Insect Trap Device and Method of Using

TECHNICAL FIELD

[0001] 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

[0002] The present application is related to U.S. provisional patent application no. 61/771,774, entitled "Insect Trap Device and Method of Using" filed March 1, 2013, and U.S. provisional patent application no. 61/787,629, entitled "Insect Trap Device and Method of Using" filed March 15, 2013, which are incorporated herein by reference in their entirety. 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.

[0003] The present application claims the benefit of U.S. provisional patent application no. 61/910,023, entitled "Insect Trap Device and Method of Using" filed November 27, 2013, and U.S. provisional patent application no. 61/916,257, entitled "Insect Trap Device and Method of Using" filed December 15, 2013, which are incorporated herein by reference in their entirety.

BACKGROUND

[0004] 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

[0005] 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.

[0006] In a first 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 comprises: 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 of the first aspect, the divider portion includes a rear surface comprising translucent material and includes a front surface comprising an adhesive surface. In an embodiment of the first aspect, 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 of the first aspect, the divider portion is configured to receive light at an oblique angle and spread across the divider portion. In an embodiment of the first aspect, the divider portion is configured to manipulate light. In an embodiment of the first aspect, the second internal surface of the rear housing portion comprises a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion. In an embodiment of the first aspect, light is transmitted through the adhesive surface, illuminating the adhesive surface to attract an insect to the adhesive surface. In an embodiment of the first aspect, the divider portion comprises a planar or contoured shape, wherein the shape of the divider portion is configured to optimize light distribution.

[0007] 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; 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 comprises a snap protrusion and wherein the trap portion comprises 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 of the second aspect, the snap fit is engageable and disengageable by a force of less than about 50 Newtons. In an embodiment of the second aspect, 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 of the second aspect, the base portion comprises a bottom flat surface or legs to enable base portion to remain upright.

[0008] 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; 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 comprises: a front housing portion having a first internal surface; and a rear housing portion having a second internal surface, the second internal surface comprising a transparent, translucent or opaque adhesive coating. In an embodiment of the third aspect, the second internal surface further comprises a reflective coating under the adhesive coating. In an embodiment of the third aspect, the lighting element comprises 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.

[0009] 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 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 of the fourth aspect, the lighting element comprises a fluorescent source, incandescent source, light emitting diode (LED), or combinations thereof. In an embodiment of the fourth aspect, trap portion further comprises a sleeve configured to receive the lighting element protruding into the trap portion. In an embodiment of the fourth aspect, the sleeve comprises a transparent, translucent, or opaque sleeve. In an embodiment of the fourth aspect, the sleeve comprises an opening and a tapered section, the opening located proximate to the base portion, from which the lighting element protrudes. In an embodiment of the fourth aspect, the tapered section of the sleeve is configured to guide the lighting element into the sleeve. In an embodiment of the fourth aspect, the sleeve is constructed from a semi-rigid material

sufficient to provide a protective covering for the lighting element. In an embodiment of the fourth aspect, the sleeve further comprises an opaque coating, the opaque coating configured to prevent light from transmitting directly from lighting element into the trap portion. In an embodiment of the fourth aspect, trap portion further comprises an opaque sleeve configured to receive the lighting element protruding into the trap portion. In an embodiment of the fourth aspect, the trap portion further comprises 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 of the fourth aspect, the sleeve comprises plastic or metal wire mesh. In an embodiment of the fourth aspect, the sleeve is configured to prevent the lighting element from contacting the adhesive surface. In an embodiment of the fourth aspect, 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 of the fourth aspect, the sleeve is further configured to diffuse light from lighting element.

[0010] 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 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 of the fifth aspect, the mounting portion comprises 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 of the fifth aspect, the trap portion comprises a bottom plate having a top surface and a bottom surface. In an embodiment of the fifth aspect, the top surface of the bottom plate comprises a transparent, translucent, or opaque adhesive coating. In an embodiment of the fifth aspect, 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 of the fifth aspect, the bottom surface is planar or planar at its perimeter. In an embodiment of the fifth aspect, the enclosure comprises: 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 of the fifth aspect, the second internal surface comprises a portion of a bottom plate and comprises a reflective coating. In an embodiment of the fifth aspect, the divider portion comprises 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 of the fifth aspect, 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 of the fifth aspect, 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 of the fifth aspect, the divider portion comprises a divider opening that corresponds to the first opening in the housing portion. In an embodiment of the fifth aspect, the second internal surface comprises a portion of a bottom plate and comprises an adhesive coating. In an embodiment of the fifth aspect, insects become trapped to the adhesive coating on the bottom plate after crawling through the first opening and divider opening. In an embodiment of the fifth aspect, 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 of the fifth aspect, the light-diffusing member comprises a transparent or translucent material. In an embodiment of the fifth aspect, the light-diffusing member comprises surface features that aid in light-diffusion. In an embodiment of the fifth aspect, the light-diffusing member comprises a flexible sheet configured to conform to inner surfaces of the top enclosure portion. In an embodiment of the fifth aspect, the light-diffusing member is configured to be received by a recess in the divider portion. In an embodiment of the fifth aspect, the light-diffusing member is configured to transmit light evenly through the divider portion and into the bottom enclosure portion.

