scent or scents that humans may find objectionable, or that children or non-intended animals (e.g., pets) may find attractive, without substantially reducing its attractiveness to insects. LEDs **2324** emit light, represented by arrows, which transmits through window **2328** in base portion **2312**, through opening **2344** in rear housing **2340** of trap portion **2314**, into rear enclosure **2348** and directly onto inside surface **2342** of rear housing **2340** and rear surface **2352** of divider **2334**. Because the light from LEDs **2324** enters rear enclosure **2348** through opening **2344** in bottom inside surface **2376** of rear housing **2340** (e.g., in a face that is substantially parallel to the overall depth of trap portion **2314**), the light can travel the entire length of rear enclosure **2348** and can diverge over the entire length of rear enclosure **2348**, and therefore can be more evenly distributed throughout rear enclosure **2348**. In some embodiments, light is not manipulated in base portion **2312** and is emitted directly into trap portion **2314**. Inside surface **2342** of rear housing **2340** may include a concave shape and may be configured to reflect and disperse the UV and visible light from

LEDs **2324** to distribute the light evenly onto rear surface **2352** of divider **2334**, although the shape of inside surface **2342** of rear housing **2340** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features (not shown) to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the UV and visible light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto rear surface **2352** of divider **2334**, may be mounted to rear housing **2340** at or near opening **2344** or to base portion **2312** at or near window **2328**, and may replace or augment the role of inside surface **2342** of rear housing **2340**. Alternatively, the light from LEDs **2324** may directly strike rear surface **2352** of divider **2334** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and may be spread across divider **2334**, and may replace or augment the role of inside surface **2342** of rear housing **2340** or of the lens or lenses mounted to rear housing **2340**.

[505] Thereafter, the light is transmitted through divider **2334** and adhesive **2336** on front surface **2338**, and into front enclosure **2346**. The light may be further evenly distributed by the light-diffusing properties of divider **2334**, adhesive **2336**, or both. A portion of the light entering front enclosure **2346** continues through opening **2320** in front housing **2318** and into the surrounding area where insect trap **2310** is installed. Insects are attracted to the light transmitted through adhesive **2336** and through opening **2320** in front housing **2318**. Insects are also attracted to the scents and/or pheromones released from carrier material **2366** in cup **2356**. In addition, heat generated by circuit board **2350** may warm carrier material **2366**, and may thereby increase the release of insect-attracting scents and/or pheromones. Insects fly or crawl into opening **2320** and onto adhesive **2336**, where they become trapped. A user may observe trapped insects by looking through opening **2320** in front housing **2318**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **2314** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2314**, and replace it with a new trap portion **2314**. The new trap portion **2314** has fresh adhesive-coated surfaces and light-directing surfaces, ensuring that insect trap **2310** will continue to efficiently and effectively attract and trap insects.

[506] In some embodiments, because trap portion **2314** mounts on top of, and not in front of, base portion **2312**, insect trap **2310** protrudes minimally from the wall when plugged into an ordinary household wall socket, and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2310** is configured such that when insect trap **2310** is mounted to a wall, its overall depth, defined by the overall distance insect trap **2310** protrudes from the wall, is smaller than its overall height and its overall width.

[507] It should be appreciated that a benefit of insect trap **2310** is the manipulation of light within trap portion **2314**. In some embodiments, light manipulation occurs solely within trap portion **2314**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface **2342**, divider **2334** and adhesive **2336**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2336**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2336** or within trap portion **2314**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[508] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[509] An insect trap **2310** of this configuration may accommodate a variety of different trap portions **2314** that may be removably mounted to base portion **2312**, each trap portion **2314** being uniquely configured to attract and trap a specific species or multiple species of flying insect. For example, the overall size and shape of trap portion **2314**, the size, shape, location and orientation of opening **2320** in front housing **2318** of trap portion **2314**, and the scent or scents impregnated in carrier material **2366**, front housing **2318**, divider **2334**, adhesive **2336** or rear housing **2340**, may be uniquely configured to attract and trap a specific species or multiple species of flying insect.

[510] For example, in some embodiments, trap portion **2314** is approximately 20mm to 600mm wide, 20mm to 600mm high and 5mm to 150mm deep. In some embodiments, trap portion **2314** is approximately 20mm to 200mm wide, 20mm to 200mm high and 5mm to 80mm deep. In some embodiments, trap portion **2314** is approximately 20mm to 130mm wide, 20mm to 130mm high and 5mm to 50mm deep.

[511] In some embodiments, base portion **2312** is approximately 20mm to 600mm wide, 10mm to 150mm high and 10mm to 150mm deep. In some embodiments, base portion **2312** is 20mm to 200mm wide, 10mm to 100mm high and 10mm to 80mm deep. In some embodiments, base portion **2312** is 20mm to 130mm wide, 10mm to 50mm high and 10mm to 50mm deep.

[512] As provided herein, opening **2320** may be a variety of shapes and/or sizes. For example, opening **2320** may be circular, square, rectangular, polygonal and/or elliptical in shape. Alternatively, opening **2320** may be slot shaped having a straight, curved or undulating shape or pattern. When opening **2320** is circular, opening **2320** may be approximately 0.5mm to 30mm in diameter. In some embodiments, circular opening **2320** is approximately 0.5mm to 20mm in diameter. In some embodiments, circular opening **2320** is approximately 0.5mm to 15mm in diameter. When opening **2320** is slot shaped, opening **2320** may be approximately 2mm to 30mm wide and 5mm to 500mm long. In some embodiments, slot shaped opening **2320** is approximately 2mm to 20mm wide and 5mm to 200mm long. In some embodiments, slot shaped opening **2320** is approximately 2mm to 15mm wide and 5mm to 100mm long.

[513] In some embodiments, opening **2320** covers all or a portion of front housing **2318**. For example, opening **2320** may cover a range of approximately 1% to 75% of the surface area of front housing **2318**. In some embodiments, opening **2320** covers approximately 5% to 50% of the surface area of front housing **2318**. In some embodiments, opening **2320** covers approximately 10% to 30% of the surface area of front housing **2318**.

[514] The configuration of insect trap **2310** may be adapted to self-activate and deliver carbon dioxide (CO_2), which is known to attract some types of insects such as mosquitos. Figure **114** is a front perspective view of an example of the twenty-third embodiment of an insect trap, indicated generally at **2310A**, and Figure **115** is an enlarged view of a portion of Figure **114**. Insect trap **2310A** includes a base

portion **2312A** and a removable trap portion **2314A**. Trap portion **2314A** is shown partially cut away and removed from base portion **2312A**. In this configuration, trap portion **2014A** may be mounted underneath base portion **2012A**. Trap portion **2314A** includes a front housing **2318A** with at least one opening **2320A** in a front surface **2316A**, a divider **2334A** with one or more perforations **2374A** and a transparent or translucent adhesive on its front surface **2338A**, a rear housing **2340A** with an inside surface **2342A** and a top inside surface **2376A**, and a reservoir assembly **2356A**. Base portion **2312A** includes a bottom surface **2326A**, at least one opening **2328A** in bottom surface **2326A**, and a lighting element such as one or more LEDs **2324A** inside base portion **2012A** and adjacent to opening **2328A**. As shown, protruding from bottom surface **2326A** of base portion **2312A** is a punch **2378A** with an angled top surface **2380A** and one or more axial grooves **2382A** that extend through angled top surface **2380A**, but do not extend to the bottom of punch **2378A**. Angled top surface **2380A** of punch **2378A** forms a point at the distal end of punch **2378A**. In some embodiments, the sides of punch **2378A** are tapered such that punch **2378A** has a larger cross section at its proximal end than at its distal end. Punch **2378A** aligns with and punctures reservoir assembly **2356A** in trap portion **2314A** when trap portion **2314A** is mounted to base portion **2312A**.

[515] Figure **116** is a cross-sectional view of insect trap **2310A** and Figure **117** is an enlarged view of a portion of Figure **116**. Base portion **2312A** is raised above trap portion **2314** in this view. Reservoir assembly **2356A** includes a downwardly facing top cup **2368A** with a lip **2358A** protruding from the perimeter of its open end, an upwardly facing bottom cup **2370A** with a lip **2372A** protruding from its open end, and a reservoir divider **2360A** between top cup **2368A** and bottom cup **2370A**. Reservoir divider **2360A** is affixed to top cup **2368A** at lip **2358A** with adhesive to form a top enclosure **2384A** with an airtight seal, and reservoir divider **2360A** is affixed to bottom cup **2370A** at lip **2372A** to form a bottom enclosure **2386A** with an airtight seal, such that reservoir divider **2360A** separates top enclosure **2384A** from bottom enclosure **2386A**. Top enclosure **2384A** includes a sugar and water solution **2388A** and bottom enclosure **2386A** includes an active yeast culture **2390A**. In some embodiments, top enclosure **2384A** and / or bottom enclosure **2386A** may include an additional substance or substances to enhance or control the production of CO_2, or augment or complement the CO_2 with additional

insect-attracting substances. Bottom cup **2370A** may be made of any material or combination of materials that act as a barrier to any of the insect-attracting substances mentioned herein. Reservoir divider **2360A** and top cup **2368A** may be made of a thin, durable, but puncturable material or combination of materials that may act as a barrier to any of the insect-attracting substances mentioned herein. Reservoir assembly **2356A** is mounted on at least one support post **2362A,** configured to reservoir assembly **2356A** below top inside surface **2376A** of rear housing **2340A**. In some embodiments, support post **2362A** is replaced by at least one protrusion (not shown) in top inside surface **2376A** of rear housing 2340A. Rear housing **2340A** includes an opening **2344A** on its top inside surface **2376A**, or alternatively opening **2344A** may be replaced by a transparent or translucent window (not shown). In some embodiments, front housing **2318A** and rear housing **2340A** are thermoformed from sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp may be used. In some embodiments, front housing **2318A** and rear housing **2340A** are made by injection molding or by other suitable manufacturing techniques. In some embodiments, front housing **2318A**, divider **2334A** and rear housing **2340** are joined together where they intersect or engage by ultrasonic welding or high frequency (HF) welding, although they may also be permanently or removably joined together by gluing or any other suitable assembly method. Divider **2334** separates trap portion **2314** into a front enclosure **2346A** and a rear enclosure **2348A**.

[516] Figure **118** is a cross-sectional view of insect trap **2310A** and Figure **119** is an enlarged view of a portion of Figure **118**. Trap portion **2314A** is shown mounted to base portion **2312A** in this view. Mounting trap portion **2314A** to base portion **2312A** causes the pointed distal end of punch **2378A** to break through top inside surface **2376A** of rear housing **2340A**, the closed end of top cup **2368A** and reservoir divider **2360A**. The portion or portions of top cup **2368A** and reservoir divider **2360A** corresponding to axial grooves **2382A** in punch **2378A** deform to create clearance between top cup **2368A** and punch **2378A** and between reservoir divider **2360A** and punch **2378A**. Sugar and water solution **2388A** (shown in Figure **117**) trickles down through the clearance between reservoir divider **2360A** and axial grooves **2382A** of punch **2378A** and onto yeast culture **2390A** (shown in

Figure 117) inside bottom cup **2370A** and forms a sugar, water and yeast culture mix **2392A,** which reacts and, within a few hours, begins to produce CO_2, which releases through the clearance between reservoir divider **2360A** and axial grooves **2382A** of punch **2378A**, through the clearance between top cup **2368A** and axial grooves **2382A** of punch **2378A**, into rear enclosure **2348A** of trap portion **2314A**, shown by arrows, and on through perforations **2374A** (shown in Figure **114**) in divider **2334A** and opening **2320A** in front housing **2318A**, and on into the surrounding area where insect trap **2310A** is installed. Because axial grooves **2382A** do not extend to the proximal end of punch **2378A**, punch **2378A** itself plugs the opening in top inside surface **2376A** of rear housing **2340A** where punch **2378A** has broken through, thereby ensuring that CO_2 is released only through the one or more perforations **2374A** in divider **2334A**. Reservoir assembly **2356A**, axial grooves **2382A** in punch **2378A**, sugar and water solution **2388A**, yeast culture **2390A**, and any other substance or substances in reservoir assembly **2356A** may be configured to release CO_2 and any other insect-attracting substance or substances for a predetermined amount of time to correspond with the expected useful life of trap portion **2314A**, which may be e.g., a week, a month or three months, or another length of time. It is desirable for CO_2 and any other insect-attracting substance or substances to be detectable by insects within a 2-meter radius of insect trap **2310A**. In some embodiments, heat alone or heat and insect-attracting substances alone are used as attractants, and light sources are not used in insect trap **2310A**.

[517] Other configurations adapted to self-activate and deliver an insect-attracting substance or substances are contemplated. Figure **120** is a front perspective view of an example of the twenty-third embodiment of an insect trap, indicated generally at **2310B**. Insect trap **2310B** includes a base portion **2312B** and a removable trap portion **2314B**. In this view, trap portion **2314B** is shown removed from base portion **2312B** and tilted to reveal its underside. Trap portion **2314B** includes a front housing **2318B** with at least one opening **2320B** in a front surface **2316B** and an opening **2356B** in a bottom surface **2358B**, and a rear housing **2340B** with a bottom surface **2376B**. Base portion **2312B** includes a top surface **2326B,** and a lighting element such as one or more LEDs **2324B**. Mounted in top surface **2326B** of base portion **2312B** may be a transparent or translucent window **2328B**, shown partially cut away to reveal LEDs **2324B**. Window **2328B** protects

LEDs **2324B** from dust and insect debris, and allows base portion **2312B** to be easily cleaned. As shown, protruding from top surface **2326B** of base portion **2312B** is a protrusion **2378B**, which aligns with and enters opening **2356B** in bottom surface **2358B** of rear housing **2340B** when trap portion **2314B** is mounted on base portion **2312B**.

[518] Figure **121** is an exploded view of trap portion **2314B** of insect trap 2310**B**. Trap portion **2314B** includes front housing **2318B**, a divider **2334B** with a coating of insect-trapping adhesive **2336B** on its front surface **2338B**, a trigger **2360B** with a dome **2362B**, a membrane **2368B,** and rear housing **2340B** with a planar seat **2372B**. Divider **2334B** may be made of a porous translucent sheet material, and adhesive **2336B** may be transparent or translucent. Trigger **2360B** may be injection molded of transparent or translucent plastic. Membrane **2368B** may be of transparent or translucent sheet material with vapor barrier properties, and rear housing **2340B** may be injection molded or thermoformed of transparent or translucent plastic with vapor barrier properties. In some embodiments, rear housing **2340B**, divider **2334B** and front housing **2318B** are joined where they intersect or engage by ultrasonic welding, high-frequency welding, or adhesive. Membrane **2368B** is configured to fit in rear housing **2340B** against seat **2372B**, and trigger **2360B** is configured to fit between rear housing **2340B**, membrane **2368B** and divider **2334B**. Configuration of trap portion **2314B** components may be similar to those found in plug-in room air freshener refills. In some embodiments, a region **2374B** at the bottom center of front surface **2338B** of divider **2334B** is not coated with adhesive **2336B**.

