

VECTOR MOSQUITO AUTOMATIC ANALYSIS DEVICE CAPABLE OF ACCURATE ANALYSIS

BACKGROUND

(a) Technical Field

The present invention relates to a vector mosquito automatic analysis device capable of accurate analysis, and more specifically, to a vector mosquito automatic analysis device capable of accurate analysis that enables easy maintenance of the cleanliness of a capture unit and a photographing unit so that accurate and clear image information on mosquitoes can be acquired and analyzed in capturing and analyzing mosquitoes to prevent and respond to the spread and damage of infectious diseases caused by vector mosquitoes.

(b) Background Art

In general, mosquitoes are collected using an insect trap in order to confirm the generation density of mosquito carrying infectious diseases and to study whether or not mosquitoes are infected with pathogens.

Such a conventional insect trap is disclosed in Korean Patent Registration No. 10-1003178.

The conventional insect trap captures mosquitoes by diffusing a black light trap or an attractant around the insect trap to attract mosquitoes around the insect trap.

However, in this case, the mosquitoes were attracted around the insect trap, but not attracted around an inlet, and thus the capture rate of mosquitoes actually attracted around the insect trap was very low.

That is, in the conventional insect trap, the majority of mosquitoes just hover around the insect trap, and the suction power of an intake fan does not attract to an effective mosquito

suction distance of an intake port where mosquitoes are actually sucked, so that the actual mosquito capture rate is low.

This problem not only acts as an obstacle to accurate measurement of the actual mosquito generation density, but also makes it difficult to confirm accurate information such as the infection rate of mosquitoes and the like.

Accordingly, there is a need to improve the mosquito capture rate by attracting mosquitoes into the range of effective mosquito suction distance of the intake port.

In addition, although the number or type of mosquitoes is to be analyzed by photographing images of mosquitoes sucked and captured through these insect traps, since the moment rate to be sucked and moved is too fast, there were cost problem associated with mounting and applying an expensive high-speed camera and technical problem with actual application when photographing the images.

In order to solve this problem, in Korean Patent Registration No. 10-1476256 as the prior art, there is disclosed a technology capable of identifying pests without expensive camera devices by spraying carbon dioxide around a suction pipe using a carbon dioxide supplier provided in a casing, introducing pests such as mosquitoes attracted by the carbon dioxide into an insect trap port through a suction force, counting the introduced pests by a counting detection unit, photographing images by an image photographing unit when temporarily caught in a rotating net of a capture unit, and discharging the pests to a collection net by rotating the rotating net of the capture unit when the image photographing is completed.

However, in the prior art, the image photographing unit photographs the pests temporarily caught by the rotating net, but it is difficult to obtain clear images as the pollutants as well as the mosquitoes previously taken in such images are still exposed, making it difficult to identify the mosquitoes.

In addition, since the rotating net for capturing mosquitoes and the image

photographing unit for photographing the captured mosquitoes are provided in the same space, it is difficult to obtain clear images as the contamination of the image photographing unit itself and the pollution of lighting become increasingly severe, and there is also a lot of inconvenience in maintenance.

Therefore, there is a need for a method to solve these problems.

[Prior Art Documents]

[Patent Documents]

Korean Patent Registration No. 10-1003178

Korean Patent Registration No. 10-1476256

Korean Patent Registration No. 10-1953515

SUMMARY OF THE INVENTION

The present invention is devised to solve the problems in the related art, and an object of the present invention is to not only ensure accurate photographing by restraining only a motion while the body of mosquito is kept intact when attracting and capturing only mosquitoes, but also enable the acquisition of clear images without being affected by pollutants through the dualization of a photographing unit and a capture unit.

The objects of the present invention are not limited to the aforementioned objects, and other objects, which are not mentioned above, will be apparent to those skilled in the art from the following description.