[0011] 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; 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 comprises an insect attractant module having a removable cover. In an embodiment of the sixth aspect, the removable cover comprises a pull tab and webbing and wherein the enclosure comprises a tab slot for receiving the removable pull tab. In an embodiment of the sixth aspect, the insect attractant module comprises a disposable cup, the disposable cup being covered by webbing until the pull tab is engaged. In an embodiment of the sixth aspect, engaging the pull tab comprises pulling the pull tab at the tab slot until the webbing is separated from the cup. In an embodiment of the sixth aspect, the removable cover provides an airtight seal to the insect attractant module while it is intact. In an embodiment of the sixth aspect, the insect attractant module comprises a carrier material and one or more insect attractants. In an embodiment of the sixth aspect, the carrier material and insect attractant is configured to release an insect-attracting scent for a predetermined period of time. In an embodiment of the sixth aspect, the predetermined period of time comprises a week, a month, or up to three months. In an embodiment of the sixth aspect, the predetermined period of time comprises the life of the trap. In an embodiment of the sixth aspect, the released insect-attracting scent changes over time. In an embodiment of the sixth aspect, 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 of the sixth aspect, 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 of the sixth aspect, 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 of the sixth aspect, 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 of the sixth aspect, the heating element comprises a circuit board located within the base portion of the trap. In an embodiment of the sixth aspect, 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 of the sixth aspect, the removable cover comprises a pull tab and webbing and wherein the divider portion comprises a slot and the front enclosure comprises 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 of the sixth aspect, the divider portion and front housing portion comprises a plurality of openings that allow insect attract from insect attractant module to be emitted from the trap.

[0012] In a seventh 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 comprises an insect attractant module configured to automatically release an insect attractant when the trap portion is engaged with the base portion. In an embodiment of the seventh aspect, the insect attractant module comprises a disposable cup, the disposable cup being covered by a penetrateable lid. In an embodiment of the seventh aspect, the base portion comprises a punch configured to puncture the penetrateable lid and/or disposable cup.

[0013] In an eighth 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 comprises a transmitter configured to emit insect-attracting sounds or vibrations. In an embodiment of the eighth aspect, the base portion comprises a second opening, the second opening providing a mounting surface for the transmitter. In an embodiment of the eighth aspect, the transmitter comprises an electromechanical actuator or a piezoelectric speaker. In an embodiment of the eighth aspect, the transmitter is configured to cause the trap to vibrate and amplify the insect-attracting sounds or vibrations. In an embodiment of the eighth aspect, 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 of the eighth aspect, 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 of the eighth aspect, the transmitter comprises an electromechanical actuator or a piezoelectric speaker. In an embodiment of the eighth aspect, the insect-emitting sounds or vibrations attract mosquitoes, midges, moths, or flies. In an embodiment of the eighth aspect, the insect-emitting sounds or vibrations comprise an insect call, reply, courtship or copulatory songs. In an embodiment of the eighth aspect, 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 of the eighth aspect, 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 of the eighth aspect, 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 of the eighth aspect, 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 of the eighth aspect, the visual indication comprises a light blinking or a predetermined light color illuminated. In an embodiment of the eighth aspect, the audible indication comprises a tone or chime. In an embodiment of the eighth aspect, the front housing further comprises a polarizing reflective bottom surface in the front enclosure. In an embodiment of the eighth aspect, the polarizing reflective surface mimics the surface of water. In an embodiment of the eighth aspect, the polarizing reflective surface comprises ridges or subfeatures.

[0014] In a ninth 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 comprises 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 of the ninth aspect, the opening in the base portion comprises a transparent or translucent window. In an embodiment of the ninth aspect, the opening in the base portion is configured to provide a mounting surface for a light detector. In an embodiment of the ninth aspect, the light detector comprises a photosensor, photovoltaic cell, phototransistor, photoresistor, or photodiode. In an embodiment of the ninth aspect, 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 of the ninth aspect, 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 of the ninth aspect, upon the insect volume reaching a predetermined threshold, the circuit board is configured to provide a visual indication to a user. In an embodiment of the ninth aspect, the visual indication comprises a light blinking or a predetermined light color illuminated.

[0015] In a tenth 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 comprises: 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 comprising text or graphics configured to provide light and dark contrast areas for attracting insects. In an embodiment of the tenth aspect, 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 comprise fluorescent pigments that appear to glow when illuminated.

[0016] In an eleventh 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 comprises an electroluminescent body or surface configured to receive light from the base portion and distribute the light in a predetermined pattern in the enclosure.

[0017] In a twelfth 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 of the twelfth aspect, the base portion comprises a transparent or translucent window, the window configured to allow light to emit from the base portion to the trap portion. In an embodiment of the twelfth aspect, the window is further configured to protect the reflective surface of rear housing and LEDs from dust and debris.

[0018] In a thirteenth 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 of the thirteenth aspect, the base portion further comprising a screen, the screen configured to block at least a portion of light from the lighting element when screen is activated. In an embodiment of the thirteenth aspect, wherein the screen comprises a liquid crystal display (LCD).