[519] Figure **122** is a cross-sectional view of insect trap **2310B** and Figure **123** is an enlarged view of a portion of Figure **122**. Trap portion **2314B** is shown raised above base portion **2312B** in this view. Base portion **2312B** includes a plurality of electrically conductive prongs **2322B** (only one of which is shown in this view), LEDs **2324B**, and circuit board **2350B**, which is electrically connected to prongs **2322B** and LEDs **2324B**. For clarity, not all electrical connections are shown. Rear housing **2340B** and membrane form a rear enclosure **2348B** containing a transparent or translucent liquid **2366B**, which may include a liquid carrier material and / or an insect-attracting substance or substances. Membrane **2368B** and divider **2334B** form a middle enclosure **2380B** containing trigger **2360B**, and divider **2334B** and front housing **2318B** form a front enclosure **2346B**. Trigger

2360B includes sharp points **2382B** (only one of which is shown in this view), and dome **2362B** presses lightly against divider **2334B**, causing it to slightly deform into front enclosure **2346B**.

[520] Figure **124** is a cross-sectional view of insect trap **2310B** and Figure **125** is an enlarged view of a portion of Figure **124**. Trap portion **2314B** is shown mounted to base portion **2312B** in this view. Mounting trap portion **2314B** to base portion **2312B** causes protrusion **2378B** on base portion **2312B** to enter opening **2356B** in bottom surface **2358B** of front housing **2318B** and press against front surface **2338B** of divider **2334B**, in region **2374B** not coated with adhesive **2336B**. Protrusion **2378B** causes divider **2334B** to press against dome **2362B** of trigger **2360B**, which deflects, causing points **2382B** (only one of which is shown) of trigger **2360B** to puncture membrane **2368B**, releasing liquid **2366B** into middle enclosure **2380B** and against divider **2334B**. In some embodiments, trigger **2360B** may have openings (not shown) through body of trigger **2360B** that allow liquid **2366B** to flow more quickly through trigger **2360B** and onto divider **2334B**. Divider **2334B** absorbs liquid **2366B** and allows it to evaporate through adhesive **2336B** or through region **2374B** or other regions (not shown) of divider **2334B** not coated with adhesive **2336B**, releasing an insect-attracting substance or substances at a controlled rate into front enclosure **2346B**, through opening **2320B** and on into the surrounding area where insect trap **2310B** is installed. Liquid **2366B**, membrane **2368B**, trigger **2360B** and divider **2334B** may be configured to release an insect-attracting substance or substances for a predetermined amount of time to correspond with the expected useful life of trap portion **2314B**, which may be e.g., a week, a month or three months, or another length of time. When conductive prongs **2322B** are inserted into an ordinary household electrical wall socket (not shown), circuit board **2350B** receives power from prongs **2322B** and illuminates LEDs **2324B**. Light from LEDs **2324B** projects through window **2328B** in base portion **2312B**, through bottom surface **2376B** of rear housing **2340B**, through liquid **2366B**, membrane **2368B**, trigger **2360B**, divider **2334B** and adhesive **2336B**, into front enclosure **2346B**, through opening **2320B** and into the surrounding area where insect trap **2310B** is installed. In some embodiments, heat and scent alone are used as attractants, and light sources are not used in insect trap **2310B**.

[521] An added benefit of insect trap **2310B** is that trap portion **2314B** may include a built-in life indicator. In some embodiments, light from the LEDs projecting through liquid **2366B** may show a visible horizontal line through divider **2334B**, corresponding to the amount of liquid **2366B** remaining in rear enclosure **2348B** and middle enclosure **2380B**. In some embodiments, liquid **2366B** may be tinted or colored to enhance the visibility of the horizontal line showing through divider **2334B**. In some embodiments, markings on divider **2334B** may indicate the position of the horizontal line showing through divider **2334B** when liquid **2366B** is fully depleted, thereby providing a visual cue indicating that trap portion **2314B** should be removed and replaced with a fresh trap portion **2314B**.

[522] Figure **126** is a front perspective view of an example of the twenty-third embodiment of an insect trap, indicated generally at **2310C**. As shown, insect trap **2310C** includes a base portion **2312C**, a removable and replaceable trap portion **2314C**, and a removable and replaceable scent cartridge **2330C**. Trap portion **2314C** is shown partially cut away, and trap portion **2314C** and scent cartridge 2330C are shown removed from base portion **2312C** in this view. Base portion **2312C** includes a port **2332C** in a bottom surface **2354C** configured to accept scent cartridge **2330C**, and at least one opening **2364C** in a top front surface **2326C**. In some embodiments, port **2332C** is configured to receive scent cartridge **2330C** in a front surface, or a side surface, or in a top surface of base portion **2312C**. Trap portion **2314C** includes a front housing **2318C** with at least one opening **2320C** in a front surface **2316C** and at least one opening **2356C** in a bottom surface **2358C**. Opening **2356C** is configured to align with opening **2364C** in base portion **2312C** when trap portion **2314C** is mounted to base portion 2312C. Scent cartridge **2330C**, which may be similar in configuration to those found in plug-in room air freshener refills, includes a rearwardly facing cup **2344C** with a lid **2368C** covering its open end (not shown). In some embodiments, cup **2344C** may face forward, left, right, upward or downward when inserted into base portion **2312C**. Scent cartridge **2330C** includes a tab **2352C** configured to protrude from port **2332C** in base portion **2312C** when scent cartridge **2330C** is inserted into base portion **2312C**, thereby allowing the user to easily remove and replace scent cartridge **2330C**.

[523] Figure **127** is a cross-sectional view of insect trap **2310C** and Figure **128** is an enlarged view of a portion of Figure **127**. Scent cartridge **2330C** is shown inserted

into port **2332C** in base portion **2312C** in these views. Base portion **2312C** includes a plurality of electrically conductive prongs **2322C** (only one of which is shown in this view), LEDs **2324C** (only one of which is shown), and circuit board **2350C**, which is electrically connected to prongs **2322C** and LEDs **2324C**. For clarity, not all electrical connections are shown. Inside of base portion **2312C** adjacent to port **2332C** is a protrusion **2380C** configured to press against lid **2368C** of scent cartridge **2330C** when scent cartridge **2330C** is inserted into port **2332C** of base portion **2312C**. Scent cartridge **2330C** includes a membrane **2378C** which is glued to a seat **2374C** in cup **2344C** to form a sealed inner scent enclosure **2370C** containing a transparent or translucent liquid **2366C**, which may include a liquid carrier material and / or an insect-attracting substance or substances. Cup **2344C**, membrane **2378C** and lid **2368C** form an outer scent enclosure **2372C** containing a trigger **2360C** with at least one sharp spike **2382C** pointing toward membrane **2378C**, and a dome **2362C** facing toward lid **2368C**. Before scent cartridge **2330C** is inserted into port **2332C**, dome **2362C** of trigger **2360C** presses lightly against lid **2368C** and spike **2382C** does not make contact with, or only presses lightly against membrane **2378C**. As shown, scent cartridge **2330C** was inserted into port **2332C** of base portion **2312C**, causing protrusion **2380C** to press against lid **2368C**, which in turn pressed against dome **2362C** of trigger **2360C**, which deflected, causing spike **2382C** to break through membrane **2378C**, thereby releasing liquid **2366C** into outer scent enclosure **2372C** and onto porous lid **2368C**. In some embodiments, trigger **2360C** may include openings (not shown) through body of trigger **2360C** that allow liquid **2366C** to flow more quickly through trigger **2360C** and onto lid **2368C**. Lid **2368C** absorbs liquid **2366C** and allows it to evaporate, releasing an insect-attracting substance or substances at a controlled rate into inside of base portion **2312C**, through opening **2364C** in base portion **2312C**, through adjacent opening **2356C** of front housing **2318C**, on through opening **2320C** of front housing, and on into the surrounding area where insect trap **2310C** is installed. Liquid **2366C**, membrane **2378C**, trigger **2360C** and lid **2368C** may be configured to release an insect-attracting substance or substances for a predetermined amount of time to correspond with the expected useful life of trap portion **2314C**, which may be e.g., a week, a month or three months, or another length of time. In some embodiments, one or more heating elements (not shown) may be electrically connected to circuit board

2350C and located adjacent to lid **2368C** of scent cartridge **2330C** and may be configured to warm lid **2368C** and liquid **2366C** absorbed in lid **2368C**, thereby enhancing the release of insect-attracting substances.

[524] It should be appreciated that the principles described in this disclosure for attracting and trapping indoor flying insect pests are also beneficial for attracting and trapping indoor crawling and jumping arthropod pests. For example, while mosquitoes and flies have been described as being attracted to the disclosed insect traps, crawling or wingless insects such as cockroaches and crawling arthropod pests such as spiders may also be attracted by and trapped by the disclosed insect traps. Figure **129** is a front perspective view of a twenty-fourth embodiment of an insect trap, indicated generally at **2410**. Insect trap **2410** may include a base portion **2412**, a removable trap portion **2414**, an electrical cord **2416** and an electrical plug **2430** with a plurality of electrically conductive prongs **2422**, adapted to provide power to insect trap **2410** by inserting conductive prongs **2422** into a standard household electrical wall socket. Alternatively, base portion **2412** may be configured to receive power from batteries (not shown) mounted in base portion **2412**. While an electrical socket and batteries have been described as providing power to insect trap **2410**, any suitable power source may be used. As shown, insect trap **2410** is configured to sit on the floor when in use and attract and trap crawling and hopping insects and other arthropod pests. Trap portion **2414** includes a housing **2418** with at least one opening **2420** on its perimeter. Opening **2420** may be configured to admit a wide variety of insects into insect trap **2410**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2420** is configured to prevent the user's fingers from penetrating opening **2420** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **2414**. In some embodiments, opening **2420** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **2420**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2420**. Opening **2420** may be of uniform or of varying width, shape and orientation, and if trap portion **2414** has more than one opening **2420**, they may be of identical or of differing widths, shapes and orientations. Opening **2420** may be configured to attract one or more individual insect species or a variety of insect species.

[525] Figure **130** is a front perspective view of insect trap **2410**. Trap portion **2414** is shown partially cut away and removed from base portion **2412** in this view. Base portion **2412** includes a lighting element such as one or more LEDs **2424**. In some embodiments, LEDs **2424** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2424** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2424** include at least one that emits IR light to better attract certain species of insects including fleas. In a front surface 2426 of base portion **2412** is at least one opening **2444**, and mounted in opening **2444** may be a transparent or translucent window (not shown). The window protects LEDs **2424** from dust and insect debris and allows base portion **2412** to be easily cleaned. In some embodiments, at least a portion of LEDs **2424** protrude from front surface **2426** of base portion **2412**, and into trap portion **2414** when trap portion **2414** is mounted to base portion **2412**. On the perimeter of front surface **2426** may be a forwardly directed rim **2432**. Trap portion **2414** includes a bottom plate **2434** with a top surface **2438**, at least a portion of which is coated with an adhesive **2436**. In some embodiments, the bottom surface (not shown) of bottom plate **2434** is planar or is planar at its perimeter and is configured such that insects cannot crawl under insect trap **2410** when insect trap **2410** is placed on a floor. As shown, housing **2418** has at least one opening **2442** that corresponds to opening **2444** in base portion **2412**. In some embodiments, opening **2442** in housing **2418** has a transparent or translucent window **2440**. In some embodiments, housing **2418** has a reflective coating (not shown) on its inside surface (not shown). Alternatively, the material and surface finish of housing **2418** may be configured to reflect and disperse UV light and/or visible light and/or IR light without a reflective coating on its inside surface. Housing **2418** may also be coated with transparent, translucent or opaque adhesive on its inside surface (not shown) to provide additional insect trapping efficiency and capacity. In some embodiments, adhesive **2436** is configured to reflect and disperse UV and/or visible light and/or IR light. Housing **2418** and bottom plate **2434** form an enclosure **2448**. In some embodiments, housing **2418** is thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and

disposability. Alternatively housing **2418** may be constructed of other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, housing **2418** is constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, housing **2418** and bottom plate **2434** are joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or high frequency (HF) welding, or by any other suitable assembly method. The materials of trap portion **2414** may also include one or more insect attractants. For example, housing **2418** and/or bottom plate **2434** and/or adhesive **2436** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2410**. In such embodiments, the insect attractant is integral to trap portion **2414**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an inside surface of enclosure **2448** or on an outside surface of housing **2418** or through an opening in housing **2418**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2410**.

[526] Figure **131** is a cross-sectional view of insect trap **2410**. For clarity, cord **2416**, plug **2430** and conductive prongs **2422** are not shown in this view. In some embodiments, base portion **2412** has a circuit board **2450** having a programmable processor or chip (not shown) for executing commands, electrically connected to cord **2416**, conductive prongs **2422** and LEDs **2424** (only one of which is shown). For clarity, however, not all of the electrical connections are shown. Circuit board **2450** may include electronic circuitry to receive ordinary household current from conductive prongs **2422** and provide power to illuminate LEDs **2424**. Circuit board **2450** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that may provide steady voltage to LEDs **2424**, although it may also provide a varying voltage to LEDs **2424** to provide a flickering light, which mimics movement that some insect species, may find attractive. Circuit board **2450** may provide power to LEDs **2424** to provide UV and/or visible and/or IR light although it may be configured to provide power to only the one or more UV LEDs **2424** or to only the visible light LEDs **2424** or to only the IR LEDs **2424**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2450** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2412** to emit insect-attracting sounds. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2410**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2410**.

[527] Circuit board **2450** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2412** and into trap portion **2414**, to attract some insect species, including fleas and mosquitoes. Alternatively, LEDs **2424** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2414** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[528] As shown, rim **2432** on front surface **2426** of base portion **2412** engages with trap portion **2414** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **2414** to be securely but removably mounted on base portion **2412**.

[529] In the operation of insect trap **2410**, conductive prongs **2422** (not shown) are inserted into a wall electrical socket, and LEDs **2424** emit light, represented by arrows, which is transmitted through opening **2444** in base portion **2412** and into enclosure **2448**, and directly onto the inside surface of housing **2418** and adhesive **2436** on top surface **2438** of bottom plate **2434**. In some embodiments, light is not manipulated in base portion **2412** and is emitted directly into trap portion **2414**.

[530] The inside surface of housing **2418** may include a concave shape and may be configured to reflect and disperse the UV and/or visible and/or IR light from LEDs **2424** to distribute the light evenly onto adhesive **2436** on top surface **2438** of bottom plate **2434** and through enclosure **2448** and out through opening **2420** of housing **2418**, although the inside surface of housing **2418** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens or any other lens or combination of lenses (not shown)

configured to distribute the UV and/or visible and/or IR light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto the inside surface of housing **2418**, may be mounted to trap portion **2414** at or near opening **2442** or to base portion **2412** at or near opening **2444**, and may replace or augment the role of the reflective-coated inside surface of housing **2418**. In some embodiments, the light from LEDs **2424** may directly strike the adhesive **2436** on top surface **2438** of bottom plate **2434** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across the adhesive **2436**, and may replace or augment the light-distributing role of the inside surface of housing **2418** or the lens or lenses mounted to trap portion **2414** or to base portion **2412**. The light may be further evenly distributed by the light-diffusing properties of window **2440** in trap portion **2414**, by adhesive **2436** on top surface **2438** of bottom plate **2434**, or by a combination of the two.

[531] Thereafter, a portion of the light entering enclosure **2448** continues through opening **2420** in housing **2418** and into the surrounding area where insect trap **2410** is installed. Insects are attracted to the light transmitted through opening **2420** and hop or crawl into opening **2420** and onto adhesive **2436**, where they become trapped. A user may observe trapped insects by looking through opening **2420** in housing **2418**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **2414** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2414**, and replace it with a new trap portion **2414**. The new trap portion **2414** has fresh adhesive-coated surfaces, ensuring that insect trap **2410** will continue to efficiently and effectively attract and trap insects.