A vector mosquito automatic analysis device capable of accurate analysis of the present invention to achieve the aforementioned objects includes a main body that forms an appearance and a hollow space therein, an inlet unit that is provided in the main body, extends to be exposed to the outside, and provides a passage through which external mosquitoes are

introduced into the main body, a detection unit that is provided at one side of the inlet unit and has an infrared light sensing structure for detecting and automatically counting the mosquitoes introduced into the main body through the inlet unit, a suction unit that is provided in the main body to suck external air containing the mosquitoes to be introduced into the main body through the inlet unit, a capture unit that is provide between the inlet unit and the suction unit to communicate with each other to capture and temporarily stun the mosquitoes introduced into the main body through the inlet unit, a photographing unit that is provided in the main body to be dualized with the capture unit and photographs the mosquitoes to acquire information required for analysis, a transfer unit that reciprocates between the capture unit and the photographing unit to transfer the mosquitoes temporarily stunned in the capture unit to the photographing unit, and a collection unit that perform collecting and destroying operations of the mosquitoes that haven been photographed.

At this time, the suction unit may be hollow therein and have one side connected to the upper end of the capture unit and the other side connected to one side of the main body, and may include a suction fan that is provided at a connection portion with the capture unit to generate a suction force so that external air is smoothly introduced into the main body through the inlet unit, and a discharge fan that is provided at a connection portion of the main body to generate a discharge force so that the external air introduced into the main body is discharged to the outside of the main body again, wherein the suction unit may allow air to circulate and flow in one direction in the main body in addition to the inlet unit and the capture unit.

In addition, the suction unit may be able to be linked with the capture unit, so that driving may be temporarily stopped during the operation of stunning the mosquitoes captured by the capture unit.

At this time, the capture unit may include a case that has one side communicating with the inlet unit, a top surface communicating with the suction unit, and a bottom surface formed

in an opened shape, an electric shock module that is provided inside the case and provided between the inlet unit and the suction unit to filter and temporarily stun the mosquitoes introduced together with external air, a supply module selectively supplying current to the electric shock module, and a discharge guide that discharges the mosquitoes temporarily stunned and captured in the electric shock module to be transmitted to the photographing unit.

In addition, the electric shock module may include a first electrode plate that is provided to block a space in which the capture unit and the suction unit communicate with each other in order to prevent the mosquitoes introduced into the capture unit together with external air from indiscriminately escaping to the suction unit and has a conductor having a mesh network shape, a second electrode plate that is provided to block the upper end of the discharge guide in order to prevent the mosquitoes introduced into the capture unit from indiscriminately escaping through the discharge guide and has a conductor having a mesh network shape, and a rotation unit that connects the first electrode plate and the second electrode plate, wherein the second electrode plate is able to swing up and down so that the second electrode plate is selectively in close contact with the first electrode plate or the upper end of the discharge guide is opened.

At this time, the first electrode plate and the second electrode plate may have different electrodes, and when the first electrode plate and the second electrode plate are in close contact with each other, a positive electrode and a negative electrode may interact with each other to temporarily stun the mosquitoes captured between the first electrode plate and the second electrode plate by electric shock.

In addition, the capture unit may further include a clean module that is provided in at least one of the first electrode plate and the second electrode plate and has a wiper shape to facilitate the maintenance of cleanliness of the electric shock module while dropping the stuck mosquitoes so that there is no mosquito that may remain in the electric shock module during

the discharging operation of the stunned mosquitoes.

When the analysis device determines that a preset quantity has been reached based on the number of mosquitoes detected by the detection unit, the second electrode plate may swing toward the first electrode plate, and the current may be applied from the supply module to the first electrode plate and the second electrode plate to perform an electric shock operation for the mosquitoes.

In addition, the photographing unit may include a seating module that allows the mosquitoes temporarily stunned in the capture unit and discharged to be seated on the upper end, and a camera module that photographs the mosquitoes seated on the seating module to acquire image information necessary for analysis.

At this time, the seating module may include a guide unit that is coupled to the transfer unit to reciprocate between the capture unit and the camera module, and a panel unit that is provided to be exposed to the upper portion of the guide unit to be seated with the temporarily stunned mosquitoes and becomes a background of a mosquito image to be photographed.

