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(19)

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(54) A DEVICE FOR CAPTURING SMALL CREATURES

(71) We, FUMAKILLA LIMITED, a corporation organised under the laws of Japan of 11 Kanda-Mikura-cho, Chiyoda-ku, Tokyo, Japan, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described, in and by the following statement:—

This invention relates to a device for capturing small creatures such as cockroaches.

Although harmful insects such as cockroaches were orginally from the Torrid Zone, their distribution area has increasingly expanded as the human culture progresses and the circumstances of human life are varied, with the result that cockroaches increase all over the world to impart a great deal of defects to the human life. Cockroaches are grotesque and smell peculiarly bad to give us uncomfortable and dirty feelings, and also propagate pathogenic bacterias such as dysentery bacillus, colon bacillus, poliovirus, etc. and are thus most harmful insects. These cockroaches live in the residences of human beings, and hide themselves in groups from the human world in daytime and are active at night so as to obtain food. In addition, they are a very harmful polyphagous insects, and feed not only human foods, but paper, being scatophagous, and propagate greatly, and indefinitely develop to live for long periods with the result that it is difficult to eliminate them. In order to eliminate them at present, there exist food poisoning insecticides, residual coating insecticides, etc., but they are not so effective.

According to the invention there is provided a device for capturing small creatures such as cockroaches, comprising: a lower body into which small creatures may be attracted, having a food retainer, passages connecting said retainer with the exterior of the device and lower doors adapted for opening only from the exterior and located one in each of the passages; and an upper body in which small creatures from the lower body may be captured, the upper body being adapted for resting on said lower body and having communication ports opposite to and connecting with said passages and an upper door covering each of said communication ports and openable only from the passage.

When such a device is used for capturing cockroaches, it is placed where cockroaches are frequently present. The cockroaches which hide themselves behind articles of furniture at daytime and crawl about at night to obtain food thereupon gather by the attraction of the smell of attractive foods in the capturing device, and pass the passages therein to push up the lower door to enter the food retainer thereof, and are prevented from escaping by the lower door. They then enter the upper body by pushing up the upper door at the bottom of the upper body of the capturing device and passing through the communication port. The cockroaches thus entered into the upper body cannot escape any further, and will therefore die therein. In order to treat the captured cockroaches, the upper body is removed therefrom, and the cockroaches captured therein are taken out.

The invention will be readily understood from the following description (which is by way of example), when read together with the drawings, wherein:

Figure 1 is a perspective view of a device for capturing cockroaches according to the present invention;

Figure 2 is a perspective view of a lower body of the device;

Figure 3 is a plan view of the lower body shown in Figure 1;

Figure 4 is a sectional view of the device taken along the line IV—IV of Figure 3;

Figure 5 is a perspective view of an upper body of the device;

Figure 6 is a plan view of the bottom of the upper body shown in Figure 1;

Figure 7 is a sectional view of the device taken along the line VII—VII of Figure 6;

Figures 8 and 9 are perspective views of the different embodiments of the lower door;

Figure 10 is a perspective view of another embodiment of lower body of the device;

Figure 11 is a perspective view of another embodiment of upper body of the device;

Figure 12 is a perspective view of a further embodiment of the lower body of the device; and

Figure 13 is a perspective view of a further embodiment of the upper body of the device.

Referring to Figure 1, a device for capturing cockroaches comprises a lower body 1 for the purpose of attracting cockroaches through floor-level entrance passages 3. An upper body 8 is positioned on top of the lower body 1. This upper body 8 communicates with the body 1, whereby cockroaches attracted into the latter pass into the former when attempting to leave the device. The upper body 8 is detachable, to allow it to be removed and the cockroaches therein disposed of hygienically.

Referring now to Figures 2 to 4, the lower body 1 has a food retainer 2 comprising a recess at the center thereof, and radial passages 3 communicating therefrom to the exterior. The retainer 2 and passages 3 are formed by side walls 4, and lower doors 5 are provided in the passages 3, mounted pivotably on bearing shafts 6 between the side walls 4 of each passage and at the upper edges of the walls 4. Each lower door 5 is inclined toward the food retainer 2, and has a ventilating portion 7 of sawteeth shape formed at the lower end thereof. Each lower door 5 opens by a slight external force but does not open by a force from inside, as will be hereinafter described. Therefore, the food retainer 2 is normally isolated by the side walls 4, lower doors 5, and upper body 8 from the exterior.