[532] In some embodiments, because trap portion **2414** mounts beside, and not on top of or underneath base portion **2412**, insect trap **2410** protrudes minimally from the floor and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2410** is configured such that when placed on a floor, its overall height, defined by the overall distance insect trap **2410** protrudes from the floor, is smaller than its overall length and its overall width.

[533] It should be appreciated that a benefit of insect trap **2410** is the manipulation of light within trap portion **2414**. In some embodiments, light manipulation occurs solely within trap portion **2414**. Light manipulation may include reflection, refraction, polarization and/or diffusion and is achieved by engaging

with a manipulative element or surface (e.g., the inside surface of housing **2418** and adhesive **2436**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2436**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2436** or within trap portion **2414**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[534] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[535] An insect trap **2410** of this configuration may accommodate a variety of different trap portions **2414** that may be removably mounted to base portion **2412**, each trap portion **2414** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **2414**, the size, shape, location and orientation of opening **2420** in housing **2418**, and the scent or scents impregnated in housing **2418**, bottom plate **2434**, or adhesive **2436**, may be uniquely configured to attract and trap a specific species or multiple species of insects.

[536] For example, in some embodiments, trap portion **2414** is approximately 20mm to 600mm wide, 20mm to 600mm long and 5mm to 150mm high. In some embodiments, trap portion **2414** is approximately 20mm to 200mm wide, 20mm to 200mm long and 5mm to 80mm high. In some embodiments, trap portion **2414** is approximately 20mm to 130mm wide, 20mm to 130mm long and 5mm to 50mm high.

[537] In some embodiments, base portion **2412** is approximately 20mm to 600mm wide, 10mm to 150mm long and 10mm to 150mm high. In some embodiments, base portion **2412** is 20mm to 200mm wide, 10mm to 100mm long and 10mm to 80mm high. In some embodiments, base portion **2412** is 20mm to 130mm wide, 10mm to 50mm long and 10mm to 50mm high.

[538] Figure **132** is a front perspective view of a twenty-fifth embodiment of an insect trap, indicated generally at **2510**. Insect trap **2510** includes a base portion **2512** and a removable trap portion **2514**. Trap portion **2514** is shown partially cut away and removed from base portion **2512** in this view. As shown, base portion **2512** includes an electrical cord **2516** and an electrical plug **2530** with a plurality of electrically conductive prongs **2522**, adapted to provide power to insect trap **2510** by inserting conductive prongs **2522** into a standard household electrical wall socket. Alternatively, base portion **2512** may be configured to receive power from batteries (not shown) mounted in base portion **2512**. While an electrical socket and batteries have been described as providing power to insect trap **2510**, any suitable power source may be used. As shown, insect trap **2510** is configured to sit on the floor when in use and attract and trap crawling and hopping insects or pests. Trap portion **2514** includes a housing **2518** with at least one opening **2520** on its perimeter. Opening **2520** in housing **2518** may be configured to admit a wide variety of insects into insect trap **2510**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2520** is configured to prevent the user's fingers from penetrating opening **2520** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **2514**. In some embodiments, opening **2520** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **2520**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2520**. Opening **2520** may be of uniform or of varying width, shape and orientation, and if trap portion **2514** has more than one opening **2520**, they may be of identical or of differing widths, shapes and orientations. Opening **2520** may be configured to attract one or more individual insect species or a variety of insect species. Base portion **2512** includes a lighting element such as one or more LEDs **2524**. In some embodiments, LEDs **2524** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2524** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2524** include at least one that emits IR light to better attract certain species of insects including fleas. In a front surface **2526** of base portion **2512** is at least one opening **2544**, and mounted in opening **2544** may be a

transparent or translucent window (not shown) that may protect LEDs **2524** from dust and insect debris, and may allow base portion **2512** to be easily cleaned. However, the window is not required. In some embodiments, at least a portion of LEDs **2524** protrude from front surface **2526** of base portion **2512** and into trap portion **2514** when trap portion **2514** is mounted to base portion **2512**. On the perimeter of front surface **2526** may be a forwardly directed rim **2532**. Trap portion **2514** includes a bottom plate **2534** with a top surface **2538**. In some embodiments, the bottom surface (not shown) of bottom plate **2534** is planar or is planar at its perimeter and is configured such that insects cannot crawl under insect trap **2510** when it is placed on a floor. In some embodiments, top surface **2538** of bottom plate **2534** has a reflective coating (not shown). Alternatively, the material of bottom plate **2534** and the surface finish of top surface **2538** of bottom plate **2534** may be configured to reflect UV and/or visible and/or IR light without a reflective coating on its inside surface. Trap portion **2514** also includes a divider **2546**, comprised of transparent or translucent material and that may have a convex shape. Divider **2546** has a top surface, of which at least a portion is coated with a transparent or translucent adhesive **2536**, and a bottom surface (not shown). In some embodiments, housing **2518** is coated with adhesive on its inside surface (not shown) to provide additional insect trapping efficiency and capacity. In some embodiments, the inside surface of housing **2518** is configured to reflect and disperse UV and/or visible and/or IR light. In some embodiments, the adhesive coating the inside surface of housing **2518** may be configured to reflect and disperse UV and/or visible and/or IR light. As shown, housing **2518** and divider **2546** form a top enclosure **2548**, and divider **2546** and bottom plate **2534** form a bottom enclosure **2528**. As shown, housing **2518** and divider **2546** each have at least one opening **2542** corresponding to opening **2544** in front surface **2526** of base portion **2512**. In some embodiments, opening **2542** may have a transparent or translucent window (not shown). In some embodiments, housing **2518** is thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, they may be constructed of other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, housing **2518** is constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, housing **2518**, divider **2546** and bottom plate **2534** are

joined together where they intersect or engage with an adhesive, although they may also be joined by other commonly used packaging assembly techniques such as ultrasonic welding or high frequency (HF) welding or by any other suitable assembly method. The materials of trap portion **2514** may also include one or more of insect-attracting substances. For example, housing **2518** and/or divider **2546** and/or bottom plate **2534** and/or adhesive **2536** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2510**. In such embodiments, the insect attractant is integral to trap portion **2414**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an inside surface of top enclosure **2548** or on an outside surface of housing **2518** or through an opening in housing **2518**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2510**.

[539] Figure **133** is a cross-sectional view of insect trap **2510**. For clarity, cord **2516**, plug **2530** and conductive prongs **2522** are not shown in this view. In some embodiments, base portion **2512** has a circuit board **2550** having a programmable processor or chip (not shown) for executing commands, electrically connected to cord **2516**, conductive prongs **2522**, and LEDs **2524**. For clarity, however, not all

of the electrical connections are shown. Circuit board **2550** may include electronic circuitry to receive ordinary household current from conductive prongs **2522** and provide power to illuminate LEDs **2524**. Circuit board **2550** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that may provide steady voltage to LEDs **2524**, although it may also provide a varying voltage to LEDs **2524** to provide a flickering light which mimics movement that some insect species may find attractive. Circuit board **2550** may provide power to LEDs **2524** to provide UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **2524** or to only visible light LEDs **2524** or to only IR LEDs **2524**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2550** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2512** to emit insect-attracting sounds or vibrations. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2510**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2510**.

[540] Circuit board **2550** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2512** and into trap portion **2514**, to attract some

insect species, including fleas and mosquitoes. Alternatively, LEDs **2524** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2514** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[541] As shown, rim **2532** on front surface **2526** of base portion **2512** engages with trap portion **2514** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **2514** to be securely but removably mounted on base portion **2512**.

[542] In the operation of insect trap **2510**, conductive prongs **2522** are inserted into a wall electrical socket, and LEDs **2524** emit light, represented by arrows, which transmits through opening **2544** in base portion **2512** and opening **2542** in trap portion **2514** and into bottom enclosure **2528**, and directly onto the bottom surface of divider **2546** and top surface **2538** of bottom plate **2534**. In some embodiments, light is not manipulated in base portion **2512** and is emitted directly into trap portion **2514**. Top surface **2538** of bottom plate **2534** may be configured to reflect and disperse the light from LEDs **2524** to project the light evenly onto the bottom surface of divider **2546**, although top surface **2538** of bottom plate **2534** may have a convex shape or a saddle shape or a combination of shapes, or may also have ribs or other features to more evenly distribute the light. Alternatively, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) onto the bottom surface of divider **2546**, may be mounted to trap portion **2514** at or near opening **2542** or to base portion **2512** at or near opening **2544**, and may replace or augment the role of top surface **2538** of bottom plate **2534**. In some embodiments, the light from LEDs **2524** may directly strike top surface **2538** of bottom plate **2534** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across top surface **2538**, and may replace or augment the light-distributing role of the bottom surface of divider **2546** or the lens or lenses mounted to trap portion **2514** or to base portion **2512**.

[543] Thereafter, the light transmits through divider **2546** and adhesive **2536** and into top enclosure **2548**. The light may be further evenly distributed by the light-diffusing properties of divider **2546**, adhesive **2536**, or by a combination of the two. A portion of the light entering top enclosure **2548** transmits through opening **2520** and into the surrounding area where insect trap **2510** is installed. Insects and other arthropod pests are attracted to the light transmitted through opening **2520**, and hop or crawl into opening **2520** and onto adhesive **2536**, where they become trapped. A user may observe trapped insects by looking through opening **2520**. When a sufficient number of insects have been trapped, the user may easily remove and discard the entire used trap portion **2514** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2514**, and replace it with a new trap portion **2514**. New trap portion **2514** has fresh adhesive-coated surfaces, ensuring that insect trap **2510** will continue to efficiently and effectively attract and trap insects.

[544] In some embodiments, because trap portion **2514** mounts beside, and not on top of or underneath base portion **2512**, insect trap **2510** protrudes minimally from the floor and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2510** may be configured such that when placed on a floor, its overall height, defined by the overall distance insect trap **2510** protrudes from the floor, is smaller than its overall length and its overall width.

[545] It should be appreciated that a benefit of insect trap **2510** is the manipulation of light within trap portion **2514**. In some embodiments, light manipulation occurs solely within trap portion **2514**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface of housing **2518** and adhesive **2536**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2536**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2536** or within trap portion **2514**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[546] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used.

Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[547] Insect trap **2510** of this configuration may accommodate a variety of different trap portions **2514** that may be removably mounted to base portion **2512**, each trap portion **2514** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **2514**, the size, shape, location and orientation of opening **2520** in housing **2518** of trap portion **2514**, and the scent or scents impregnated in housing **2518**, bottom plate **2534**, divider **2546** or adhesive **2536**, may be uniquely configured to attract and trap a specific species or multiple species of insects.

[548] For example, in some embodiments, trap portion **2514** is approximately 20mm to 600mm wide, 20mm to 600mm long and 5mm to 150mm high. In some embodiments, trap portion **2514** is approximately 20mm to 200mm wide, 20mm to 200mm long and 5mm to 80mm high. In some embodiments, trap portion **2514** is approximately 20mm to 130mm wide, 20mm to 130mm long and 5mm to 50mm high.

[549] In some embodiments, base portion **2512** is approximately 20mm to 600mm wide, 10mm to 150mm long and 10mm to 150mm high. In some embodiments, base portion **2512** is 20mm to 200mm wide, 10mm to 100mm long and 10mm to 80mm high. In some embodiments, base portion **2512** is 20mm to 130mm wide, 10mm to 50mm long and 10mm to 50mm high.

[550] It should be appreciated that insect trap **2510** may be adapted to attract and trap flying insects in addition to crawling and jumping arthropod pests. Figure **134** is a front perspective view of an example of the twenty-fifth embodiment of an insect trap, indicated generally at **2510A**. Insect trap **2510A** includes a base portion **2512A** and a removable trap portion **2514A**. Trap portion includes a housing **2518A** with a top surface **2540A**. Insect trap **2510A** may be identical to trap portion **2510** (not shown in this view), except that top surface **2540A** of trap portion **2514A** has openings **2552A** configured to allow light from trap portion **2514A** to project upwardly into the room where insect trap **2510A** is installed and attract flying insects, which fly or crawl through openings **2552A** in housing

2518A, into trap portion **2514A**, and onto adhesive (not shown) inside trap portion **2514A**.

[551] It should also be appreciated that insect trap **2510A** may be adapted to mount on a wall by plugging into an ordinary household wall electrical socket. Figure **135** is a front perspective view of an example of the twenty-fifth embodiment of an insect trap, indicated generally at **2510B**. Insect trap **2510B** includes a base portion **2512B** and a removable trap portion **2514B**. Insect trap **2510B** is shown plugged into a household wall electrical socket **2562B** in this view. Trap portion **2514B** includes a housing **2518B** with openings **2552B** in its top surface **2540B** and openings **2520B** (only one of which is shown) on its perimeter.

[552] Figure **136** is a rear perspective view of insect trap **2510B**. Insect trap **2510B** is shown removed from a household wall electrical socket (not shown) in this view. Base portion **2512B** includes a wall plate recess **2554B** in its rear surface **2556B**, and a plurality of electrically conductive prongs **2522B**, affixed into and protruding perpendicularly from wall plate recess **2554B**. Insect trap **2510B** mounts to a wall (not shown in this view) and receives power by plugging prongs **2522B** into a household electrical socket (not shown in this view). Trap portion **2514B** includes a bottom plate **2534B** with a wall plate recess **2558B** in its rear surface **2560B**. When insect trap **2510B** is plugged into a household wall electrical socket (not shown in this view), wall plate recess **2554B** in base portion **2512B** and wall plate recess **2558B** in bottom plate **2534B** are configured to accommodate the wall plate (not shown in this view) and allow rear surface **2556B** of base portion **2512B** and rear surface **2560B** of bottom plate **2534B** to contact the wall (not shown in this view) adjacent to the wall plate. Insect trap **2510B** is configured to attract and trap flying insects through openings **2552B** (shown in Figure **135**) in top surface **2540B** (shown in Figure **135**) of housing **2518B**, and is also configured to attract and trap arthropod pests crawling on the wall through openings **2520B** (only one of which is shown) on the perimeter of housing **2518B**.