[0019] 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

[0020] 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:

[0021] Figure **1** is a front perspective view of a first embodiment of an insect trap in accordance with principles of the disclosure;

[0022] Figure **2** is a rear perspective view of a base portion of the insect trap of Figure **1**;

[0023] Figure **3** is an exploded view of a trap portion of the insect trap of Figure **1**;

[0024] Figure **4** is a cross-sectional view through the insect trap of Figure **1**;

[0025] Figure **5** is a cross-sectional view through a second embodiment of an insect trap in accordance with principles of the disclosure;

[0026] Figure **6** is a front perspective view of a third embodiment of an insect trap in accordance with principles of the disclosure;

[0027] Figure **7** is a rear perspective view of a base portion of the insect trap of Figure **6**;

[0028] Figure **8** is a front perspective view of a trap portion of the insect trap of Figure **6**;

[0029] Figure **9** is a cross-sectional view through the insect trap of Figure **6**;

[0030] Figure **10** is a front perspective view of a fourth embodiment of an insect trap in accordance with principles of the disclosure;

[0031] Figure **11** is a rear perspective view of the insect trap of Figure **10**;

[0032] Figure **12** is a front perspective view of a fifth embodiment of an insect trap in accordance with principles of the disclosure;

[0033] Figure **13** is a rear perspective view of the insect trap of Figure **12**;

[0034] Figure **14** is a front perspective view of the insect trap of Figure **12**;

[0035] Figure **15** is a front perspective view of a trap portion of the insect trap of Figure **12**;

[0036] Figure **16** is a cross-sectional view through the insect trap of Figure **12**;

[0037] Figure **17** is a front perspective view of a sixth embodiment of an insect trap in accordance with principles of the disclosure;

[0038] Figure **18** is a cross-sectional view through the insect trap of Figure **17**;

[0039] Figure **19** is a cross-sectional view through a seventh embodiment of an insect trap in accordance with principles of the disclosure;

[0040] Figure **20** is an enlarged view of a portion of Figure **19**;

[0041] Figure **21** is a front perspective view of an eighth embodiment of an insect trap in accordance with principles of the disclosure;

[0042] Figure **22** is a cross sectional view of the insect trap of Figure **21**;

[0043] Figure **23** is an enlarged view of a portion of Figure **22**;

[0044] Figure **24** is a front perspective view of a ninth embodiment of an insect trap in accordance with principles of the disclosure,;

[0045] Figure **25** is a cross sectional view of the insect trap of Figure **24**;

[0046] Figure **26** is an enlarged view of a portion of Figure **25**;

[0047] Figure **27** is a front perspective view of a tenth embodiment of an insect trap in accordance with principles of the disclosure;

[0048] Figure **28** is a cross-sectional view through the insect trap of Figure **27**;

[0049] Figure **29** is a front perspective view of an eleventh embodiment of an insect trap in accordance with principles of the disclosure;

[0050] Figure **30** is a cross-sectional view of the insect trap of Figure **29**;

[0051] Figure **31** is a front perspective view of a twelfth embodiment of an insect trap in accordance with principles of the disclosure;

[0052] Figure **32** is a cross-sectional view of the insect trap of Figure **31**;

[0053] Figure **33** is a front perspective view of a thirteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0054] Figure **34** is a cross-sectional view of the insect trap of Figure **33**;

[0055] Figure **35** is a front perspective view of a fourteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0056] Figure **36** is a cross-sectional view of the insect trap of Figure **35**;

[0057] Figure **37** is a front perspective view of a fifteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0058] Figure **38** is a front perspective view of the insect trap of Figure **37**;

[0059] Figure **39** is a front perspective view of the insect trap of Figure **37**;

[0060] Figure **40** is a cross-sectional view through the insect trap of Figure **37**;

[0061] Figure **41** is a front perspective view of a sixteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0062] Figure **42** is a cross-sectional view through the insect trap of Figure **41**;

[0063] Figure **43** is a rear perspective view of a seventeenth embodiment of an insect trap in accordance with principles of the disclosure;

[0064] Figure **44** is a cross-sectional view through the insect trap of Figure **43**;

[0065] Figure **45** is an enlarged view of a portion of Figure **44**

[0066] Figure **46** is a front perspective view of an eighteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0067] Figure **47** is a front perspective view of a nineteenth embodiment of an insect trap in accordance with principles of the disclosure;

[0068] Figure **48** is a rear perspective view of the insect trap of Figure **47**;

[0069] Figure **49** is a cross-sectional view through the insect of Figure **47**;

[0070] Figure **50** is a front perspective view of a twentieth embodiment of an insect trap in accordance with principles of the disclosure;

[0071] Figure **51** is a cross-sectional view through the insect trap of Figure **50**;

[0072] Figure **52** is a rear perspective view of a twenty-first embodiment of an insect trap in accordance with principles of the disclosure;

[0073] Figure **53** is a front perspective view of the insect trap of Figure **52**;

[0074] Figure **54** is a cross-sectional view through the insect trap of Figure **52**;

[0075] Figure **55** is an enlarged view of a portion of Figure **54**;

[0076] Figure **56** is a front perspective view of a twenty-second embodiment of an insect trap in accordance with principles of the disclosure;

[0077] Figure **57** is a front perspective view of the insect trap of Figure **56**;

[0078] Figure **58** is a front perspective view of the insect trap of Figure **56**;