In addition, the seating module may further include a motor unit that is provide at one side of the guide unit to generate a rotational force, and a rotational shaft unit that has one side connected to the motor unit and the other side extended to be connected to the panel unit so that the panel unit is rotatable in a vertical direction by the rotational force of the motor unit, in which after the photographing of the mosquitoes is completed, the motor unit may be driven to rotate the panel unit, so that the mosquitoes that have been seated on the upper end of the panel unit may be collected by the collection unit.

At this time, the guide unit may further include a through hole formed to penetrate so that the upper and lower surfaces are opened at a position where the panel unit is provided, in which after the photographing of the mosquitoes is completed, the mosquitoes seated on the upper end of the rotating panel unit may be discharged through the through hole to the

collection unit located at the lower portion of the guide unit.

In addition, the guide unit may further include a spray hole that is formed to pass through the inside, wherein one side is connected by a pneumatic generator and a hose provided in the main body, and the other side is formed to communicate with one surface of the through hole so that high-pressure air generated from the pneumatic generator is sprayed toward the through hole.

After the photographing of the mosquitoes is completed in the analysis device, the seating module may be located at the upper portion of the collection unit so that the panel unit may be rotated and the mosquitoes that have been seated on the upper end of the panel unit may be discharged to the collection unit through the through hole and simultaneously, the pneumatic generator may be driven to spray the high-pressure air to the panel unit through the spray hole to be washed without stuck mosquitoes.

At this time, when the panel unit rotates to discharge the mosquitoes seated on the upper end, the surface facing the spray hole may be inclined upward so that the flow of the high-pressure air sprayed through the spray hole may be directed toward the collection unit to perform the stable collection of the mosquitoes.

In addition, the analysis device may further include an information processing unit that receives and stores image information photographed from the camera module, analyzes the stored information, and transmits the analyzed information to a central server.

In addition, the analysis device may further include a gas injection module that is provided in the main body and injects carbon dioxide to the outside through the inlet unit so that only the mosquitoes are selectively attracted from the outside through the inlet unit to be introduced into the main body.

The vector mosquito automatic analysis device capable of accurate analysis of the present invention to solve the problems has the following effects.

First, there is an advantage capable of not requiring unnecessary classification and acquiring only necessary information by attracting only a specific target object among pests.

Second, there is an advantage capable of performing accurate photographing by suppressing only a motion without damaging the bodies of the mosquitoes by temporarily stunning the mosquitoes introduced into the capture unit by electric shock.

Third, there is an advantage capable of acquiring clear images regardless of whether the capture unit is contaminated by separating the mosquitoes captured in the capture unit from the capture unit, seating the mosquitoes in the seating module, and transferring the mosquitoes to the camera module to perform the photographing.

Fourth, there is an advantage capable of facilitating maintenance of cleanliness and acquiring clear images continuously by collecting the mosquitoes after the photographing is completed and simultaneously spraying high-pressure air to wash the panel unit.

Fifth, as a result, there is an advantage that it is possible to obtain clean and intact photographing videos and images, and based on this, it is possible to perform accurate analysis of mosquitoes.

The effects of the present invention are not limited to the aforementioned effect, and other effects not mentioned above will be clearly understood to those skilled in the art from the description of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an exemplary view illustrating an overall appearance of a vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention;

FIG. 2 is an exemplary view illustrating an overall structure and an air flow of a vector mosquito automatic analysis device capable of accurate analysis according to an embodiment

of the present invention;

FIG. 3 is an exemplary view illustrating a capture unit and a suction unit in the vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention;

FIG. 4 is an exemplary view illustrating a driving appearance of an electric shock module and a clean module in the vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention;

FIG. 5 is an exemplary view illustrating a linkage and an operation of a transfer unit and a seating module in the vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention;

FIG. 6 is an exemplary view illustrating an operation sequence of a vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention; and

FIG. 7 is an exemplary view illustrating a process of collecting mosquitoes after photographing has been completed and washing a panel unit in the vector mosquito automatic analysis device capable of accurate analysis according to an embodiment of the present invention.

DETAILED DESCRIPTION

Hereinafter, preferred embodiments of the present invention, in which a purpose of the present invention can be realized in detail, will be described with reference to the accompanying drawings. In describing the embodiment, like names and like reference numerals will be used with respect to like components and the resulting additional description will be omitted.