[553] Figure **137** is a front perspective view of a twenty-sixth embodiment of an insect trap, indicated generally at **2610**. Insect trap **2610** includes a base portion **2612** and a removable trap portion **2614**. Trap portion **2614** is shown partially cut away and removed from base portion **2612** in this view. As shown, base portion **2612** includes an electrical cord **2616** and an electrical plug **2630** with a plurality

of electrically conductive prongs **2622**, adapted to provide power to insect trap **2610** by inserting conductive prongs **2622** into a standard household electrical wall socket. Alternatively, base portion **2612** may be configured to receive power from batteries (not shown) mounted in base portion **2612**. While an electrical socket and batteries have been described as providing power to insect trap **2610**, any suitable power source may be used. As shown, insect trap **2610** is configured to sit on the floor when in use and attract and trap crawling and hopping insects and other arthropod pests. Trap portion **2614** includes a housing **2618** with at least one opening **2620** on its perimeter. Opening **2620** in housing **2618** may be configured to admit a wide variety of insects into insect trap **2610**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2620** is configured to prevent the user's fingers from penetrating opening **2620** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **2614**. In some embodiments, opening **2620** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **2620**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2620**. Opening **2620** may be of uniform or of varying width, shape and orientation, and if trap portion **2614** has more than one opening **2620**, they may be of identical or of differing widths, shapes and orientations. Opening **2620** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, the inside surface (not shown) of housing **2618** may have a reflective coating. Alternatively, the material of housing **2618** and the surface finish of the inside surface of housing **2618** may be configured to reflect light without a reflective coating on its inside surface. Base portion **2612** includes a lighting element such as one or more LEDs **2624**. In some embodiments, LEDs **2624** include at least one that emits UV light and at least one that emits visible light. In some embodiments, LEDs **2624** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2624** include at least one that emits IR light to better attract certain species of insects including fleas. In a front surface **2644** of base portion **2612** is at least one opening **2620**, and mounted in opening **2620** may be a transparent or translucent window (not shown), which may protect

LEDs **2624** from dust and insect debris, and may allow base portion **2612** to be easily cleaned. However, the window is not required. In some embodiments, at least a portion of LEDs **2624** protrude from front surface **2626** of base portion **2612** and into trap portion **2614** when trap portion **2614** is mounted to base portion **2612**. On the perimeter of front surface **2626** may be a forwardly directed rim **2632**. Trap portion **2614** includes a bottom plate **2634** with a top surface **2638**, at least a portion of which is coated with an adhesive **2636**. In some embodiments, the bottom surface (not shown) of bottom plate **2634** is planar or is planar at its perimeter and is configured such that insects cannot crawl under insect trap **2610** when it is placed on a floor. Trap portion **2614** includes a divider **2646**, comprised of transparent or translucent material and which includes a top surface **2640**. In some embodiments, divider **2646** is coated on its inside surfaces with a transparent or translucent adhesive to provide additional insect trapping efficiency and capacity. Divider **2646** has at least one opening **2652** that corresponds to opening **2620** in housing **2618**. As shown, housing **2618** and divider **2646** form a top enclosure **2648**, and divider **2646** and bottom plate **2634** form a bottom enclosure **2628**. As shown, housing **2618** has at least one opening **2642** that corresponds to opening **2644** in front surface **2626** of base portion **2614**. In some embodiments, opening **2642** has a transparent or translucent window (not shown). In some embodiments, housing **2618** is thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, they may be constructed of other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, housing 2618 is constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, housing **2618**, divider **2646** and bottom plate **2634** are joined together where they intersect or engage with an adhesive, although they may also be joined together by other commonly used packaging assembly techniques such as ultrasonic welding or high frequency (HF) welding or by any other suitable assembly method. The materials of trap portion **2614** may also include one or more of insect-attracting substances. For example, housing **2618** and/or divider **2646** and/or bottom plate **2634** and/or adhesive **2636** may be impregnated with sorbitol, coleopteran attractants including brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol,

and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2610**. In such embodiments, the insect attractant is integral to trap portion **2614**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an inside surface of bottom enclosure **2628** or on an outside surface of housing **2618** or through an opening in housing **2618**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2610**.

[554] Figure **138** is a cross-sectional view of insect trap **2610**. For clarity, cord **2616**, plug **2630** and conductive prongs **2622** are not shown. In some embodiments, base portion **2612** has a circuit board **2650** having a programmable processor or chip (not shown) for executing commands, electrically connected to cord **2616**, conductive prongs **2622** and LEDs **2624**. For clarity, however, not all of the electrical connections are shown. Circuit board **2650** may include electronic circuitry to receive ordinary household current, for example from conductive prongs **2622** and provide power to illuminate LEDs **2624**. Circuit board **2650** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that may provide steady voltage to LEDs **2624**, although it may also provide a varying voltage to LEDs **2624** to provide a flickering light which mimics movement that some insect species may find attractive. Circuit board **2650** may provide power to LEDs **2624** to provide UV and/or visible and/or IR

light, although it may be configured to provide power to only UV LEDs **2624** or to only visible light LEDs **2624** or to only IR LEDs **2624**, or to provide variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2650** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2612** to emit insect-attracting sounds or vibrations. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2610**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2610**.

[555] Circuit board **2650** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heating exchanging elements (not shown) (e.g., using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2612** and into trap portion **2614**, to attract some insect species, including fleas and mosquitoes. Alternatively, LEDs **2624** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2614** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[556] As shown, rim **2632** on front surface **2626** of base portion **2612** engages with trap portion **2614** to secure it in place during use, although any other form of attachment may be substituted that allows trap portion **2614** to be securely but removably mounted on base portion **2612**.

[557] In the operation of insect trap **2610**, conductive prongs **2622** (not shown) are inserted into a wall electrical socket, and LEDs **2624** light, represented by arrows, which transmits through opening **2644** in base portion **2612** and opening **2642** in housing **2618**, and into top enclosure **2648**, and directly onto the inside surface of housing **2618** and top surface **2640** of divider **2646**. In some embodiments, light is not manipulated in base portion **2612** and is emitted directly into trap portion **2614**. In some embodiments, the inside surface of housing **2618** is configured to reflect the light from LEDs **2624** to project the light onto and through top surface **2640** of divider **2646** and on into bottom enclosure **2628**, although the inside surface of housing **2618** may also have ribs or other features (not shown) to more evenly distribute the light. Top surface **2640** of divider **2646** may be planar or convex or concave or be a combination of forms to more evenly distribute the light onto adhesive **2636**. In some embodiments, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) through divider **2646** and onto adhesive **2636**, may be mounted to trap portion **2614** at or near opening **2642** in housing **2618** or to base portion **2612** at or near opening **2644**, and may replace or augment the role of inside surface of housing **2618**. The light may be further evenly distributed by the light-diffusing properties of divider **2646**, the adhesive coating the inside surface of divider **2646**, or by a combination of the two. In some embodiments, the light from LEDs **2624** may directly strike top surface **2640** of divider **2646** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across top surface **2640**, and may replace or augment the light-distributing role of top surface **2640** of divider **2646** or of the lens or lenses mounted to trap portion **2614** or to base portion **2612**.

[558] Thereafter, a portion of the light entering bottom enclosure **2628** continues through opening **2652** in divider **2646** and its corresponding opening **2620** in housing **2618** and into the surrounding area where insect trap **2610** is installed. Insects and other arthropod pests are attracted to the light transmitted through

opening **2652** in divider **2646** and its corresponding opening **2620** in housing **2618**, and crawl through opening **2620** in housing **2618** and its corresponding opening **2652** in divider **2646** and onto adhesive **2636** on bottom plate **2634**, where they become trapped. A user may observe trapped insects by looking through opening **2620** in housing **2618** and its corresponding opening **2652** in divider **2646**. When a sufficient number of insects have been trapped, the user can easily remove and discard entire used trap portion **2614** without touching the trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2614**, and replace it with a new trap portion **2614**. New trap portion **2614** has fresh adhesive-coated surfaces, ensuring that insect trap **2610** continues to efficiently and effectively attract and trap insects.

[559] In some embodiments, because trap portion **2614** mounts beside, and not on top of or underneath base portion **2612**, insect trap **2610** protrudes minimally from the floor and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2610** is configured such that when placed on a floor, its overall height, defined by the overall distance insect trap **2610** protrudes from the floor, is smaller than its overall length and its overall width.

[560] It should be appreciated that a benefit of insect trap **2610** is the manipulation of light within trap portion **2614**. In some embodiments, light manipulation occurs solely within trap portion **2614**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface of housing **2618** and adhesive **2636**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2636**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2636** or within trap portion **2614**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[561] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of

approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[562] An insect trap **2610** of this configuration may accommodate a variety of different trap portions **2614** that may be removably mounted to base portion **2612**, each trap portion **2614** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **2614**, the size, shape, location and orientation of opening **2620** in housing **2618** of trap portion **2614**, and the scent or scents impregnated in housing **2618**, bottom plate **2634**, divider **2646** or adhesive **2636**, may be uniquely configured to attract and trap a specific species or multiple species of insects.

[563] For example, in some embodiments, trap portion **2614** is approximately 20mm to 600mm wide, 20mm to 600mm long and 5mm to 150mm high. In some embodiments, trap portion **2614** is approximately 20mm to 200mm wide, 20mm to 200mm long and 5mm to 80mm high. In some embodiments, trap portion **2614** is approximately 20mm to 130mm wide, 20mm to 130mm long and 5mm to 50mm high.

[564] In some embodiments, base portion **2612** is approximately 20mm to 600mm wide, 10mm to 150mm long and 10mm to 150mm high. In some embodiments, base portion **2612** is 20mm to 200mm wide, 10mm to 100mm long and 10mm to 80mm high. In some embodiments, base portion **2612** is 20mm to 130mm wide, 10mm to 50mm long and 10mm to 50mm high.

[565] Figure **139** is a front perspective view of a twenty-seventh embodiment of an insect trap, indicated generally at **2710**. Insect trap **2710** includes a base portion **2712** and a removable trap portion **2714**. Trap portion **2714** and base portion **2712** are shown partially cut away, and trap portion **2714** is shown removed from base portion **2712** in this view. Insect trap **2710** is configured to be placed on the floor and to attract and trap crawling and hopping insects or pests. As shown, base portion **2712** includes an electrical cord **2716** and an electrical plug **2730** with a plurality of electrically conductive prongs **2722**, adapted to provide power to insect trap **2710** by inserting conductive prongs **2722** into a standard household electrical wall socket. Alternatively, base portion **2712** may be configured to receive power from batteries (not shown) mounted in base portion **2712**. While an electrical socket and batteries have been described as providing power to insect trap **2710**, any suitable power source may be used. Base portion **2712** includes a

lighting element such as one or more LEDs **2724**. In some embodiments, LEDs **2724** include at least one that emits ultraviolet (UV) light and at least one that emits visible light. In some embodiments, LEDs **2724** include at least one that emits UV light and at least one that emits blue light to better attract a wide variety of insect species. In some embodiments, the lighting element emits a combination of wavelengths to mimic sunlight. In some embodiments, LEDs **2764** include at least one that emits IR light to better attract certain species of insects including fleas. In a front surface 2726 of base portion **2712** is at least one opening **2744**, and mounted in opening **2744** may be a transparent or translucent window (not shown), which may protect LEDs **2724** from dust and insect debris, and may allow base portion **2712** to be easily cleaned. However, the window is not required. In some embodiments, at least a portion of LEDs **2724** may protrude from front surface **2726** of base portion **2712**, and into trap portion **2714** when trap portion **2714** is mounted to base portion **2712**. On the perimeter of front surface **2726** may be a forwardly directed rim **2732**.

[566] Trap portion **2714** includes a housing **2718** with at least one opening **2720** on its perimeter. Opening **2720** in housing **2718** may be configured to admit a wide variety of insects into insect trap **2710**, or alternatively it may be configured to admit one or more specific insect species. In some embodiments, opening **2720** is configured to prevent the user's fingers from penetrating opening **2720** and inadvertently touching trapped insects or adhesive when removing and replacing trap portion **2714**. In some embodiments, opening **2720** has a size and shape such that a sphere 25mm in diameter cannot pass through opening **2720**, and has a size and shape such that a sphere 1mm in diameter can pass through any portion of opening **2720**. Opening **2720** may be of uniform or of varying width, shape and orientation, and if trap portion **2714** has more than one opening **2720**, they may be of identical or of differing widths, shapes and orientations. Opening **2720** may be configured to attract one or more individual insect species or a variety of insect species. In some embodiments, the inside surface (not shown) of housing **2718** has a reflective coating. Alternatively, the material of housing **2718** and the surface finish of the inside surface of housing **2718** may be configured to reflect and disperse light without a reflective coating on its inside surface. Trap portion **2714** includes a bottom plate **2734** with a top surface **2738**, at least a portion of which is coated with an adhesive **2736**. In some embodiments, the bottom surface

(not shown) of bottom plate **2734** is planar or is planar at its perimeter and may be configured such that insects cannot crawl under insect trap **2710** when it is placed on a floor. Trap portion **2714** includes a divider **2746**, comprised of transparent or translucent material and which includes a top surface **2740**. In some embodiments, divider **2746** is coated on its inside surfaces with a transparent or translucent adhesive to provide additional insect trapping efficiency and capacity. Divider **2746** has at least one opening **2752** that corresponds to opening **2720** in housing **2718**. Divider **2746** may be thermoformed from a transparent or translucent plastic that may allow for a low cost and disposability, although it may also be made by injection molding, and it may also be made of other transparent or translucent materials. Trap portion **2714** also includes a diffuser **2754**, only half of which is shown in this view, made of transparent or translucent material with light-diffusing characteristics. Alternatively, diffuser **2754** may have a surface finish or surface features or a surface coating that provides light-diffusing characteristics to diffuser **2754**. In some embodiments, diffuser **2754** is a strip of sheet material that fits into a recess in divider **2746** and conforms to the shape of the surfaces of divider **2746** that it contacts. Alternatively, diffuser **2754** may be molded or thermoformed to shape. As shown, housing **2718** and divider **2746** form a top enclosure **2748**, and divider **2746** and bottom plate **2734** form a bottom enclosure **2728**. As shown, housing **2718** includes at least one opening **2742** that corresponds to opening **2744** in front surface **2726** of base portion **2712**. In some embodiments, opening **2742** has a transparent or translucent window (not shown). In some embodiments, housing **2718** is thermoformed from opaque sheet plastic, creating a clean and aesthetically pleasing shape while maintaining low cost and disposability. Alternatively, they may be constructed of other opaque, transparent or translucent materials such as paper, paperboard, cardboard or paper pulp. In some embodiments, housing **2718** is constructed by injection molding or by other suitable manufacturing techniques. In some embodiments, housing **2718**, divider **2746** and bottom plate **2734** are joined together where they intersect or engage with an adhesive, although they may also be joined together by other commonly used packaging assembly techniques such as ultrasonic welding or high frequency (HF) welding or by any other suitable assembly method. For example, housing **2718** and/or divider **2746** and/or bottom plate **2734** and/or adhesive **2736** may be impregnated with sorbitol, coleopteran attractants including brevicomin,

dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call, dipteran attractants including ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure, homopteran attractants including rescalure, lepidopteran attractants such as disparlure, straight chain lepidopteran pheromones including codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone, and other insect attractants such as eugenol, methyl eugenol, and siglure, or other substances to provide a scent that may further increase the insect-attracting efficiency of insect trap **2710**. Alternatively, the insect attractants may be embedded or contained in a separate piece (not shown) that may mount on an inside surface of divider **2746** or on outside surface of housing **2718** or through an opening in housing **2718**. Alternatively, water may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances, as water vapor is a known mosquito attractant. Alternatively, other insect attractants such sugar solution, molasses, or honey may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. Alternatively, a combination of live yeast, sugar, and water, which can produce mosquito-attracting carbon dioxide, may be embedded or contained in the separate piece in addition to, or in place of, the one or more insect-attracting substances. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2710**.