[0079] Figure **59** is a cross-sectional view through the insect trap of Figure **56**;

[0080] Figure **60** is a front perspective view of a twenty-third embodiment of an insect trap in accordance with principles of the disclosure;

[0081] Figure **61** is an enlarged view of a portion of Figure **60**;

[0082] Figure **62** is a cross-sectional view through the insect trap of Figure **6**0;

[0083] Figure **63** is an enlarged view of a portion of Figure **62**;

[0084] Figure **64** is a cross-sectional view through the insect trap of Figure **60**;

[0085] Figure **65** is an enlarged view of a portion of Figure **64**;

[0086] Figure **66** is a front perspective view of a twenty-fourth embodiment of an insect trap in accordance with principles of the disclosure;

[0087] Figure **67** is a front perspective view of the insect trap of Figure **66**;

[0088] Figure **68** is a cross-sectional view of the insect trap of Figure **66**;

[0089] Figure **69** is a front perspective view of a twenty-fifth embodiment of an insect trap in accordance with principles of the disclosure;

[0090] Figure **70** is a cross-sectional view of the insect trap of Figure **69**;

[0091] Figure **71** is a front perspective view of a twenty-sixth embodiment of an insect trap in accordance with principles of the disclosure;

[0092] Figure **72** is a cross-sectional view of the insect trap of Figure **71**; and

[0093] Figure **73** is a front perspective view of a twenty-seventh embodiment of an insect trap in accordance with principles of the disclosure.

DETAILED DESCRIPTION

[0094] 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**. 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.

[0095] 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, 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**.

[0096] Figure **3** is an exploded view of trap portion **114** of insect trap **110**. 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 an opening **144** on its bottom surface **166**, or alternatively opening **144** may be replaced by a transparent or translucent window (not shown).

[0097] 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.

[0098] 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.

[0099] 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 in a separate piece (not shown) that mounts on inside surface **170** of front housing **118** or through opening **120** in front housing **118** or on front surface **138** of divider **134**. It is desirable for such attractants to be detectable by an insect for approximately a 2 meter radius from insect trap **110**.

[0100] Figure **4** is a cross-sectional view through 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**.

[0101] 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**.

[0102] 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 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**. 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**.

[0103] 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.

[0104] 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.

[0105] 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.

[0106] 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.

[0107] 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.

[0108] 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.

[0109] 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.

[0110] 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**.

[0111] 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**. 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, 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.

[0112] 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.

[0113] 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.

[0114] 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.

[0115] 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**.

[0116] 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 in a separate piece (not shown) that mounts on inside surface **250** of front housing **228** or through opening **230** in front housing **228** or on front surface **254** of light-conducting body **238**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **210**.

[0117] 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**.

[0118] 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**.

[0119] 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.

[0120] 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.

[0121] 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.

[0122] 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.

[0123] 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.

[0124] 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.

[0125] 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.

[0126] 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**.

[0127] 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**. 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.

[0128] 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, 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**.

[0129] 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.

[0130] 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**.

[0131] 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 in a separate piece (not shown) that mounts on inside surfaces **334** of housing

318 or through opening **320** in housing **318**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **310**.

[0132] Figure **9** is a cross-sectional view through 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**.

[0133] 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.

[0134] 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.

[0135] 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.

[0136] 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.

[0137] 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.

[0138] 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.

[0139] 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.

[0140] 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**.

[0141] 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.

[0142] 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**.

[0143] 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.

[0144] 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.

[0145] 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.

[0146] 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.

[0147] 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.

[0148] 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.

[0149] 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**.

[0150] 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**. 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, 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.

[0151] 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.

[0152] 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 in a separate piece (not shown) that mounts on inside surfaces **530** of housing **524** or through opening **526** in housing **524**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **510**.

[0153] Figure **16** is a cross-sectional view through 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**.

[0154] 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.

[0155] 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.

[0156] 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.

[0157] 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.

[0158] 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.

[0159] 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.

[0160] 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.

[0161] 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**.

[0162] Figure **17** is a front perspective view of a sixth embodiment of an insect trap, indicated generally at **610**. 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, 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**.

[0163] 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 in a separate piece (not shown) that mounts on inside surface of front housing **618** or through opening **620** in front housing **618** or on front surface **642** of

back plate **638**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **610**.

[0164] 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**.

[0165] 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**.

[0166] 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.

[0167] 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.

[0168] 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.

[0169] 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.

[0170] 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.

[0171] 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.

[0172] 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.

[0173] 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**.

[0174] Figure **19** is a cross-sectional view of a seventh embodiment of an insect trap, indicated generally at **710**, and Figure **20** is an enlarged view of a portion of Figure **19**. Insect trap **710** includes a base portion **712** and a removable trap portion **714**. 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, 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**.

[0175] 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.

[0176] 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.

[0177] 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 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 **734** of divider **730**. 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**.

[0178] 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**.

[0179] 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**.

[0180] 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.

[0181] 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.

[0182] 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.

[0183] 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.

[0184] 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.

[0185] 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.

[0186] 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.

[0187] 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**.

[0188] Figure **21** 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 8**18** 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 **23**) 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**.

[0189] Figure **22** is a cross sectional view of insect trap **810** and Figure **23** is an enlarged view of a portion of Figure **22**. 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.