On the other hand, as shown in Figures 5 to 7, which show the upper body of the device, the upper body 8 is so constructed that the portions corresponding to the passages 3 and the lower doors 5 on the bottom plate 9 have openings 10, and journals 11 are provided at the positions adjacent the communication openings 10, supporting a bearing shaft of upper doors 12. The upper doors 12 close the communication ports 10. Ventilating portions 13 of sawteeth shape are formed at the outer ends of the upper doors 12. The upper body 8 is formed with downwardly depending walls which 14 are so provided as to correspond to the outside of the side walls 4 of the food retainer 2 of the lower body 1. The upper body 8 has a capturing chamber 16 formed by clipping a cover 15 on the bottom plate 9. A knob 17 is provided on the cover 15 by which it may be conveniently removed. The upper body 8 thus constructed engages removably with the legs 14 correspondingly to the side walls 4 of the lower body 1.

A feature of the capturing device resides in the structure of the lower doors 5 provided at the inlet passages 3. As shown in Figures 8 and 9, which show alternative lower doors of the capturing device, each lower door 5 has a bearing shaft 6 at the upper end thereof, which shaft 6 is rotatably supported at both side walls 4 forming passages 3 and at the upper portion of the walls 4, and is inclined towards the food retainer 2. Therefore, the lower doors 5 thus inclined toward the food retainer 2 open when pushed from the exterior, but since the lower ends of the doors 5 reach the bottom, even if they are pushed from the interior, they do not open at all. Since these doors 5 are inclined, they are adapted for the cockroaches in the lower body to climb over into the upper chamber 16, as will be hereinafter described. As shown in Figure 8, the lower doors 5 may be of mere plate, but in order to enhance the capturing effect, using light material to enable opening with extremely slight force, and as shown in Figure 9, a balance weight 18 is provided at the opposite side of the lower shield plate 5 around the bearing shaft 6 provided at the upper end thereof as the rocking center of the lower door 5 so as to enable of opening with extremely slight force with the result that cockroaches may enter easily into the interior of the capturing device. As clear from the results of the above first and second embodiments, as to the door of balance type and single plate type, the force for pushing the door may be smaller in the balance type than the other, allowing more cockroaches to be captured than the other.

This balancing may be varied according to the weight of the lower door 5 extended to the opposite side from the bearing shaft 6, but if the balance weight is greater, it is apprehended that the cockroaches which have entered into the interior may raise the lower door 5 to escape, and accordingly the preferable movement of the lower door is from 0.02 to 0.2 g. It is also preferable that a proper size of cutout of sawtooth shape is provided at the lower end of the lower door 5 so that the smell of the attracting food in the interior of the device will emanate outwardly and so that the food can be seen from the exterior, and may be sensed directly from the exterior. The ventilating portion 7 is provided thereat, which is very preferred from the viewpoint of the habits of cockroaches when searching

for food. As clear from Table 2 below, there exist considerable differences in effectiveness of the device depending upon the existence of the ventilating portion 7 of the lower end of the lower door.

A second feature of the capturing device resides in the separate provision of the lower and upper bodies in such a manner that the upper body is removable from the upper part of the lower body. This results from the detailed studies of the habits of cockroaches, in which it was found that the cockroaches move freely on a flat surface and an inclined surface in the normal travelling activities thereof, but when they are entered into the closed box, they move abruptly and quickly to look for an escaping portion, in which case they look for at first upwardly an escaping port, and if no escaping port is found, they look for other routes. Therefore, this device for capturing the cockroaches, once having attracted the cockroaches to the attracting portion, then introduces them upwardly, and when they have once entered into the capturing chamber 16, they cannot escape at all.

For such purposes, the upper body 8 has communication ports 10 opposite to the passages 3 on the bottom plate 9, and upper doors 12 are provided at the communication ports 10. A ventilating portion 13 of sawteeth shape is formed normally in the upper door 12. Therefore, the cockroaches which have entered into the attracting portion of the device lose their escape route by the lower shield plates 5, and climb up the lower door 5 to push up the upper door 12 from the communication port 10 provided in the bottom plate 9 of the upper body 8, according to their habit, so as to enter the capturing chamber 16. Since the upper door 12 is pivotably supported at both sides by the journals 11 provided on the bottom plate 9, by means of the bearing shaft provided at one end of the door 12, it may open if pushed from below but since the other end thereof is supported by the bottom plate 9, it may not open if pushed from above. Accordingly, cockroaches that have entered into the upper body 16 completely lose any method of escape and die.