[567] In some embodiments, base portion **2712** includes a circuit board **2750** having a programmable processor or chip (not shown) for executing commands, electrically connected to cord **2716**, conductive prongs **2722** and LEDs **2724**. For clarity, however, the electrical connections are not shown. Circuit board **2750** may also include electronic circuitry to receive ordinary household current, for example, from conductive prongs **2722** and provide power to illuminate LEDs **2724**. Circuit board **2750** may include an energy stabilizer such as a full wave rectifier circuit or any other circuit that may provide steady voltage to LEDs **2724**, although it may also provide a varying voltage to LEDs **2724** to provide a flickering light, which mimics movement that some insects find attractive. Circuit board **2750** may provide power to LEDs **2724** to provide both UV and/or visible and/or IR light, although it may be configured to provide power to only UV LEDs **2724** or to only visible light LEDs **2724** or to only IR LEDs **2724**, or to provide

variable power to produce combinations of flickering UV and/or visible and/or IR light. Circuit board **2750** may also be configured to drive a transmitter or transceiver such as a piezoelectric speaker (not shown) or other device that may be mounted in base portion **2712** to emit insect-attracting sounds or vibrations. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect sounds or vibrations to better attract insects, and may include one or more of insect call, reply, courtship and copulatory songs. In some embodiments, the transmitter or transceiver may emit recorded and/or generated insect-attracting sounds or vibrations such as the heartbeat of a mammal. For example, the transmitter or transceiver may emit an insect-attracting sound or sounds having a frequency in the range of approximately 0.5Hz (e.g., the heart rate of large mammals) to approximately 240kHz (e.g., the highest frequency detectable by insects). In some embodiments, the frequency is in the range of approximately 5Hz to 100kHz. In some embodiments, the frequency is in the range of approximately 35Hz to 50Khz. It is desirable for such insect-attracting sound to be detectable by an insect within approximately a 2-meter distance from insect trap **2710**. It is desirable for such insect-attracting sound to be undetectable by a human beyond approximately a 1-meter distance from insect trap **2710**.

[568] Circuit board **2750** may also include one or more electrical elements (not shown), such as resistors (not shown) or resistance heating elements (not shown), or one or more heat exchanging elements (not shown) (e.g., elements using the Peltier effect and/or the Thomson effect to move heat to a specific region), or a combination of electrical elements that generate and/or move heat, which may transmit through base portion **2712** and into trap portion **2714**, to attract some insect species, including fleas and mosquitoes. Alternatively, LEDs **2724** may generate heat, to replace or augment the heat generated by the one or more electrical elements. In general, the heat generated may increase and maintain the temperature of at least a portion of trap portion **2714** to between approximately 30 degrees C and 45 degrees C, and to preferably between approximately 33 degrees C and 42 degrees C, in order to mimic the skin and body temperatures of mammals. The addition of heat may also enhance the release of insect-attracting substances, including water vapor and carbon dioxide.

[569] As shown, rim **2732** on front surface **2726** of base portion **2712** engages with trap portion **2714** to secure it in place during use, although any other form of

attachment may be substituted that allows trap portion **2714** to be securely but removably mounted on base portion **2712**.

[570] In the operation of insect trap **2710**, conductive prongs **2722** (not shown) are inserted into a wall electrical socket, and LEDs **2724** emit light, represented by arrows, which transmits through opening **2744** in base portion **2712** and opening **2742** in housing **2718**, into top enclosure **2748**, and directly onto diffuser **2754**, top surface **2740** of divider **2746** and the inside surface of housing **2718**. In some embodiments, light is not manipulated in base portion **2712** and is emitted directly into trap portion **2714**. Diffuser **2754** transmits the light evenly through the corresponding surfaces of divider **2746** and into bottom enclosure **2728**. In some embodiments, the inside surface of housing **2718** may be configured to reflect and disperse light from LEDs **2724** through divider **2746** into bottom enclosure **2728,** and evenly onto adhesive **2736** coating top surface **2738** of bottom plate **2734**, although the inside surface of housing **2718** may also have ribs or other features (not shown) to more evenly distribute the light. Top surface **2740** of divider **2746** may be planar or convex or concave or be a combination of forms to more evenly distribute the light onto adhesive **2736**. In some embodiments, an optical enhancer such as an anamorphic lens (not shown) or any other lens or combination of lenses configured to distribute the light (e.g., evenly, according to specific patterns, at a focal point, etc.) through divider **2746** and onto adhesive **2736**, may be mounted to trap portion **2714** at or near opening **2742** in housing **2718** or to base portion **2712** at or near opening **2744**, and may replace or augment the role of the reflective-coated inside surface of housing **2718**. The light may be further evenly distributed by the light-diffusing properties of divider **2746**, the adhesive coating the inside surface of divider **2746**, or by a combination thereof. In some embodiments, the light from LEDs **2724** may directly strike top surface **2740** of divider **2746** at an oblique angle (e.g., an acute angle from approximately 0° to 90°) and be spread across top surface **2740**, and may replace or augment the light-distributing role of the top surface **2740** of divider **2746** or of the lens or lenses mounted to trap portion **2714** or to base portion **2712**.

[571] Thereafter, a portion of the light entering bottom enclosure **2728** continues through opening **2752** in divider **2746** and its corresponding opening **2720** in housing **2718** and into the surrounding area where insect trap **2710** is installed. Insects and other arthropod pests are attracted to the light from diffuser **2754** and

from adhesive **2736** that transmits through opening **2752** in divider **2746** and its corresponding opening **2720** in housing **2718**, and hop or crawl through opening **2720** in housing **2718** and its corresponding opening **2752** in divider **2746** and onto adhesive **2736**, where they may become trapped. A user may observe trapped insects by looking through opening **2720** in housing **2718** and its corresponding opening **2752** in divider **2746**. When a sufficient number of insects have been trapped, the user can easily remove and discard the entire used trap portion **2714** without touching trapped insects, insect debris or adhesive, which remain out of reach inside trap portion **2714**, and replace it with a new trap portion **2714**. New trap portion **2714** has fresh adhesive-coated surfaces, ensuring that insect trap **2710** continues to efficiently and effectively attract and trap insects.

[572] In some embodiments, because trap portion **2714** mounts beside, and not on top of or underneath base portion **2712**, insect trap **2710** protrudes minimally from the floor and therefore intrudes minimally into the home environment. In some embodiments, insect trap **2710** may be configured such that when placed on a floor, its overall height, defined by the overall distance insect trap **2710** protrudes from the floor, is smaller than its overall length and its overall width.

[573] It should be appreciated that a benefit of insect trap **2710** is the manipulation of light within trap portion **2714**. In some embodiments, light manipulation occurs solely within trap portion **2714**. Light manipulation may include reflection, refraction, polarization, dispersion and/or diffusion and is achieved by engaging with a manipulative element or surface (e.g., inside surface of housing **2718** and adhesive **2736**). In some embodiments, light manipulation produces an even distribution of light on adhesive **2736**. In some embodiments, light is manipulated to produce a predetermined pattern on adhesive **2736** or within trap portion **2714**, for example, an even distribution, an even distribution with hot spots of higher intensity, hot spot patterns, and/or combinations thereof.

[574] Any suitable adhesive material may be used as part of an adhesive surface for trapping an insect. In some embodiments, pressure sensitive adhesives such as acrylics, butyl rubber, natural rubber, nitriles, silicones, styrene block copolymers, styrene-ethylene/propylene, styrene-isoprene-styrene, vinyl ethers may be used. Generally, the thickness of such adhesives will be in the range of approximately 0.01mm to 1mm. In some embodiments, the adhesive thickness is in the range of

approximately 0.05mm to 0.2mm, with a thickness of approximately 0.1mm being most often used.

[575] An insect trap **2710** of this configuration may accommodate a variety of different trap portions **2714** that may be removably mounted to base portion **2712**, each trap portion **2714** being uniquely configured to attract and trap a specific species or multiple species of insects. For example, the overall size and shape of trap portion **2714**, the size, shape, location and orientation of opening **2720** in housing **2718** of trap portion **2714**, and the scent or scents impregnated in housing **2718**, bottom plate **2734**, divider **2746** or adhesive **2736**, may be uniquely configured to attract and trap a specific species or multiple species of insects.

[576] For example, in some embodiments, trap portion **2714** is approximately 20mm to 600mm wide, 20mm to 600mm long and 5mm to 150mm high. In some embodiments, trap portion **2714** is approximately 20mm to 200mm wide, 20mm to 200mm long and 5mm to 80mm high. In some embodiments, trap portion **2714** is approximately 20mm to 130mm wide, 20mm to 130mm long and 5mm to 50mm high.

[577] In some embodiments, base portion **2712** is approximately 20mm to 600mm wide, 10mm to 150mm long and 10mm to 150mm high. In some embodiments, base portion **2712** is 20mm to 200mm wide, 10mm to 100mm long and 10mm to 80mm high. In some embodiments, base portion **2712** is 20mm to 130mm wide, 10mm to 50mm long and 10mm to 50mm high.

[578] Figure **140** is a front perspective view of a twenty-eighth embodiment of an insect trap, indicated generally at **2810**. Insect trap **2810** includes a base portion **2812** and a removable and replaceable trap portion **2814**. Trap portion **2814** is shown mounted on base portion **2812** and partially cut away in this view. Trap portion **2814** includes a front housing **2818** with at least one insect opening **2820** and a pivot opening **2822** on a front surface **2816** and a tab opening **2824** on a top surface **2826**, a pivot **2828** mounted in pivot opening **2822** in front surface **2816** of front housing **2818**, and a shutter **2830** mounted on pivot **2828** and located immediately behind front surface **2816** of front housing **2818**. Shutter **2830** includes at least one insect opening **2832** that corresponds in size, shape and number to insect opening **2820** in front surface **2816** of front housing **2818**, and a tab **2834** which protrudes through tab opening **2824** in top surface **2826** of front housing **2818**. Shutter **2830** is configured to rotate about pivot **2828** and to allow

tab **2834** to move freely to the left and to the right within tab opening **2824** in top surface **2826** of front housing **2818**. As shown, tab **2834** has been moved to the left and insect opening **2832** in shutter **2830** is aligned with insect opening **2820** in front housing **2818**, thereby exposing the interior of trap portion **2814** through insect opening **2820** and insect opening **2832**. When tab **2834** is moved to the right, insect opening **2832** in shutter **2830** is not aligned with insect opening **2820** in front housing **2818**, and shutter **2830** obstructs insect opening **2820**. Accordingly, moving tab **2834** to the left opens trap portion **2814** and moving tab to the right closes trap portion **2814.** However, it should be readily apparent that shutter **2830** may be configured in the opposite orientation, such that moving tab **2834** to the right opens trap portion **2814** and moving tab **2834** to the left closes trap portion **2814**. Shutter **2830** may be made of any thin, opaque or translucent material such as sheet metal, sheet plastic or paperboard.

[579] Tab **2834** may have words or graphics printed, molded or formed on its front surface to show the user the tab locations when shutter **2830** is in the open and closed positions. As shown, the front surface of tab **2834** has the words "open" on the left and "closed" on the right. Alternatively, words or graphics indicating "in use" and "discard" may be present on tab **2834**, or any word or graphic or combination of words and / or graphics to indicate the appropriate position of tab **2834**. As shown, insect opening **2820** in front housing and insect opening **2832** in shutter **2830** is configured in a radiating pattern about pivot **2828**, although insect opening **2820** and insect opening 2830 may have a variety of shapes, sizes and arrangements. In some embodiments, shutter **2830** may rotate about a protrusion in front housing, thereby eliminating the need for pivot **2828**. Although shutter **2830** is shown opening and closing by rotating about a pivot substantially perpendicular to front surface **2816** of front housing **2818**, it may also be configured to operate by pivoting on a vertical axis or on a horizontal axis, or by sliding horizontally or vertically without a pivot, or by any combination thereof. The user may close trap portion **2814** by sliding tab **2834** before removing and replacing trap portion **2814**, thereby avoiding seeing or contacting dead insects while handling trap portion **2814**.

[580] It should be appreciated that insect trap **2810** may be adapted to open and close automatically without requiring additional action by the user. Figure **141** is a front perspective view of an example of the twenty-eighth embodiment of an

insect trap, indicated generally at **2810A**. Insect trap **2810A** includes a base portion **2812A** and a removable and replaceable trap portion **2814A**. Trap portion **2814A** is shown mounted on base portion **2812A** and partially cut away in this view. Base portion **2812A** includes a top surface **2824A**. Trap portion **2814A** includes a front housing **2818A** with at least one insect opening **2820A** and a pivot opening **2822A** on a front surface **281A6**, a pivot **2828A** mounted in pivot opening **2822A** in front surface **2816A** of front housing **2818A**, and a shutter **2830A** mounted on pivot **2828A** and located immediately behind front surface **2816A** of front housing **2818A**. Shutter **2830A** includes at least one insect opening **2832A** that corresponds in size, shape and number to insect opening **2820A** in front surface **2816A** of front housing **2818A**, a tab **2834A** which protrudes through a tab opening (not shown) in bottom surface (not shown) of front housing **2818A** when trap portion **2814A** is removed from base portion **2812A**, and a counterweight **2826A** on the back surface (not shown) of shutter **2830A** adjacent to tab **2834A**. Shutter **2830A** is configured to rotate about pivot **2828A** and to allow tab **2834A** to move freely in the tab opening in the bottom surface of front housing **2818**. As shown, top surface **2824A** of base portion **2812A** pushes tab **2834A** upwards into trap portion **2814A** until tab **2834A** no longer protrudes from trap portion **2814A** when trap portion **2814A** is mounted on base portion **2812A**, which rotates shutter **2830A** to a position that aligns insect opening **2832A** in shutter **2830A** with insect opening **2820A** in front housing, which exposes the interior of trap portion **2814A**, thereby opening trap portion **2014A**. When trap portion **2814A** is removed from base portion **2812A**, counterweight **2826A** pushes tab **2834A** down through the opening on the bottom surface of front housing **2818A** and rotates shutter **2830A** such that insect opening **2832A** in shutter **2830A** does not align with insect opening **2820A** in front housing, and shutter **2830A** obstructs insect opening **2820A,** thereby closing trap portion **2014A**, thereby preventing the user from seeing or contacting dead insects while removing and disposing of trap portion 2814A.

[581] As shown, top surface **2824A** of base portion **2812A** pushes tab **2834A** to rotate shutter **2830** to open trap portion **2814A**, and counterweight **2826A** rotates shutter **2830A** to close trap portion **2814A**. However, other configurations may be contemplated that automatically open and close trap portion **2814A**. In some embodiments, shutter **2830A** may be configured to balance such that it rotates by

its own weight to close trap portion **2814A**, thereby eliminating the need for counterweight **2826A**. In some embodiments, a spring (not shown) may rotate shutter **2830A** to close trap portion **2814A**, replacing counterweight **2826A**. In some embodiments, a magnet (not shown) on shutter **2830A** on the opposite side from tab **2834A** may be attracted to a magnet (not shown) inside base portion **2812A** and rotate shutter **2830A** to open trap portion **2814A**, thereby replacing the role of tab **2834A**. Alternatively, a piece of ferrous metal on shutter **2830A** on the opposite side from tab **2834A** may be attracted to an electromagnet inside base portion **2812A** and rotate shutter **2830A** to open trap portion **2814A**, thereby replacing the role of tab **2834A** and offering the added benefit of opening trap portion **2814A** only when insect trap **2810A** is receiving electric power.