[0190] 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**.

[0191] Figure **24** 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 **26**), 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**.

[0192] Figure **25** is a cross sectional view of insect trap **910** and Figure **26** is an enlarged view of a portion of Figure **25**. 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**.

[0193] Figure **27** 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. 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.

[0194] Protruding from a rear surface **1060** (shown in Figure **28**) 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, 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 **102**4 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**.

[0195] Figure **28** is a cross-sectional view through 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).

[0196] 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.

[0197] 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.

[0198] 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 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 **1038** of divider **1034**. 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**.

[0199] 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**.

[0200] 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**. 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**.

[0201] 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.

[0202] 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.

[0203] 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.

[0204] 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.

[0205] 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.

[0206] 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.

[0207] 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.

[0208] 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.

[0209] 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**.

[0210] Figure **29** 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**. 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 **30**) 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, 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.

[0211] 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 **30**), 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**.

[0212] Figure **30** 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 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 **1142** of back plate **1138**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1110**.

[0213] 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**.

[0214] 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**.

[0215] 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.

[0216] 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.

[0217] 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.

[0218] 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.

[0219] 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.

[0220] 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.

[0221] 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.

[0222] 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**.

[0223] Figure **31** 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. 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 **32**) 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, 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** 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 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**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1210**.

[0224] Figure **32** is a cross-sectional, cut-away view through 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**.

[0225] 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**.

[0226] 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**.

[0227] 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.

[0228] 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.

[0229] 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.

[0230] 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.

[0231] 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.

[0232] 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.

[0233] 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.

[0234] 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.

[0235] 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**.

[0236] Figure **33** 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. 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 **34**) 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, 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 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**. 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**.

[0237] Figure **34** is a cross-sectional view through 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**.

[0238] 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**.

[0239] 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**.

[0240] 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**.

[0241] 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.

[0242] 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.

[0243] 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.

[0244] 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.

[0245] 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.

[0246] 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.

[0247] 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.

[0248] 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.

[0249] 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**.

[0250] Figure **35** 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. 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.

[0251] 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.

[0252] 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.

[0253] 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 in a separate piece (not shown) that may mount on an inside surface of enclosure **1444** or through an opening in front housing **1418** or back plate **1426**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **1410**.

[0254] Figure **36** is a cross-sectional view through 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, 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**.

[0255] 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**.

[0256] 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.

[0257] 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.

[0258] 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.

[0259] 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.

[0260] 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.

[0261] 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.

[0262] 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.

[0263] 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**.

[0264] Figure **37** 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. Trap portion **1514** includes a front housing **1518** with a tab slot **1568** and at least one opening **1520** in a front surface **1516**. 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 40) 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, 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, LEDs **1524** include 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**.

[0265] Figure **38** 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**.

[0266] Figure **39** 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. 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. 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**.

[0267] Figure **40** is a cross-sectional view through insect trap. 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).

[0268] 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.

[0269] 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**.

[0270] 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**.

[0271] 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**.

[0272] 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**. 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**.

[0273] 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.

[0274] 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.

[0275] 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.

[0276] 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.

[0277] 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.

[0278] 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.

[0279] 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.

[0280] 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.

[0281] 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**.

[0282] Figure **41** 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. Trap portion **1614** includes a front housing **1618** with at least one opening **1620** in a front surface **1660**. 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 **42**) 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, 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**.

[0283] Figure **42** is a cross-sectional view through 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.

[0284] 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.

[0285] 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.

[0286] 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**.

[0287] 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**.

[0288] 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**.

[0289] 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**. 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 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**.

[0290] 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.

[0291] 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.

[0292] 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.

[0293] 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.

[0294] 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.

[0295] 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.

[0296] 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.

[0297] 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**.

[0298] Figure **43** 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. 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**. 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).

[0299] 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, 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**.

[0300] Figure **44** is a cross-sectional, cut-away view through insect trap **1710** showing the interiors of base portion **1712** and trap portion **1714**, and Figure **45** is an enlarged view of a portion of Figure **44**. 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**.

[0301] 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.

[0302] 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.

[0303] 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 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 **1738** of divider **1734**. 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**.

[0304] 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**.

[0305] 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**. 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**.

[0306] 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.

[0307] 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.

[0308] 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.

[0309] 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.

[0310] 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.

[0311] 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.

[0312] 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.

[0313] 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.

[0314] 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**.

[0315] Figure **46** 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.

[0316] Figure **47** is a front perspective view and Figure **48** 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. 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**.

[0317] In some embodiments, base portion **1912** may have a flat 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 48) 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, 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. 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**.

[0318] Figure **49** is a cross-sectional, view through 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).

[0319] 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.

[0320] 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.

[0321] 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 **1014**. Alternatively, the insect attractants may be embedded 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 **1938** of divider **1934**. 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**.

[0322] 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**. 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**.

[0323] 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.

[0324] 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.

[0325] 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.

[0326] 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.

[0327] 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.

[0328] 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.

[0329] 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.

[0330] 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.

[0331] 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**.

[0332] Figure **50** 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. Trap portion **2014** includes a divider **2034** and a front housing **2018** with at least one opening **2020** in a front surface **2016**. 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 **51**) 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, 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**.