Thus, since the capturing device has a separate lower body into which cockroaches are attracted and an upper body in which they are captured, the cockroaches entering into the lower portion move into the upper portion, according to their habit, before they have eaten much food, so as to save the food. Further, since the upper portion of the device is so provided as to be easily removable, the upper body 8 is removed from the lower body 1 when sufficient number of cockroaches have entered thereinto, so as to treat the captured cockroaches by any means such as immersing in water, etc. Thus, not only is the food saved, but the device may be kept clean by cleaning of the upper body 8 only without cleaning the device overall, every time. Since the device is thus constructed, the food retainer 2 of the lower body is always vacant, and accordingly it does not affect the cockroaches coming in subsequently, but the following cockroaches may enter continuously to capture a large number of cockroaches extremely efficiently. In addition, if the engaging legs 14 are formed as boxes depending downwardly into the lower body 16, the cockroaches entered into the upper chamber 16 fall therein to be contained, and therefore a great deal of cockroaches are captured in compact manner thus making the device most advantageous.

If the food retainer is so constructed as to also function as the capturing chamber, the larvae of small cockroaches escape from the ventilating portion 7 of the lower end of the lower doors 5 outwardly, but in the capturing device of the present invention, the larvae climb into the upper body 16 according to their habit, and if the cutouts in the ventilating portion 13 of the upper shield plate 12 are made smaller, small larvae may easily be captured. As shown in Table 3 below, this does not affect greatly the capture of the larger types of black cockroach, but affects clearly the capturing of the small type of brown feather cockroach, particularly of their larvae. If the cover is made of transparent plastic, the interior of the device is easily seen so as to immediately investigate the number of captured cockroaches, and accordingly it is very convenient. The device may be of any circular, elliptical, rectangular, square, polygonal shape, etc., and the inlets may not only be in one direction, but in several. The place of use may be varied.

Reference is now made to Figures 10 and 11, which show another embodiment of the device suitable for capturing the cockroaches.

This embodiment is similar to the previous embodiment, but the shape of the device is circular. The engaging legs 14 formed on the bottom of upper body 8 are each engaged with a cutout recess portion 19 of the lower body 1. Therefore, the cockroaches entering into the upper body 8 fall in the interior of the engaging legs 14 of box shape to be contained. The upper portion of the upper body 8 is open constituting a removing port, over which a cover 15 is removably clipped.

The embodiment of Figures 12 and 13 is similar to the previous embodiments, but the lower body 1 has food retainer 2 and the passages 3 formed by walls 4 having grooves 20 formed on their upper surfaces. On the other hand, a corresponding number of engaging projections 21 project from the lower surface of the bottom plate 9 of the upper body 8. The upper body 8 is thus removably securable to

to the lower body 2. One portion of the periphery of the capturing body 8 is open to form a port 22, and sliding grooves are formed in both side edges of the port 22 in such a manner that both side edges of a closing plate 23 are engaged with the sliding grooves for closing the removing port 22.

Bait for attracting the cockroaches will now be described.

Some of the best baits are sugar, wheat flour, barley flour, oatmeal, laver bean powder, cheese, potato, honey, rice bran, sesame, or mixtures thereof, and these may be treated at high temperature, pulverized, or crushed so as to expand the surface area to provide good dissemination of the smell thereof.

Since the cockroaches captured using the bait live for a while so that it takes long time to treat them, in order to overcome this problem, insecticides may be blended with the bait, such as lindane; 0,0-dimethyl 0-2,2-dichlorovinylphosphate(DDVP); 0, 0-dimethyl 0-(3-methyl-4-nitrophenyl) thionophosphate (Phenitrothion); 0,0-diethyl 0-2-isopropyl-4-methyl-pyrimidyl-16)-thionophosphate (Diazinon); 5-Benzyl-3-furylmethyl chrysanthemate (Resmethrin); boric acid, etc. Though the insecticides are blended therewith to produce an expected effect, the insecticides have slightly repelling qualities for the cockroaches. Accordingly, if they are blended with the food after they are absorbed in an absorptive substance such as active carbon, etc., there is provided bait having insecticidal effect without lowering the attracting effect.