[582] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith. In an embodiment, the first opening is configured to allow an insect to enter into the enclosure. In an embodiment, the enclosure includes a second opening, the second opening configured to allow light to emit from the enclosure. In an embodiment, within the base portion, the light is not manipulated. In an embodiment, the enclosure includes a third opening, the third opening configured to allow light to be received from base portion into the enclosure. In an embodiment, wherein the enclosure is configured to distribute the light in a predetermined pattern. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein at least one of the first or second internal surfaces is configured to manipulate light. In an embodiment, at least one of the first or second internal surfaces includes an adhesive surface. In an embodiment, the rear housing portion has a concave surface, the concave surface configured to reflect light evenly

within the enclosure. In an embodiment, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion. In an embodiment, the divider portion includes a rear surface including translucent material and includes a front surface including an adhesive surface. In an embodiment, the second internal surface of the rear housing portion includes a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion. In an embodiment, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment, the rear surface of the divider portion is configured to receive the light from the second internal surface of the rear housing portion or directly from the lighting element. In an embodiment, the divider portion is configured to receive light at an oblique angle and spread across the divider portion. In an embodiment, the divider portion is configured to manipulate light. In an embodiment, the divider portion includes a planar or contoured shape, wherein the shape of the divider portion is configured to optimize light distribution. In an embodiment, the base portion includes a protrusion and wherein the trap portion includes a recess for receiving the protrusion, wherein when the protrusion is received by the trap portion, the base portion and trap portion are engaged. In an embodiment, the trap portion includes a protrusion and wherein the base portion includes a recess for receiving the protrusion, wherein when the protrusion is received by the base portion, the base portion and trap portion are engaged. In an embodiment, the trap portion includes a polymeric, fibrous, or carbon-based material. In an embodiment, the mounting portion includes an electrical plug having rigid conductors protruding substantially perpendicularly and directly from the rear surface of the mounting portion, wherein the conductors are insertable into an electrical power outlet. In an embodiment, the power source includes an electrical power outlet or a battery. In an embodiment, the lighting element includes a light emitting diode (LED). In

an embodiment, the lighting element includes an ultraviolet (UV) LED and a blue LED. In an embodiment, the base portion includes an energy stabilizer configured to provide a constant voltage to the lighting element. In an embodiment, the energy stabilizer includes full rectifier circuit. In an embodiment, the base portion includes an opening, the opening configured to allow light to emit from the base portion to the trap portion. In an embodiment, the opening includes a transparent or translucent window. In an embodiment, the opening is proximate to the lighting element. In an embodiment, the trap portion includes an insect attractant. In an embodiment, the insect attractant is selected from the group consisting of: sorbitol, coleopteran attractants, dipteran attractants, homopteran attractants, lepidopteran, straight chain lepidopteran pheromones, eugenol, methyl eugenol, and siglure. In an embodiment, the coleopteran attractants include brevicomin, dominicalure, frontalin, grandlure, ipsdienol, ipsenol, japonilure, lineatin, megatomoic acid, multistriatin, oryctalure, sulcatol, and trunc-call. In an embodiment, the dipteran attractants include ceralure, cue-lure, latilure, medlure, moguchun, muscalure, and trimedlure. In an embodiment, the homopteran attractants include rescalure. In an embodiment, the lepidopteran attractants include disparlure. In an embodiment, the straight chain lepidopteran pheromones include codlelure, gossyplure, hexalure, litlure, looplure, orfralure, and ostramone. In an embodiment, the insect attractant is integral to the enclosure. In an embodiment, the base portion includes a transmitter. In an embodiment, the transmitter includes a piezoelectric speaker configured to emit an insect-attracting sound. In an embodiment, the insect-attracting sound includes frequencies in the range of approximately 0.2Hz to 240KHz. In an embodiment, the base includes a switch, the switch configured to allow a user to control a property of the trap. In an embodiment, the property is selected from the group consisting of: power, light intensity, light wavelength or frequency, light flickering, light patterns, and combinations thereof. In an embodiment, the switch includes a mechanical switch, an optical switch, an electronic switch, an electromechanical switch, or a Hall effect sensor. In an embodiment, the enclosure includes a reflective surface. In an embodiment, the adhesive surface is proximate to the reflective surface. In an embodiment, the base portion includes a circuit configured to a varying voltage to the lighting element, wherein the lighting element provides intermittent light to the trap portion. In an embodiment, the enclosure includes an outer surface, the

outer surface at least partially surrounded by sleeve that is configured to reduce the amount of light emitted by the enclosure. In an embodiment, the at least one of the first or second internal surfaces includes a textured surface, the textured surface configured to increase the surface area of the enclosure. In an embodiment, the textured surfaces include ribs extending at least a portion of the length of the first or second internal surfaces. In an embodiment, the at least one of the first or second internal surfaces include a textured surface, the textured surface configured to increase the surface area of the enclosure. In an embodiment, the textured surfaces include ribs extending at least a portion of the length of the first or second internal surfaces. In an embodiment, the trap further includes: a light conducting body located proximate to the second internal surface of the rear housing portion, the light conducting body having a front surface and a rear surface and the light conducting body configured to receive light from the base portion and distribute the light in a predetermined pattern in the enclosure. In an embodiment, the front surface of the light conducting body further includes an adhesive material. In an embodiment, the rear surface of the light reflecting body is configured to reduce the amount of light from being emitted in a predetermined direction. In an embodiment, the light conducting body is tapered, having a thicker depth at a portion proximate to the base portion and a thinner depth at an opposite end. In an embodiment, the rear surface of the light conducting body is configured to reflect light into the light conducting body. In an embodiment, light is reflected multiple times within the light conducting body before being emitted into the enclosure. In an embodiment, the rear surface includes a rear cover or a matte layer. In an embodiment, the base portion further includes an optical enhancer, the optical enhancer configured to direct the light into the trap portion in a predetermined pattern. In an embodiment, the optical enhancer includes a lens. In an embodiment, the enclosure includes an inner sleeve and the base portion includes an outer sleeve, the inner sleeve configured to align with the outer sleeve. In an embodiment, the outer sleeve includes a face plate having an opening. In an embodiment, the face plate opening corresponds to an enclosure opening, the openings providing an alignment means. In an embodiment, the inner sleeve is configured to be dropped into the outer sleeve. In an embodiment, the inner sleeve includes a tab for holding on to the inner sleeve. In an embodiment, the base portion includes a docking switch, the docking switch

configured to activate the lighting element when the trap portion is correctly engaged with the base portion. In an embodiment, the trap portion includes a docking switch activator, the docking switch activator configured to activate the docking switch when the trap portion is correctly engaged with the base portion. In an embodiment, the docking switch includes a mechanical switch, an optical switch, an electronic switch, an electromechanical switch, or a Hall effect sensor.

[583] In an aspect, an insect trap is disclosed including: a trap portion including: an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect, and a lighting element at least partially contained within the enclosure, wherein the lighting element is configured to provide light within the enclosure and wherein the lighting element is configured to communicate with and receive power from a power source; and a base portion configured to removably engage the trap portion and provide access to the power source. In an embodiment, the lighting element includes a plurality of electrical trap contacts and wherein the base portion includes a plurality of electrical base contacts, the trap contacts configured to communicate with the base contacts to provide power to the lighting element. In an embodiment, the base contacts are in communication with the power source. In an embodiment, the lighting element includes a light emitting diode (LED).

[584] In an aspect, a removable insect trap cartridge is disclosed including: an enclosure defining the cartridge, the enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect, wherein the first opening is configured to allow an insect to enter the enclosure, and wherein the enclosure is configured to provide light in a predetermined pattern within the enclosure. In an embodiment, the enclosure further includes a lighting element. In an embodiment, the lighting element includes a light emitting diode (LED). In an embodiment, the lighting element includes an ultraviolet (UV) LED and a blue LED. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein at least one of the first or second internal surfaces is configured to manipulate light. In an embodiment, at least one of the

first or second internal surfaces includes an adhesive surface. In an embodiment, the rear housing portion has a concave surface, the concave surface configured to reflect light evenly within the enclosure. In an embodiment, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion. In an embodiment, the divider portion includes a rear surface having translucent material and includes a front surface having an adhesive surface. In an embodiment, the second internal surface of the rear housing portion includes a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion. In an embodiment, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment, the rear surface of the divider portion is configured to receive the light from the second internal surface of the rear housing portion or directly from a lighting element. In an embodiment, the enclosure includes a bottom surface, the bottom surface configured to be removably received in a pluggable base. In an embodiment, wherein the enclosure includes biodegradable materials. In an embodiment, the enclosure includes an outer surface, the outer surface including a decorative element. In an embodiment, the decorative element includes a shape selected from the group consisting of: a flower, a plant, a shell, a company logo, a sports team logo, a football, a basketball, a soccer ball, a hockey puck, a football helmet or a hockey stick. In an embodiment, the trap portion includes an insect attractant. In an embodiment, the insect attractant is selected from the group consisting of: sorbitol, coleopteran attractants, dipteran attractants, homopteran attractants, lepidopteran, straight chain lepidopteran pheromones, eugenol, methyl eugenol, and siglure. In an embodiment, the insect attractant is detectable by an insect at a distance of approximately 2 meters from the cartridge. In an embodiment, the enclosure includes a textured surface, the textured surface configured to increase the surface area of the enclosure. In an embodiment, the

textured surface includes ribs extending at least a portion of the length of the enclosure. In an embodiment, the cartridge further includes: a light conducting body located within the enclosure, the light conducting body configured to receive light and distribute the light in a predetermined pattern in the enclosure. In an embodiment, the enclosure includes an inner sleeve that is configured to be received into and aligned with an outer sleeve. In an embodiment, the outer sleeve includes a face plate having an opening. In an embodiment, the face plate opening corresponds to an enclosure opening, the openings providing an alignment means. In an embodiment, the inner sleeve includes a tab for holding on to the inner sleeve. In an embodiment, the cartridge includes a docking switch activator, the docking switch activator configured to activate a docking switch when the cartridge is correctly engaged with a base portion. In an embodiment, the docking switch activator includes a mechanical switch, an optical switch, an electronic switch, an electromechanical switch, or a Hall effect sensor.

[585] In an aspect, a method is disclosed including: providing a base portion of an insect trap; providing a first trap portion of an insect trap, wherein the first trap portion includes an opening; mounting the first trap portion to the base portion; coupling the base portion to a power source to provide power to a lighting element, wherein the lighting element is within the base portion or first trap portion and wherein the lighting element is configured to attract an insect into the first trap portion; and receiving an insect into the first trap portion through the opening. In an embodiment, the method further includes: separating the first trap portion from the base portion; and disposing of the first trap portion, wherein the insect remains in the disposed first trap portion. In an embodiment, the first trap portion is disposed without the human contact with the insect in the first trap portion. In an embodiment, the first trap portion includes an adhesive surface and wherein the insect adheres to the adhesive surface. In an embodiment, the base portion includes a docking switch, wherein the docking switch is configured to activate the lighting element when the first trap portion is correctly mounted to the base portion. In an embodiment, upon separating the first trap portion from the base portion, the lighting element is powered off. In an embodiment, upon separating the first trap portion from the base portion, the lighting element is partially shielded from emitting light. In an embodiment, the method further includes: providing a second trap portion of an insect trap, wherein the second trap

portion includes an opening; and mounting the second trap portion to the base portion. In an embodiment of the fourth aspect, the first insect trap and second insect trap have different configurations.

[586] In an aspect, a docking apparatus is disclosed including: a docking structure configured to activate in response to a docking activator, the docking activator located on a separate piece configured to engage the docking structure, wherein the docking structure is in communication with a power source and is configured to control power to a lighting element. In an embodiment, the docking activator includes a surface, a protrusion, a tab or a magnet. In an embodiment, the docking structure is configured to close when the docking activator engages with it and is configured to open when the docking activator disengages from it. In an embodiment, the docking structure is configured to activate in response to pressure from the docking activator. In an embodiment, the docking structure is configured to activate in response to displacement from the docking activator.

[587] In an aspect, a removable insect trap cartridge is disclosed including: an enclosure defining the cartridge, the enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect, and a docking activator, the docking activator configured to engage a docking structure in a mounting portion.

[588] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion in a primary direction, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; and wherein the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, the divider portion configured to be at an acute angle in relation to the primary direction of the light. In an embodiment, the acute angle is from about 0 degrees to 45 degrees from a plane in the primary direction of the light. In an

embodiment, the divider portion includes a rear surface including translucent material and includes a front surface including an adhesive surface. In an embodiment, the rear surface of the divider portion is configured to receive the light from the second internal surface of the rear housing portion or directly from the lighting element. In an embodiment, the divider portion is configured to receive light at an oblique angle and spread across the divider portion. In an embodiment, the divider portion is configured to manipulate light. In an embodiment, the second internal surface of the rear housing portion includes a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion. In an embodiment, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment, the divider portion includes a planar or contoured shape, wherein the shape of the divider portion is configured to optimize light distribution.

[589] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; wherein the base portion includes a snap protrusion and wherein the trap portion includes a snap recess for receiving the snap protrusion, wherein when the snap protrusion is received by the trap portion, the base portion and trap portion are engaged in a snap fit, the snap fit configured to provide positive tactile or audible cue to a user that the trap is properly engaged. In an embodiment, the snap fit is engageable and disengageable by a force of less than about 50 Newtons. In an embodiment, the snap fit allows a user to engage or disengage the trap portion with the base portion using a single hand. In an embodiment of the second aspect, the base portion is configured to remain upright when placed on a horizontal surface. In an embodiment, the base portion includes a bottom flat surface or legs to enable base portion to remain upright.

[590] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; wherein the enclosure includes: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, the second internal surface including a transparent, translucent or opaque adhesive coating. In an embodiment, the second internal surface further includes a reflective coating under the adhesive coating. In an embodiment, the lighting element includes an ultraviolet (UV) light emitting diode (LED) or blue LED, and wherein the lighting element transmits light directly onto the adhesive coating of the rear housing portion.

[591] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to at least partially protrude into the trap portion from the base portion and provide light to the trap portion when engaged with the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion. In an embodiment, the lighting element includes a fluorescent source, incandescent source, light emitting diode (LED), or combinations thereof. In an embodiment, trap portion further includes a sleeve configured to receive the lighting element protruding into the trap portion. In an embodiment, the sleeve includes a transparent, translucent, or opaque sleeve. In an embodiment, the sleeve includes an opening and a tapered section, the opening located proximate to the base portion, from which the lighting element protrudes. In an embodiment, the tapered section of the sleeve is configured to guide the lighting element into the sleeve. In an embodiment, the sleeve is constructed from a semi-rigid material

sufficient to provide a protective covering for the lighting element. In an embodiment, the sleeve further includes an opaque coating, the opaque coating configured to prevent light from transmitting directly from lighting element into the trap portion. In an embodiment, trap portion further includes an opaque sleeve configured to receive the lighting element protruding into the trap portion. In an embodiment, the trap portion further includes a semi-rigid sleeve configured to receive the lighting element protruding into the trap portion and configured to guide the lighting element into the sleeve. In an embodiment, the sleeve includes plastic or metal wire mesh. In an embodiment, the sleeve is configured to prevent the lighting element from contacting the adhesive surface. In an embodiment, the lighting element is configured to emit light and wherein the sleeve is configured to transmit the emitted light into the enclosure and onto the adhesive surface. In an embodiment, the sleeve is further configured to diffuse light from lighting element.