[0333] Figure **51** is a cross-sectional view through 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).

[0334] 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.

[0335] 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.

[0336] 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**.

[0337] 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**.

[0338] 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**. 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**.

[0339] 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.

[0340] 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.

[0341] 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.

[0342] 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.

[0343] 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.

[0344] 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.

[0345] 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.

[0346] 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**.

[0347] Figure **52** 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. Trap portion **2114** includes a front housing **2118** with at least one opening **2120** in its front surface **2116** (shown in Figure **53**), a rear housing **2140**, and a divider **2134** with a rear surface **2152**. 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).

[0348] 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, 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**.

[0349] Figure **53** 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**.

[0350] 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.

[0351] Figure **54** is a cross-sectional view through insect trap and Figure **55** is an enlarged view of a portion of Figure **54**. 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.

[0352] 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.

[0353] 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**.

[0354] 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**.

[0355] 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**. 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**.

[0356] 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.

[0357] 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.

[0358] 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.

[0359] 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.

[0360] 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.

[0361] 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.

[0362] 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.

[0363] 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**.

[0364] Figure **56** 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. Trap portion **2214** includes a front housing **2218** with a tab slot **2268** and at least one opening **2220** in a front surface **2216**. 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 **59**) 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, 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**.

[0365] Figure **57** 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**.

[0366] Figure **58** 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. 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**. 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**.

[0367] Figure **59** is a cross-sectional view through 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).

[0368] 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.

[0369] 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**.

[0370] 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**.

[0371] 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**.

[0372] 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**. 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**.

[0373] 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.

[0374] 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.

[0375] 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.

[0376] 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.

[0377] 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.

[0378] 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.

[0379] 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.

[0380] 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.

[0381] 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**.

[0382] Figure **60** is a front perspective view of a twenty-third embodiment of an insect trap, indicated generally at **2310**, and Figure **61** is an enlarged view of a portion of Figure **60**. Insect trap **2310** includes a base portion **2312** and a removable trap portion **2314**. Trap portion **2314** is shown partially cut away and removed from base portion **2312**

in Figure **60**. 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 **62**). 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 be 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.

[0383] Protruding from a rear surface **2354** (shown in Figure **62**) 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, 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.

[0384] Figure **62** is a cross-sectional view through insect trap **2310** and Figure **63** is an enlarged view of a portion of Figure **62**. 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**. 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**.

[0385] 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.

[0386] 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**.

[0387] 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**.

[0388] Figure **64** is a cross-sectional view through insect trap **2310** and Figure **65** is an enlarged view of a portion of Figure **64**. 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**.

[0389] 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**. 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**.

[0390] 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.

[0391] 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.

[0392] 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.

[0393] 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.

[0394] 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.

[0395] 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.

[0396] 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.

[0397] 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.

[0398] 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**.

[0399] 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 **66** 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.

[0400] Figure **67** 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 in a separate piece (not shown) that may mount on an inside surface of enclosure **2448** or through an opening in housing **2418**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2410**.

[0401] Figure **68** is a cross-sectional view through 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**.

[0402] 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**.

[0403] 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**.

[0404] 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.

[0405] 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.

[0406] 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.

[0407] 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.

[0408] 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.

[0409] 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.

[0410] 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.

[0411] 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.

[0412] Figure **69** 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 in a separate piece (not shown) that may mount on an inside surface of top enclosure **2548** or through an opening in housing **2518**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2510**.

[0413] Figure **70** is a cross-sectional view through 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**.

[0414] 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**.

[0415] 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**.

[0416] 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.

[0417] 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.

[0418] 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.

[0419] 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.

[0420] 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.

[0421] 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.

[0422] 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.

[0423] Figure **71** 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 in a separate piece (not shown) that may mount on an inside surface of bottom enclosure **2628** or through an opening in housing **2618**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2610**.

[0424] Figure **72** 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**.

[0425] 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**.

[0426] 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**.

[0427] 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.

[0428] 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.

[0429] 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.

[0430] 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.

[0431] 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.

[0432] 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.

[0433] 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.

[0434] Figure **73** 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**.

[0435] 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 in a separate piece (not shown) that may mount on an inside surface of divider **2746** or through an opening in housing **2718**. It is desirable for such attractants to be detectable by an insect for approximately a 2-meter radius from insect trap **2710**.

[0436] 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**.

[0437] 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**.

[0438] 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**.

[0439] 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.

[0440] 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.

[0441] 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.

[0442] 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.

[0443] 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.

[0444] 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.

[0445] 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.

[0446] 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.

[0447] 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).

[0448] 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.

[0449] 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.

[0450] 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.

[0451] 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.

[0452] 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.

[0453] 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 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 comprises:

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.

2. The insect trap of claim 1, wherein the acute angle is from about 0 degrees to 45 degrees from a plane in the primary direction of the light.

3. The insect trap of claim 1, wherein the divider portion includes a rear surface comprising translucent material and includes a front surface comprising an adhesive surface.

4. The trap of claim 3, wherein 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.

5. The trap of claim 4, wherein the divider portion is configured to receive light at an oblique angle and spread across the divider portion.