Example 1

In the device for capturing cockroaches shown in Figures 1 to 7, the differences of the forces required for pushing up the lower door 5 provided in the passages 3 due to their structural difference were measured. The measurement was conducted as to the device using an unbalanced door shown in Figure 8 and to the door of balance type shown in Figure 9 in such a manner that the thickness of the door 5 was made constant and the force required for raising the end of the door 5 with the bearing shaft 6 as a fulcrum was measured by weight and expressed by the ratio with respect to that of the balance type. When the force of the device of balance type was 1, that of the single plate type was 2.1. The door of balance type used here had the ratio by weight of the front and rear portions of the bearing shaft 6 as 4:3.

Example 2

The hiding place of the cockroaches was made at the center of a wooden box of 100 cm×50 cm×200 cm, and fifty imagos of black cockroaches were released, and after the place was held in natural living smell, the device for capturing the cockroaches shown in Figures 1 to 7 loaded with 5 g. of sugar as the food of the cockroaches was placed in the corner of the box. Then, the number of captured cockroaches were observed after one day. For the lower door a plate of single vane type shown in Figure 8 and a plate of the balanced vane type shown in Figure 9 were used. Both doors were provided with cutouts at the end as the ventilating portion 7. Similar experiments were conducted as to the larvae of black cockroaches, imagos of brown feather cockroaches and larvae thereof. The capturing effect due to the difference of the structure of the door were examined. The results were as in Table 1:

TABLE 1

Type of Door	No. of Experiments	Number of Captured Cockroaches: Black Cockroaches Imagos	Black Cockroaches Larvas	Brown Feather Cockroaches Imagos	Brown Feather Cockroaches Larvas
Balance type	1	3	6	4	4
	2	6	8	7	11
	3	2	12	8	10
	4	5	8	10	7
	Mean	4.0	8.5	7.2	8.0
Single vane type	1	1	3	7	6
	2	2	1	2	3
	3	2	3	5	2
	4	4	3	2	5
	Mean	2.2	2.5	4.0	4.0

Example 3

Using the method of Example 2, the relative efficiency of a device having the lower door having sawteeth cutouts as a ventilating portion and a device having the lower door having no ventilating portion was investigated, and the results shown in Table 2 were obtained. The lower door was of balance type.

TABLE 2

Type of Door	No. of Experiments	Number of Captured Cockroaches: Black Cockroaches Imagos	Black Cockroaches Larvas	Brown Feather Cockroaches Imagos	Brown Feather Cockroaches Larvas
With ventilating portion	1	2	6	8	3
	2	1	4	10	9
	3	5	3	14	6
	4	4	7	12	13
	Mean	3.0	5.0	11.0	7.7
Without ventilating portion	1	0	0	1	2
	2	0	0	0	3
	3	0	0	1	0
	4	0	0	0	1
	Mean	0	0	0.5	1.5

Example 4

In the method of the Example 2 the relative efficiency of a device having separate lower and upper bodies as the present invention, and a device having an integral attracting portion also functioning as the capturing portion in structure was investigated, and the results shown in Table 3 were obtained. The lower door was of the balance type having a ventilating portion at the end shown in Figure 9 for both devices.

TABLE 3

Type or Devices	No. of Experiments	Number of Captured Cockroaches: Black Cockroaches Imagos	Black Cockroaches Larvas	Brown Feather Cockroaches Imagos	Brown Feather Cockroaches Larvas
Separate Type	1	3	5	7	13
	2	1	5	15	19
	3	5	8	8	6
	4	2	9	10	12
	Mean	2.7	6.7	10.0	10.0
Integral Type	1	1	2	3	1
	2	3	2	8	0
	3	0	4	4	0
	4	4	2	7	1
	Mean	2.0	2.5	5.5	0.5

WHAT WE CLAIM IS:—

1. A device for capturing small creatures such as cockroaches, comprising: a lower body into which small creatures may be attracted, having a food retainer, passages connecting said retainer with the exterior of the device, and lower doors adapted for opening only from the exterior and located one in each of the passages; and an upper body in which small creatures from the lower body may be captured, the upper body being adapted for resting on said lower body and having communication ports opposite to and connecting with said passages and an upper door covering each of said communication ports and openable only from the passage.