[592] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; and wherein the trap is configured to be placed on top of a flat surface and receive crawling insects through the first opening in the enclosure. In an embodiment, the mounting portion includes an electrical cord in communication with an electrical plug having rigid conductors protruding substantially perpendicularly and directly from the plug, wherein the conductors are insertable into an electrical power outlet. In an embodiment, the trap portion includes a bottom plate having a top surface and a bottom surface. In an embodiment, the top surface of the bottom plate includes a transparent, translucent, or opaque adhesive coating. In an embodiment, the bottom surface of the bottom plate is configured to prevent insects from crawling under the trap when the trap is placed on top of a flat surface. In an embodiment, the bottom surface is planar or planar at its perimeter. In an embodiment, the enclosure

includes: a top housing portion having a first internal surface; a bottom housing portion having a second internal surface; and a divider portion disposed at least partially between the top housing portion and bottom housing portion, wherein the top housing portion and bottom housing portion are matingly engaged with each other to form the enclosure; and wherein the divider portion divides the enclosure into a top enclosure portion and a bottom enclosure portion. In an embodiment, the second internal surface includes a portion of a bottom plate and includes a reflective coating. In an embodiment, the divider portion includes a top surface and a bottom surface, and wherein the top surface is at least partially coated with a transparent or translucent adhesive. In an embodiment, the first opening in the trap portion is located in the top enclosure portion and wherein insects become trapped to the adhesive on the divider portion. In an embodiment, the lighting element emits light, which is received into the top enclosure on the first internal surface of the housing and a top surface of the divider portion. In an embodiment, the divider portion includes a divider opening that corresponds to the first opening in the housing portion. In an embodiment, the second internal surface includes a portion of a bottom plate and includes an adhesive coating. In an embodiment, insects become trapped to the adhesive coating on the bottom plate after crawling through the first opening and divider opening. In an embodiment, the trap further includes a light-diffusing member located within the top enclosure portion, the light-diffusing member having light-diffusing characteristics. In an embodiment, the light-diffusing member includes a transparent or translucent material. In an embodiment, the light-diffusing member includes surface features that aid in light-diffusion. In an embodiment, the light-diffusing member includes a flexible sheet configured to conform to inner surfaces of the top enclosure portion. In an embodiment, the light-diffusing member is configured to be received by a recess in the divider portion. In an embodiment, the light-diffusing member is configured to transmit light evenly through the divider portion and into the bottom enclosure portion.

[593] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to

the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the trap portion includes an insect attractant module having a removable cover. In an embodiment, the removable cover includes a pull tab and webbing and wherein the enclosure includes a tab slot for receiving the removable pull tab. In an embodiment, the insect attractant module includes a disposable cup, the disposable cup being covered by webbing until the pull tab is engaged. In an embodiment, engaging the pull tab includes pulling the pull tab at the tab slot until the webbing is separated from the cup. In an embodiment, the removable cover provides an airtight seal to the insect attractant module while it is intact. In an embodiment, the insect attractant module includes a carrier material and one or more insect attractants. In an embodiment, the carrier material and insect attractant is configured to release an insect-attracting scent for a predetermined period of time. In an embodiment, the predetermined period of time includes a week, a month, or up to three months. In an embodiment, the predetermined period of time includes the life of the trap. In an embodiment, the released insect-attracting scent changes over time. In an embodiment, a first insect-attracting scent is released for a first time period and wherein a second insect-attracting scent is released for a second time period. In an embodiment, a first insect-attracting scent is released for a first time period at a first concentration and wherein the first insect-attracting scent is released for a second time period at a second concentration. In an embodiment, the carrier material is configured to release one or more masking scents, the masking scents configured to mask the insect-attractants to humans and/or non-intended animals. In an embodiment, the trap further includes a heating element, the heating element configured to warm the insect attractant module and aid in the release of insect attractants. In an embodiment, the heating element includes a circuit board located within the base portion of the trap. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion, and wherein the insect attractant module is located in the rear

housing portion. In an embodiment, the removable cover includes a pull tab and webbing and wherein the divider portion includes a slot and the front enclosure includes a tab slot for receiving the removable pull tab, the pull tab extending through the divider portion slot and front enclosure tab slot. In an embodiment, the divider portion and front housing portion includes a plurality of openings that allow insect attract from insect attractant module to be emitted from the trap.

[594] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the trap portion includes an insect attractant module configured to automatically release an insect attractant when the trap portion is engaged with the base portion. In an embodiment, the insect attractant module includes a disposable cup, the disposable cup being covered by a penetrateable lid. In an embodiment, the base portion includes a punch configured to puncture the penetrateable lid and/or disposable cup.

[595] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the trap includes a transmitter configured to emit insect-attracting sounds or vibrations. In an embodiment, the base portion includes a second opening, the second opening providing a mounting surface for the transmitter. In an embodiment, the transmitter includes an electromechanical actuator or a piezoelectric speaker. In an embodiment, the transmitter is configured to cause the trap to vibrate and amplify the insect-

attracting sounds or vibrations. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, the divider portion having a front surface proximate to the front housing portion and a rear surface proximate to the rear housing portion; wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion, and wherein the transmitter is connected to the rear surface of the divider portion. In an embodiment, the trap further includes a circuit board located within the base portion of the trap, the circuit board in electrical communication with the transmitter when the trap portion and base portion are engaged. In an embodiment, the transmitter includes an electromechanical actuator or a piezoelectric speaker. In an embodiment, the insect-emitting sounds or vibrations attract mosquitoes, midges, moths, or flies. In an embodiment, the insect-emitting sounds or vibrations include an insect call, reply, courtship or copulatory songs. In an embodiment, the circuit board is configured to send electrical pulses to the transmitter and configured to receive electrical response signals from the transmitter, the response signals indicative of insect volume within the trap. In an embodiment, the electrical response signals are partially caused by the insect volume stuck to the adhesive surface and in communication with the divider portion. In an embodiment, the electrical pulses cause the divider portion to vibrate, the vibration being affected by the insect volume stuck to the adhesive surface and in communication with the divider portion. In an embodiment, upon the insect volume reaching a predetermined threshold, the circuit board is configured to provide an audible or visual indication to a user. In an embodiment, the visual indication includes a light blinking or a predetermined light color illuminated. In an embodiment, the audible indication includes a tone or chime. In an embodiment, the front housing further includes a polarizing reflective bottom surface in the front enclosure. In an embodiment, the polarizing reflective surface mimics the surface of water. In an embodiment, the polarizing reflective surface includes ridges or subfeatures.

[596] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a

mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the base portion includes an opening, the opening configured to allow light to emit from the base portion to the trap portion, wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein a portion of the lighting element protrudes through the opening into the trap portion from the base portion and provides light to the trap portion when engaged with the trap portion. In an embodiment, the opening in the base portion includes a transparent or translucent window. In an embodiment, the opening in the base portion is configured to provide a mounting surface for a light detector. In an embodiment, the light detector includes a photosensor, photovoltaic cell, phototransistor, photoresistor, or photodiode. In an embodiment, the trap further includes: a circuit board located within the base portion of the trap, the circuit board in electrical communication with the lighting element and light detector when the trap portion and base portion are engaged. In an embodiment, the circuit board is configured to detect changes in the electrical properties of the light detector, the changes indicative of insect volume within the trap. In an embodiment, upon the insect volume reaching a predetermined threshold, the circuit board is configured to provide a visual indication to a user. In an embodiment, the visual indication includes a light blinking or a predetermined light color illuminated.

[597] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; and wherein the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, the divider portion including

text or graphics configured to provide light and dark contrast areas for attracting insects. In an embodiment, the text or graphics is applied by printing, hot stamping, silk screening, embossing, engraving, or molding. In an embodiment of the tenth aspect, the text or graphics include fluorescent pigments that appear to glow when illuminated.

[598] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith; and wherein the enclosure further includes an electroluminescent body or surface configured to receive light from the base portion and distribute the light in a predetermined pattern in the enclosure.

[599] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element includes an array of light emitting diodes (LEDs) and is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the base portion includes a rear housing having a reflective surface, the reflective surface configured to act as a barrier in the rear direction to light emitted from the LEDs. In an embodiment, the base portion includes a transparent or translucent window, the window configured to allow light to emit from the base portion to the trap portion. In an embodiment, the window is further configured to protect the reflective surface of rear housing and LEDs from dust and debris.

[600] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive

surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element, a mounting portion and a docking switch, wherein the lighting element is configured to provide light to the trap portion and wherein the mounting portion is configured to communicate with and receive power from a power source, and; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, wherein the docking switch is configured to activate the lighting element when the trap portion is correctly engaged with the base portion and block light from the lighting element when the trap portion is not properly engaged with the base portion. In an embodiment, the base portion further including a screen, the screen configured to block at least a portion of light from the lighting element when screen is activated. In an embodiment, wherein the screen includes a liquid crystal display (LCD).

[601] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; and a first heating element in communication with the power source, wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the first heating element provides heat to at least a portion of the trap when the trap is engaged. In an embodiment, the first heating element is located on a circuit in the base portion. In an embodiment, the circuit is configured to supply a constant or intermittent voltage to the lighting element. In an embodiment, the first heating element includes at least one of resistors, resistance heating elements, or heat exchanging elements. In an embodiment, the first heating element maintains a temperature of at least approximately 30°C in at least a portion of the trap. In an embodiment, the first heating element maintains a temperature of between approximately 30°C and 45°C in at least a portion of the trap. In an embodiment, the first heating element maintains a temperature of between approximately 33°C and 42°C in at least a portion of the trap. In an embodiment, the lighting element includes a second

heating element, the second heating element configured to assist the first heating element in providing heat to the trap. In an embodiment of the first aspect, the lighting element includes one or more light emitting diodes (LEDs), incandescent light bulbs, or combinations thereof. In an embodiment, the lighting element includes a second heating element, the second heating element configured to replace the first heating element in providing heat to the trap. In an embodiment, the lighting element includes one or more light emitting diodes (LEDs), incandescent light bulbs, or combinations thereof. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein at least one of the first or second internal surfaces is configured to manipulate light, and wherein the base portion includes: an opening, the opening configured to allow light to emit from the base portion to the enclosure such that the light diverges over substantially the second internal surface. In an embodiment, the opening is proximate to the lighting element and the light diverges in a predetermined pattern over the second internal surface. In an embodiment, the enclosure includes: a front housing portion having a first internal surface; a rear housing portion having a second internal surface; and a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the front housing portion and rear housing portion are matingly engaged with each other to form the enclosure; and wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion, and wherein the base portion includes: an opening, the opening configured to allow light to emit from the base portion to the enclosure such that the light diverges over substantially the second internal surface. In an embodiment, the opening is proximate to the lighting element and the light diverges in a predetermined pattern over the second internal surface. In an embodiment, the trap portion includes an insect attractant. In an embodiment, the first heating element enhances the release of the insect attractant. In an embodiment, the insect attractant is selected from the group consisting of: water, water vapor, sugar, sugar solution, molasses, honey, yeast, insect-attracting scents, pheromones, and combinations thereof. In an embodiment, the first heating

element enhances the release of water vapor. In an embodiment, the first heating element enhances the release of carbon dioxide.

[602] In an aspect, an insect trap is disclosed including: a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and a base portion including a lighting element and a mounting portion, wherein the lighting element is configured to provide light to the trap portion, and wherein the mounting portion is configured to communicate with and receive power from a power source; wherein the trap portion is configured to removably engage with the base portion and receive light from the base portion when engaged therewith, and wherein the trap portion includes an insect attractant module having a removable cover and one or more insect attractants, wherein at least one of the insect attracts includes water, water vapor, sugar, sugar solution, molasses, honey, yeast, insect-attracting scents, pheromones, and combinations thereof. In an embodiment, the removable cover includes a pull tab and webbing and wherein the enclosure includes a tab slot for receiving the removable pull tab. In an embodiment, the insect attractant module includes a container, the container being covered by webbing until the pull tab is engaged. In an embodiment, the insect attractant module further includes a carrier material inside the container. In an embodiment, the carrier material includes a solid, a liquid, a gel, or combinations thereof. In an embodiment, at least one insect attractant is embedded in the carrier material. In an embodiment, water or water vapor is embedded in the carrier material. In an embodiment, at least one insect attractant is located in the container. In an embodiment, the insect attractant is configured to release an insect-attracting scent for a predetermined period of time. In an embodiment, the predetermined period of time includes a week, a month, or up to three months. In an embodiment, the predetermined period of time includes the life of the trap. In an embodiment, the released insect-attracting scent changes over time. In an embodiment, a first insect-attracting scent is released for a first time period and wherein a second insect-attracting scent is released for a second time period. In an embodiment, a first insect-attracting scent is released for a first time period at a first concentration and wherein the first insect-attracting scent is released for a second time period at a second concentration. In an embodiment, the insect attractant module is

configured to release one or more masking scents, the masking scents configured to mask the insect-attractants to humans and/or non-intended animals. In an embodiment, the trap further includes a heating element, the heating element configured to warm the insect attractant module and aid in the release of insect attractants. In an embodiment, the heating element includes a circuit component located within the base portion of the trap. In an embodiment, the heating element maintains a temperature of at least approximately 30°C in at least a portion of the trap. In an embodiment, the heating element maintains a temperature of between approximately 30°C and 45°C in at least a portion of the trap. In an embodiment, the heating element maintains a temperature of between approximately 33°C and 42°C in at least a portion of the trap.

[603] Insect traps disclosed herein may attract and trap insects effectively and efficiently. They may be less costly than existing traps. They may be small enough to fit wherever needed, and be conveniently movable from one location to another. They may protrude minimally when mounted on a wall. The removable and replaceable trap portions may be attractive in appearance, but also be inexpensive and disposable, and may be easy for the user to maintain without touching trapped insects or adhesive.

[604] The above description of the disclosed embodiments is provided to enable any person skilled in the art to make or use the disclosure. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the generic principles described herein can be applied to other embodiments without departing from the spirit or scope of the disclosure. Thus, it is to be understood that the description and drawings presented herein represent exemplary embodiments of the disclosure and are therefore representative of the subject matter, which is broadly contemplated by the present disclosure. It is further understood that the scope of the present disclosure fully encompasses other embodiments and that the scope of the present disclosure is accordingly limited by nothing other than the appended claim.

CLAIMS

What is claimed is:

1. An insect trap comprising:

a trap portion including a frame and a membrane having an adhesive surface, wherein the membrane is at least partially contained within the frame and is configured to adhere to an insect; and

a base portion including a lighting element and a housing portion, wherein the housing portion is configured to receive and retain the trap portion when engaged therewith.

2. The insect trap of claim 1, wherein the housing portion of the base portion includes one or more alignment guides for receiving the trap portion.

3. The insect trap of claim 1, wherein the alignment guides comprise side channels, slots, flanges, or recesses.

4. The insect trap of claim 1, wherein the frame of the trap portion comprises a border that substantially surrounds the periphery of the membrane.

5. The insect trap of claim 4, wherein the border of the trap portion surrounds one, two, or three sides of the membrane.

6. The insect trap of claim 4, wherein the border of the trap portion comprises side flanges and is configured to be received into one or more alignment guides on the housing portion of the base portion.

7. The insect trap of claim 4, wherein the frame further comprises a tab that is configured to allow a user to insert and remove the trap portion from base portion.

8. The insect trap of claim 7, wherein the trap portion is configured to removably engage with the base portion via the tab.

9. The insect trap of claim 1, wherein the base portion further comprises an enclosure, the enclosure at least partially surrounding the trap portion and including a first opening that is configured to allow an insect to enter into the enclosure.