The present invention relates to a vector mosquito automatic analysis device capable

of accurate analysis that enables easy maintenance of the cleanliness of a capture unit and a photographing unit so that accurate and clear image information on mosquitoes can be acquired and analyzed in capturing and analyzing mosquitoes to prevent and respond to the spread and damage of infectious diseases caused by vector mosquitoes.

The vector mosquito automatic analysis device capable of accurate analysis according to the present invention, as illustrated in FIGS. 1 and 2, may be configured by including a main body 100 that has an overall appearance, and a hollow space formed to provide a space for performing a series of operations to capture and photograph mosquitoes, and collect and destroy the mosquitoes that have been photographed, an inlet unit 200 that may be provided in the main body 100, has one side connected to the inside of the main body 100 and the other side extending to be exposed to the outside of the main body 100, and provides a passage through which the mosquitoes existing outside the main body 100 may be introduced into the main body 100, a suction unit 300 that may be provided in the main body 100 and generates a suction force so that external air including the mosquitoes may be smoothly introduced into the main body 100 through the inlet unit 200, a capture unit 400 that may be provided between the inlet unit 200 and the suction unit 300 and captures the mosquitoes introduced into the main body 100 from the outside through the inlet unit 200 to temporarily stun the captured mosquitoes, a photographing unit 500 that is provided in the main body 100 to be dualized with the capture unit 400, and performs photographing to acquire images and image information of the mosquitoes for analysis by receiving the mosquitoes captured in the capture unit 400 and temporarily stunned, a transfer unit 600 that may reciprocate between the capture unit 400 and the photographing unit 500 formed in the separate dualized structures and allows the mosquitoes temporarily stunned in the capture unit 400 to be discharged from the capture unit 400 and transferred to the photographing unit 500, and a collection unit 700 that may be provided in the main body 100, collects the mosquitoes that have been completely

photographed, and performs a destroying operation.

At this time, the analysis device may further include a detection unit 800 that may be provided on one side of the inlet unit 200, which serves as a passage through which the mosquitoes are introduced into the main body 100 from the outside, and detects the mosquitoes introduced into the capture unit 400 positioned inside the main body 100 through the inlet unit 200 and automatically count the detected mosquitoes, and it is preferable that the detection unit 800 is formed in an infrared light sensing structure to perform accurate detection and counting of the mosquitoes.

According to an embodiment of the present invention, the suction unit 300 that generates a suction force in an inward direction of the main body 100 to introduce the mosquitoes together with the external air into the main body 100 through the inlet unit 200 is formed in a hollow structure, and one side of the structure may be connected to an upper end of the capture unit 400 to communicate with each other and the other side may be connected to one side of the main body 100 to communicate with each other.

The suction unit 300 may be configured by including a suction fan 310 that may be provided at a connection portion with the capture unit 400 to generate a suction force in the inward direction of the main body 100 so that the external air may be smoothly introduced into the main body 100 through the inlet unit 200, and a discharge fan 320 that may be provided at a connection portion of the main body 100 to generate a discharge force so that the external air introduced into the main body 100 by the driving of the suction fan 310 may be discharged to the outside of the main body 100 again.

As such, in the structure that is hollow and has one side connected to the upper end of the capture unit 400 to communicate with each other and the other side connected to one side of the main body 100 to communicate with each other, the suction unit 300 may allow the air to flow in one direction in the main body 100, more specifically, to circulate in one direction

having the air flow flowing to the outside again through the inside from the outside of the main body 100, in addition to the inlet unit 200 and the capture unit 400 having the structure that communicates with each other by interaction between the suction fan 310 and the discharge fan 320 that may be provided at the connection portion with the capture unit 400 and the connection portion with the main body 100, respectively.

As the air flows, the mosquitoes outside the main body 100 are sucked into the main body 100 through the inlet unit 200 together with the external air, and then filtered and collected by the capture unit 400, and as a result, only the air circulates and flows in one direction through the passage formed in the main body 100.