2. A device as set forth in claim 1, wherein each lower door is rotatably supported on the upper portions of the side walls of the passages by a bearing shaft located at the upper end of said door and each lower door is inclined in such a manner that the lower end thereof is relatively close to the food retainer area.

3. A device as set forth in claim 1 or 2, wherein each upper door is supported by a bearing shaft provided at one end thereof and on a bottom plate of said upper body at the other end thereof.

4. A device as set forth in any preceding claim, wherein each door has a ventilating portion of sawtooth shape at the free end thereof.

5. A device as set forth in claim 2, or claim 3 or 4 where appendant thereto, wherein each lower door has a balance weight at the opposite side around the bearing shaft of the upper end thereof.

TABLE 2

Type of Door	No. of Experiments	Number of Captured Cockroaches: Black Cockroaches Imagos	Black Cockroaches Larvas	Brown Feather Cockroaches Imagos	Brown Feather Cockroaches Larvas
With ventilating portion	1	2	6	8	3
	2	1	4	10	9
	3	5	3	14	6
	4	4	7	12	13
	Mean	3.0	5.0	11.0	7.7
Without ventilating portion	1	0	0	1	2
	2	0	0	0	3
	3	0	0	1	0
	4	0	0	0	1
	Mean	0	0	0.5	1.5

Example 4

In the method of the Example 2 the relative efficiency of a device having separate lower and upper bodies as the present invention, and a device having an integral attracting portion also functioning as the capturing portion in structure was investigated, and the results shown in Table 3 were obtained. The lower door was of the balance type having a ventilating portion at the end shown in Figure 9 for both devices.

TABLE 3

Type or Devices	No. of Experiments	Number of Captured Cockroaches: Black Cockroaches Imagos	Black Cockroaches Larvas	Brown Feather Cockroaches Imagos	Brown Feather Cockroaches Larvas
Separate Type	1	3	5	7	13
	2	1	5	15	19
	3	5	8	8	6
	4	2	9	10	12
	Mean	2.7	6.7	10.0	10.0
Integral Type	1	1	2	3	1
	2	3	2	8	0
	3	0	4	4	0
	4	4	2	7	1
	Mean	2.0	2.5	5.5	0.5

WHAT WE CLAIM IS:—

1. A device for capturing small creatures such as cockroaches, comprising: a lower body into which small creatures may be attracted, having a food retainer, passages connecting said retainer with the exterior of the device, and lower doors adapted for opening only from the exterior and located one in each of the passages; and an upper body in which small creatures from the lower body may be captured, the upper body being adapted for resting on said lower body and having communication ports opposite to and connecting with said passages and an upper door covering each of said communication ports and openable only from the passage.

2. A device as set forth in claim 1, wherein each lower door is rotatably supported on the upper portions of the side walls of the passages by a bearing shaft located at the upper end of said door and each lower door is inclined in such a manner that the lower end thereof is relatively close to the food retainer area.

3. A device as set forth in claim 1 or 2, wherein each upper door is supported by a bearing shaft provided at one end thereof and on a bottom plate of said upper body at the other end thereof.

4. A device as set forth in any preceding claim, wherein each door has a ventilating portion of sawtooth shape at the free end thereof.

5. A device as set forth in claim 2, or claim 3 or 4 where appendant thereto, wherein each lower door has a balance weight at the opposite side around the bearing shaft of the upper end thereof.

6. A device as set forth in claim 3, wherein said upper body includes a cover which encloses the bottom plate in which are formed said communication ports.

7. A device as set forth in any of claims 1 to 5, wherein said upper body has a removing port at a periphery thereof, at which port a closing plate is engaged with sliding grooves provided at the edges of said port.

8. A device as set forth in claim 6 or 7 wherein said upper body has engaging legs adapted for engagement with the side walls of said lower body in a complementary and adjacent manner.

9. A device as set forth in claim 8, wherein said engaging legs are of box shape to form capturing chambers.

10. A device as set forth in any of claims 1 to 7, wherein said lower body has a plurality of grooves, and said upper body has a plurality of projections removably engaging within the said grooves, said projection being located on the lower surface of a bottom plate thereof.

11. A device for capturing small creatures such as cockroaches substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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