10. The insect trap of claim 1, wherein the lighting element is located in front of the trap portion.

11. The insect trap of claim 10, wherein the enclosure comprises a second opening configured to allow light to emit from the enclosure.

12. The insect trap of claim 11, wherein the enclosure is configured to distribute the light in a predetermined pattern.

13. The trap of claim 1, wherein the base portion further comprises a mounting portion configured to communicate with and receive power from a power source.

14. The insect trap of claim 1, wherein the trap portion further comprises a cover configured to cover at least a portion of the membrane of the trap portion when the trap portion is not engaged with the base portion.

15. The insect trap of claim 14, wherein the trap portion further comprises a hinge, the hinge configured to allow the cover to swing into an open position and a closed position.

16. The insect trap of claim 15, wherein when the cover is in an open position, the cover is located behind the membrane, thereby exposing the adhesive surface.

17. The insect trap of claim 15, wherein when the cover is in a closed position, the cover is located in front of the membrane, thereby covering at least a portion of the adhesive surface.

18. The insect trap of claim 14, wherein the cover comprises one or more engagement features for securing the cover to the frame.

19. The insect trap of claim 18, wherein the frame comprises one or more receiving features for securing the cover to the frame.

20. The insect trap of claim 18, wherein the engagement features comprise: ribs, bumps, lips, protrusions, and recesses.

21. The insect trap of claim 18, wherein the receiving features comprise: ribs, bumps, lips, protrusions, and recesses.

22. The insect trap of claim 14, wherein the cover comprises: a tambour, a roller blind, a solid plate, a shutter, or one or more slats.

23. The insect trap of claim 14, wherein the cover is configured to automatically cover at least a portion of the membrane of the trap portion upon removal of the trap portion from the base portion.

24. The insect trap of claim 14, wherein the cover is configured to automatically uncover the membrane of the trap portion upon engagement of the trap portion with the base portion.

25. The insect trap of claim 1, wherein the lighting element comprises a light emitting diode (LED).

26. The insect trap of claim 25, wherein the lighting element comprises an ultraviolet (UV) LED and a blue LED.

27. The insect trap of claim 1, wherein the trap portion comprises an insect attractant.

28. The insect trap of claim 27, wherein the insect attractant is selected from the group consisting of: sorbitol, coleopteran attractants, dipteran attractants, homopteran attractants, lepidopteran, straight chain lepidopteran pheromones, eugenol, methyl eugenol, and siglure.

29. The insect trap of claim 1, wherein the trap portion further comprises a reflective surface.

30. The insect trap of claim 29, wherein the membrane comprises a reflective surface.

31. An insect trap comprising:

a trap portion including:

an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect, the enclosure further comprising a visual indicator integral to the enclosure, the visual indicator providing an indication of trap life remaining; and

one or more insect-attracting substances, and

a base portion configured to removably engage the trap portion.

32. The insect trap of claim 31, the trap portion further comprising a removable tab covering the one or more insect-attracting substances, wherein upon removal of the tab, the one or more insect-attracting substances is released from the trap.

33. The insect trap of claim 31, wherein the visual indicator comprises a visible level of the one or more insect-attracting substances in the trap portion.

34. The insect trap of claim 31, wherein the one or more insect-attracting substances comprises an insect attractant and a carrier material.

35. The insect trap of claim 34, wherein the carrier material is configured to change color when the insect attractant is depleted.

36. The insect trap of claim 31, the base portion further comprising:

a mounting portion configured to communicate with and receive power from a power source; and

a heating element configured to receive power from the power source and heat the one or more insect-attracting substances in the trap portion.

37. The insect trap of claim 36, the base portion further comprising:

a circuit board having a programmable processor for executing commands related to the operating settings of the insect trap,

wherein the circuit board is in communication with the heating element and is configured to monitor an electrical property of the one or more insect-attracting substances.

38. The insect trap of claim 37, wherein the circuit board is configured to provide the visual indicator when an electrical property of the one or more insect-attracting substances exceeds or drops below a threshold value.

39. The insect trap of claim 38, further comprising a lighting element in communication with the circuit board, the circuit board configured to cause the lighting element to flash or change color as the visual indicator when the one or more insect-attracting substances is depleted.

40. The insect trap of claim 38, further comprising a speaker in communication with the circuit board, the circuit board configured to cause the speaker to make an audible noise when the one or more insect-attracting substances is depleted.

41. The insect trap of claim 36, wherein the heating element comprises: an electrical contact, an electrical resistance coil, one or more resistors, one or more infrared LEDs, one or more Peltier or Thompson effect devices, a metal-oxide film, or a printed conductive ink.

42. The insect trap of 37, wherein the processor is configured to receive commands wirelessly from a user and execute said commands related to the operating settings of the insect trap.

43. The insect trap of claim 42, wherein the commands from the user can be sent via a mobile device.

44. The insect trap of claim 31, the base portion further comprising:

a mounting portion configured to communicate with and receive power from a power source; and

a sensor configured to receive power from the power source and monitor an electrical property of the one or more insect-attracting substances.

45. The insect trap of claim 44, the base portion further comprising:

a circuit board having a programmable processor for executing commands related to the operating settings of the insect trap;

wherein the circuit board is in communication with the sensor.

46. The insect trap of claim 45, wherein the circuit board is configured to provide the visual indicator when an electrical property of the one or more insect-attracting substances exceeds or drops below a threshold value.

47. The insect trap of claim 46, further comprising a lighting element in communication with the circuit board, the circuit board configured to cause the lighting element to flash or change color as the visual indicator when the one or more insect-attracting substances is depleted.

48. The insect trap of claim 46, further comprising a speaker in communication with the circuit board, the circuit board configured to cause the speaker to make an audible noise when the one or more insect-attracting substances is depleted.

49. The insect trap of claim 44, wherein the sensor comprises: a voltage detector, a current detector, an impedance detector, a pH sensor, or a moisture detector.

50. An insect trap comprising:

a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect;

a base portion configured to removably engage the trap portion; and

a removable insect attractant cartridge configured to be received in the trap portion or base portion.

51. The insect trap of claim 50, wherein the base portion comprises an opening configured to receive the insect attractant cartridge.

52. The insect trap of claim 50, further comprising a heating element in communication with the removable insect attractant cartridge, the heating element configured to increase the rate at which the insect attractant is released.

53. The insect trap of claim 50, wherein the insect attractant cartridge comprises: a scent cartridge, a double scent cartridge, a single chamber container, or a double chamber container.

54. The insect trap of claim 53, wherein the insect attractant cartridge comprises a single or double chamber container and wick and wherein the insect attractant comprises an evaporable liquid attractant.

55. The insect trap of claim 54, wherein the single or double chamber is transparent or translucent, allowing a user to view the level of the evaporable liquid attractant.

56. The insect trap of claim 55, wherein the evaporable liquid attractant comprises a colored or dyed liquid.

57. The insect trap of claim 54, wherein the single or double chamber comprises a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of liquid attractant in the chamber.

58. The insect trap of claim 53, wherein the insect attractant cartridge further comprises an attachment portion configured to attach to the insect trap.

59. The insect trap of claim 54, the insect trap further comprising a heating element in communication with the wick, wherein the heating element heats the insect attractant by radiation, conduction, or convection.

60. The insect trap of claim 53, wherein the insect attractant cartridge comprises a double chamber container and wicks, and wherein the double chamber is configured to hold two different insect attractants, one part each of a two-part insect attractant, or an insect attractant and neutralizer.

61. The insect trap of claim 60, wherein the double chamber releases a first insect attractant at a first time and a second insect attractant at a second time.

62. The insect trap of claim 61, wherein the first and second insect attractants are released at intermittent time intervals.

63. The insect trap of claim 50, the base portion further comprising:

a protrusion configured to puncture the removable insect attractant cartridge.

64. An insect trap comprising:

a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect; and

a base portion configured to removably engage the trap portion with a plurality of engagement features.

65. The insect trap of claim 64, wherein the engagement features comprise a snap and a hook located on the base portion of the trap.

66. The insect trap of claim 65, wherein the engagement features further comprises a snap recess and a hook recess located on the trap portion of the trap.

67. The insect trap of claim 64, wherein the trap further comprises grip features on the trap portion and/or base portion.

68. The insect trap of claim 67, wherein the grip features comprise: side recesses for fingers, grooves, ribs, bumps, or waves.

69. The insect trap of claim 64, the base portion further comprising:

a mounting portion configured to communicate with and receive power from a power source,

wherein the base portion includes a recessed area proximate to the mounting portion, allowing the insect trap to be flush with a wall when mounted thereto.

70. The insect trap of claim 64, wherein the enclosure further comprises a second opening, the first opening located on a front surface of the enclosure and the second opening located on a side surface of the enclosure.

71. An insect trap comprising:

a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect and wherein the enclosure comprises:

a front housing portion;

a rear housing portion; and

a divider portion disposed at least partially between the front housing portion and rear housing portion, wherein the divider portion divides the enclosure into a front enclosure portion and a rear enclosure portion;

a base portion configured to removably engage the trap portion; and

an evaporable insect attractant located in the enclosure.

72. The insect trap of claim 71, wherein the evaporable attractant comprises a solid, a liquid, a gel, or a suspension.

73. The insect trap of claim 71, wherein the evaporable insect attractant is located in the rear enclosure portion of the trap portion.

74. The insect trap of claim 73, wherein trap portion further comprises a protective cap over the rear enclosure portion to prevent the evaporable insect attractant from escaping the trap when not engaged.

75. The insect trap of claim 73, wherein the rear enclosure portion further comprises a wick for evaporating the evaporable insect attractant.

76. The insect trap of claim 75, wherein the base portion further comprises:

a heating element in communication with the wick, wherein the heating element heats the insect attractant by radiation, conduction, or convection.

77. The insect trap of claim 76, wherein the base portion further comprises:

a mounting portion configured to communicate with and receive power from a power source,

wherein the heating element is configured to receive power from the power source and heat at least a portion of the wick.

78. The insect trap of claim 76, wherein the front enclosure portion of the trap portion comprises a plurality of openings in communication with the base portion, the openings

configured to allow for evaporated insect attractant to move from the base portion into the trap portion.

79. The insect trap of claim 78, wherein the evaporated insect attractant is emitted from the first opening in the trap portion.

80. The insect trap of claim 71, wherein the divider portion comprises a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of insect attractant in the trap.

81. The insect trap of claim 71, wherein the insect attractant comprises a colored or dyed liquid.

82. The insect trap of claim 71, wherein the divider portion comprises a first membrane and

and a protrusion configured to puncture the first membrane.

83. The insect trap of claim 82, wherein the divider portion comprises a second membrane.

84. The insect trap of claim 83, wherein the first membrane comprises a barrier membrane and wherein the second membrane comprises an absorbable membrane.

85. The insect trap of claim 84, wherein the absorbable membrane is proximate to rear enclosure portion and wherein rear enclosure portion holds the evaporable insect attractant.

86. The insect trap of claim 85, wherein the absorbable membrane is configured to absorb the evaporable insect attractant when the protrusion punctures the barrier membrane.

87. The insect trap of claim 71, wherein the divider portion comprises a visual indicator, wherein the visual indicator provides one or more level lines indicative of the volume of insect attractant in the trap.

88. The insect trap of claim 87, wherein the base portion comprises a lighting element configured to provide light to the enclosure and wherein the lighting element is configured to communicate with and receive power from a power source.

89. An insect trap comprising:

a trap portion including an enclosure having an adhesive surface and a first opening, wherein the adhesive surface is at least partially contained within the enclosure and is configured to adhere to an insect;

a base portion configured to removably engage the trap portion; a

a reservoir assembly configured to be received in the trap portion or base portion; and

a punch configured to puncture reservoir assembly and activate the contents of reservoir assembly.

90. The insect trap of claim 89, wherein the reservoir assembly is located within the trap portion and the punch is located on the base portion.

91. The insect trap of claim 89, wherein the punch has a plurality of grooves that extend a portion of the length of the punch.

92. The insect trap of claim 89, wherein the punch is configured to act as a seal against the reservoir assembly when the reservoir assembly is punctured.

93. The insect trap of claim 89, wherein the reservoir assembly comprises a first chamber and a second chamber.

94. The insect trap of claim 93, wherein the first chamber comprises a water and sugar solution and the second chamber comprises a yeast culture.

95. The insect trap of claim 94, wherein the punch is configured to puncture a passageway from the first chamber into the second chamber.

96. The insect trap of claim 95, wherein the activated contents of the reservoir assembly produce carbon dioxide.

97. The insect trap of claim 96, wherein the carbon dioxide is emitted from the first opening in the trap portion.

98. A insect trap comprising:

a trap portion including a housing having an adhesive surface, wherein the adhesive surface is at least partially contained within the housing and is configured to adhere to an insect; and

a base portion including:

a mounting portion configured to communicate with and receive power from a power source, and

a heating element configured to receive power from the power source and heat the adhesive surface of the trap portion,

wherein the base portion is configured to removably engage the trap portion.

99. The insect trap of claim 98, wherein the heating element comprises one or more heating wires configured to provide the adhesive surface with a predetermined heating profile.

100. The insect trap of claim 99, wherein the one or more heating wires are arranged in a pattern comprising a concentric pattern, a vertical pattern, a horizontal pattern, or a labyrinthine pattern.

101. The insect trap of claim 99, wherein the predetermined heating profile comprises a uniform pattern or non-uniform pattern.

102. The insect trap of claim 99, wherein the one or more heating wires are constructed from conductive polymers, self correcting conductive polymers, metals, or metal oxides.

103. The insect trap of claim 99, wherein the heating wires are configured to maintain a temperature of the adhesive surface at approximately 30 °C to approximately 45 °C.

104. The insect trap of claim 103, wherein the heating wires are configured to maintain a temperature of the adhesive surface at approximately 33 °C to approximately 42 °C.

105. The insect trap of claim 98, wherein the base portion further comprises a lighting element configured to illuminate the adhesive surface of the trap portion.

106. A insect trap comprising:

a trap portion including:

a housing having an adhesive surface, wherein the adhesive surface is at least partially contained within the housing and is configured to adhere to an insect,

a heating element configured to heat the adhesive surface; and

a base portion including a mounting portion configured to receive power from a power source and configured to provide the power to the heating element,

wherein the base portion is configured to removably engage the trap portion.

107. The insect trap of claim 106, wherein the heating element comprises one or more heating wires configured to provide the adhesive surface with a predetermined heating profile.

108. The insect trap of claim 107, wherein the one or more heating wires are arranged in a pattern comprising a concentric pattern, a vertical pattern, a horizontal pattern, or a labyrinthine pattern.

109. The insect trap of claim 107, wherein the predetermined heating profile comprises a uniform pattern or non-uniform pattern.

110. The insect trap of claim 107, wherein the one or more heating wires are constructed from conductive polymers, self correcting conductive polymers, metals, or metal oxides.

111. The insect trap of claim 107, wherein the heating wires are configured to maintain a temperature of the adhesive surface at approximately 30 °C to approximately 45 °C.

112. The insect trap of claim 111, wherein the heating wires are configured to maintain a temperature of the adhesive surface at approximately 33 °C to approximately 42 °C.

113. The insect trap of claim 106, wherein the base portion further comprises a lighting element configured to illuminate the adhesive surface of the trap portion.