At this time, the suction unit 300, more specifically, the suction fan 310 and the discharge fan 320 included in the suction unit 300 may be linked with the capture unit 400, so that it is preferable to temporarily stop the driving during the operation of stunning the mosquitoes captured in the capture unit 400 so that the stable operation of stunning the mosquitoes may be performed.

In addition, the vector mosquito automatic analysis device capable of accurate analysis according to the present invention may attract only specific objects to be analyzed among pests to be introduced into the main body 100 through the inlet unit 200, thereby accurately acquiring only necessary information without an operation of classifying a target object among several species in the process of analyzing the pests.

In the present invention, a pest injection module may be provided inside the main body 100 by limiting a target pest to a mosquito so that carbon dioxide may be injected to the outside through the inlet unit 200, but is not limited thereto, and it should be recognized that when the target object for analysis among pests is not a mosquito, an attracting means for attracting only the corresponding target object may be selectively provided and applied.

According to an embodiment of the present invention, as illustrated in FIGS. 2 and 3,

the capture unit 400 is provided to communicate with each other between the inlet unit 200 and the suction unit 300 in the inner space of the main body 100 to perform the capturing operation by capturing and temporarily stunning the mosquitoes introduced into the main body 100. The capture unit 400 may be configured by including a case 410 that has one side connected to communicate with the inlet unit 200 and the other side, more specifically a top surface connected to communicate with the suction unit 200 and a bottom surface formed in an opened shape to form an inner space, an electric shock module 420 that is provided inside the case 410 and provided between the inlet unit 200 and the suction unit 300 to filter and temporarily stun the mosquitoes introduced together with external air, a supply module 430 selectively supplying current to the electric shock module 420, and a discharge guide 440 that is a passage through which the mosquitoes temporarily stunned and captured in the electric shock module 420 are discharged to be transmitted to the photographing unit 500.

At this time, the discharge guide 440 may be formed in a shape that matches or extends further than the opened lower surface of the case 410, and is preferably formed in a shape having opened upper and lower surfaces for smooth discharge of mosquitoes.

According to an embodiment of the present invention, as illustrated in FIGS. 3 and 4, the electric shock module 420 that temporarily stuns the mosquitoes captured in the capture unit 400 by electric shock may be configured by including a first electrode plate 421 that is provided to block a space in which the capture unit 400 and the suction unit 300 communicate with each other in order to prevent the mosquitoes introduced into the capture unit 400 through the inlet unit 200 together with external air from indiscriminately escaping to the suction unit 300 connected to communicate with the upper end of the capture unit 400, and a second electrode plate 422 that is provided to block the upper end of the discharge guide 440 in order to prevent the mosquitoes introduced into the capture unit 400 from indiscriminately escaping to the photographing unit 500 through the discharge guide 440.

At this time, the first electrode plate 421 is preferably formed in a mesh shape so that the external air flows smoothly, but the mosquitoes may not escape but be filtered out, and preferably formed of a conductor so that the current applied from the supply module 430 flows well to temporarily stun the mosquitoes by electric shock, and such a structure may be equally applied even to the second electrode plate 422.

For example, the first electrode plate 421 and the second electrode plate 422 may be connected with the supply module 430 wirelessly or wiredly, and receive the current by the supply module 430 to temporarily stun the mosquitoes captured between the first electrode plate 421 and the second electrode plate 422 in the capture unit 400 by electric shock.

At this time, it is preferable to control the power supplied to the first electrode plate 421 and the second electrode plate 422 within a range in which temporary stunning may be performed so as to suppress only the motion without damaging the bodies of the mosquitoes, and it should be recognized that the detailed numerical range corresponds to the know-how of the present invention.

In addition, the power supplied to the first electrode plate 421 and the second electrode plate 422 through the supply module 430 is selectively supplied only at the moment when the mosquitoes captured in the capture unit 400 are stunned, thereby preventing unnecessary power consumption and preventing safety accidents that may occur by any chance.

According to an embodiment of the present invention, as described above, the first electrode plate 421 and the second electrode plate 422 of the electric shock module 420 may be provided to be fixed to a space where the capture unit 400 and the suction unit 200 communicate with each other and an upper position of the discharge guide 440, but are not limited thereto. Preferably, the first electrode plate 421 and the second electrode plate 422 are formed in a structure that may be selectively moved by swinging to be in close contact with each other so as to maximize the efficiency of temporarily stunning the mosquitoes captured

in the capture unit 400 by electric shock and perform a stable operation.