6. The trap of claim 4, wherein the divider portion is configured to manipulate light.

7. The trap of claim 3, wherein the second internal surface of the rear housing portion comprises a concave surface, the concave surface configured to reflect light onto the rear surface of the divider portion.

8. The trap of claim 7, wherein light is transmitted through the adhesive surface illuminating the adhesive surface to attract an insect to the adhesive surface.

9. The trap of claim 1, wherein the divider portion comprises a planar or contoured shape, wherein the shape of the divider portion is configured to optimize light distribution.

10. 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 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 comprises a snap protrusion and wherein the trap portion comprises 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.

11. The trap of claim 10, wherein the snap fit is engageable and disengageable by a force of less than about 50 Newtons.

12. The trap of claim 11, wherein the snap fit allows a user to engage or disengage the trap portion with the base portion using a single hand.

13. The trap of claim 10, wherein the base portion is configured to remain upright when placed on a horizontal surface.

14. The trap of claim 13, wherein the base portion comprises a bottom flat surface or legs to enable base portion to remain upright.

15. 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 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 comprises:

a front housing portion having a first internal surface; and

a rear housing portion having a second internal surface, the second internal surface comprising a transparent, translucent or opaque adhesive coating.

16. The trap of claim 15, wherein the second internal surface further comprises a reflective coating under the adhesive coating.

17. The trap of claim 15, wherein the lighting element comprises 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.

18. 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 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.

19 The trap of claim 18, wherein the lighting element comprises a fluorescent source, incandescent source, light emitting diode (LED), or combinations thereof.

20. The trap of claim 18, wherein trap portion further comprises a sleeve configured to receive the lighting element protruding into the trap portion.

21. The trap of claim 20, wherein the sleeve comprises a transparent, translucent, or opaque sleeve.

22. The trap of claim 20, wherein the sleeve comprises an opening and a tapered section, the opening located proximate to the base portion, from which the lighting element protrudes.

23. The trap of claim 22, wherein the tapered section of the sleeve is configured to guide the lighting element into the sleeve.

24. The trap of claim 20, wherein the sleeve is constructed from a semi-rigid material sufficient to provide a protective covering for the lighting element.

25. The trap of claim 20, wherein the sleeve further comprises an opaque coating, the opaque coating configured to prevent light from transmitting directly from lighting element into the trap portion.

26. The trap of claim 18, wherein the trap portion further comprises an opaque sleeve configured to receive the lighting element protruding into the trap portion.

27. The trap of claim 18, wherein the trap portion further comprises 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.

28. The trap of claim 27, wherein the sleeve comprises plastic or metal wire mesh.

29. The trap of claim 27, wherein the sleeve is configured to prevent the lighting element from contacting the adhesive surface.

30. The trap of claim 27, wherein 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.

31. The trap of claim 27, wherein the sleeve is further configured to diffuse light from lighting element.

32. 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 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.

33. The trap of claim 32, wherein the mounting portion comprises 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.

34. The trap of claim 32, wherein the trap portion comprises a bottom plate having a top surface and a bottom surface.

35. The trap of claim 34, wherein the top surface of the bottom plate comprises a transparent, translucent, or opaque adhesive coating.

36. The trap of claim 34, wherein 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.

37. The trap of claim 36, wherein the bottom surface is planar or planar at its perimeter.

38. The trap of claim 31, wherein the enclosure comprises:

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.

39. The trap of claim 38, wherein the second internal surface comprises a portion of a bottom plate and comprises a reflective coating.

40. The trap of claim 38, wherein the divider portion comprises a top surface and a bottom surface, and wherein the top surface is at least partially coated with a transparent or translucent adhesive.

41. The trap of claim 40, wherein 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.

42. The trap of claim 38, wherein 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.

43. The trap of claim 42, wherein the divider portion comprises a divider opening that corresponds to the first opening in the housing portion.

44. The trap of claim 43, wherein the second internal surface comprises a portion of a bottom plate and comprises an adhesive coating.

45. The trap of claim 44, wherein insects become trapped to the adhesive coating on the bottom plate after crawling through the first opening and divider opening.

46. The trap of claim 38, further comprising:

a light-diffusing member located within the top enclosure portion, the light-diffusing member having light-diffusing characteristics.

47. The trap of claim 46, wherein the light-diffusing member comprises a transparent or translucent material.

48. The trap of claim 46, wherein the light-diffusing member comprises surface features that aid in light-diffusion.

49. The trap of claim 46, wherein the light-diffusing member comprises a flexible sheet configured to conform to inner surfaces of the top enclosure portion.

50. The trap of claim 49, wherein the light-diffusing member is configured to be received by a recess in the divider portion.

51. The trap of claim 46, wherein the light-diffusing member is configured to transmit light evenly through the divider portion and into the bottom enclosure portion.

52. 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 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 comprises an insect attractant module having a removable cover.

53. The trap of claim 52, wherein the removable cover comprises a pull tab and webbing and wherein the enclosure comprises a tab slot for receiving the removable pull tab.

54. The trap of claim 53, wherein the insect attractant module comprises a disposable cup, the disposable cup being covered by webbing until the pull tab is engaged.

55. The trap of claim 54, wherein engaging the pull tab comprises pulling the pull tab at the tab slot until the webbing is separated from the cup.

56. The trap of claim 52, wherein the removable cover provides an airtight seal to the insect attractant module while it is intact.

57. The trap of claim 52, wherein the insect attractant module comprises a carrier material and one or more insect attractants.

58. The trap of claim 57, wherein the carrier material and insect attractant is configured to release an insect-attracting scent for a predetermined period of time.

59. The trap of claim 58, wherein the predetermined period of time comprises a week, a month, or up to three months.

60. The trap of claim 58, wherein the predetermined period of time comprises the life of the trap.

61. The trap of claim 60, wherein the released insect-attracting scent changes over time.

62. The trap of claim 61, wherein 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.

63. The trap of claim 62, wherein 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.

64. The trap of claim 57, wherein 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.

65. The trap of claim 52, further comprising a heating element, the heating element configured to warm the insect attractant module and aid in the release of insect attractants.

66. The trap of claim 65, wherein the heating element comprises a circuit board located within the base portion of the trap.

67. The trap of claim 52, the enclosure comprising:

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.

68. The trap of claim 67, wherein the removable cover comprises a pull tab and webbing and wherein the divider portion comprises a slot and the front enclosure comprises a tab slot for receiving the removable pull tab, the pull tab extending through the divider portion slot and front enclosure tab slot.

69. The trap portion of claim 67, wherein the divider portion and front housing portion comprises a plurality of openings that allow insect attract from insect attractant module to be emitted from the trap.

70. 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 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 comprises an insect attractant module configured to automatically release an insect attractant when the trap portion is engaged with the base portion.

71. The trap of claim 70, wherein the insect attractant module comprises a disposable cup, the disposable cup being covered by a penetrateable lid.

72. The trap of claim 71, wherein the base portion comprises a punch configured to puncture the penetrateable lid and/or disposable cup.

73. 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 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 comprises a transmitter configured to emit insect-attracting sounds or vibrations.

74. The trap of claim 73, wherein the base portion comprises a second opening, the second opening providing a mounting surface for the transmitter.

75. The trap of claim 73, wherein the transmitter comprises an electromechanical actuator or a piezoelectric speaker.

76. The trap of claim 73, wherein the transmitter is configured to cause the trap to vibrate and amplify the insect-attracting sounds or vibrations.

77. The trap of claim 73, the enclosure comprising:

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.

78. The trap of claim 77, further comprising 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.

79. The trap of claim 78, wherein the transmitter comprises an electromechanical actuator or a piezoelectric speaker.

80. The trap of claim 77, wherein the insect-emitting sounds or vibrations attract mosquitoes, midges, moths, or flies.

81. The trap of claim 77, wherein the insect-emitting sounds or vibrations comprise an insect call, reply, courtship or copulatory songs.

82. The trap of claim 78, wherein 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.

83. The trap of claim 82, wherein the electrical response signals are partially caused by the insect volume stuck to the adhesive surface and in communication with the divider portion.

84. The trap of claim 82, wherein 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.

85. The trap of claim 82, wherein upon the insect volume reaching a predetermined threshold, the circuit board is configured to provide an audible or visual indication to a user.

86. The trap of claim 85, wherein the visual indication comprises a light blinking or a predetermined light color illuminated.

87. The trap of claim 85, wherein the audible indication comprises a tone or chime.

88. The trap of claim 82, wherein the front housing further comprises a polarizing reflective bottom surface in the front enclosure.

89. The trap of claim 88, wherein the polarizing reflective surface mimics the surface of water.

90. The trap of claim 88, wherein the polarizing reflective surface comprises ridges or subfeatures.

91. 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 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 comprises 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.

92. The trap of claim 91, wherein the opening in the base portion comprises a transparent or translucent window.

93. The trap of claim 91, wherein the opening in the base portion is configured to provide a mounting surface for a light detector.

94. The trap of claim 93, wherein the light detector comprises a photosensor, photovoltaic cell, phototransistor, photoresistor, or photodiode.

95. The trap of claim 94, further comprising 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.

96. The trap of claim 95, wherein 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.

97. The trap of claim 96, wherein upon the insect volume reaching a predetermined threshold, the circuit board is configured to provide a visual indication to a user.

98. The trap of claim 97, wherein the visual indication comprises a light blinking or a predetermined light color illuminated.

99. 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 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 comprises:

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 comprising text or graphics configured to provide light and dark contrast areas for attracting insects.

100. The trap of claim 99, wherein the text or graphics is applied by printing, hot stamping, silk screening, embossing, engraving, or molding.

101. The trap of claim 100, wherein the text or graphics comprise fluorescent pigments that appear to glow when illuminated.

102. 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 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 comprises an electroluminescent body or surface configured to receive light from the base portion and distribute the light in a predetermined pattern in the enclosure.

103. 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 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.

104. The trap of claim 103, wherein the base portion comprises a transparent or translucent window, the window configured to allow light to emit from the base portion to the trap portion.

105. The trap of claim 104, wherein the window is further configured to protect the reflective surface of rear housing and LEDs from dust and debris.

106. 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 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.

107. The trap of claim 106, the base portion further comprising a screen, the screen configured to block at least a portion of light from the lighting element when screen is activated.

108. The trap of claim 107, wherein the screen comprises a liquid crystal display (LCD).