To this end, the electric shock module 420 may further include a rotation unit 423 in which one side of the first electrode plate 421 and one side of the second electrode plate 422 are coupled to each other so that the first electrode plate 421 and the second electrode plate 422 may be interconnected, but the second electrode plate 422 may move by swing up and down so that the second electrode plate 422 is selectively in close contact with the first electrode plate 421 or the upper end of the discharge guide 440 is opened.

For example, the position of the first electrode plate 421 provided to block the space in which the capture unit 400 and the suction unit 300 communicate with each other is fixed and coupled, but the second electrode plate 422 is coupled to one side of the first electrode plate 421 by the rotation unit 423 and has a structure capable of swinging up and down with respect to the rotation unit 423. While the mosquitoes introduced into the capture unit 400, more specifically, between the first electrode plate 421 and the second electrode plate 422 are captured, the second electrode plate 422 is swing-moved by the rotation unit 423 so as to come into close contact with the first electrode plate 421, and the first electrode plate 421 and the second electrode plate 422 receive current from the supply module 430 while being in close contact with each other to stably and temporarily stun the captured mosquitoes to be positioned between the first electrode plate 421 and the second electrode plate 422 by the connection of the first electrode plate 421 and the second electrode plate 422.

At this time, it may be most preferable that the rotation unit 423 is provided so that the first electrode plate 421 and the second electrode plate 422 may be connected to each other as described above so as to finely adjust a space between the second electrode plate 422 and the first electrode plate 421 swing-moved toward the first electrode plate 421, but it is not limited thereto. In some cases, the rotation unit 423 may also be provided to be connected to one side of the second electrode plate 422 so that only the second electrode plate 422 is rotatable inside

the case 410 to be coupled to the inner surface of the case 410.

At this time, the first electrode plate 421 and the second electrode plate 422 may be provided so that only the second electrode plate 422 may swing-move, as described above, but in some cases, both the first electrode plate 421 and the second electrode plate 422 may also have a structure capable of swing-moving.

Here, importantly, it should be recognized that the second electrode plate 422 provided to block the upper end of the discharge guide 440 to discharge the mosquitoes temporarily stunned by the electric shock module 420 to be transmitted to the photographing unit 500 needs to inevitably have a structure capable of swinging up and down.

That is, the second electrode plate 422 may swing upward toward the first electrode plate 421 by the rotation unit 423 to stably electric-shock the captured mosquitoes, and after the electric shock is completed, the second electrode plate 422 needs to swing downward to be opened to the upper end of the discharge guide 440 so that the stunned mosquitoes may be discharged through the discharge guide 440 to be transmitted to the photographing unit 500.

In addition, the first electrode plate 421 and the second electrode plate 422 have different electrodes, and for example, when the first electrode plate 421 is a positive electrode, the second electrode plate 422 has a negative electrode, and conversely, when the first electrode plate 421 is a negative electrode, the second electrode plate 422 may have a positive electrode. When the first electrode plate 421 and the second electrode plate 422 are selectively brought into close contact with each other by the rotation unit 423, the positive electrode and the negative electrode interact with each other to electric-shock the mosquitoes located between the first electrode plate 421 and the second electrode plate 422.

According to an embodiment of the present invention, the capture unit 400 may further include a clean module 450 that may be provided in at least one of the first electrode plate 421 and the second electrode plate 422 and has a wiper shape to facilitate the management by

maintaining the clean without polluting the electric shock module 420 for a long time while dropping the stuck mosquitoes so that there is no mosquito that may remain in the electric shock module 420, that is, the first electrode plate 421 and/or the second electrode plate 422 during the discharging operation of the stunned mosquitoes.

The clean module 450 is provided on one side of at least one of the first electrode plate 421 and the second electrode plate 422 and has a structure including a bar-shaped wiper structure to sweep the surface, and a motor to generate a rotational force to such a bar-shaped wiper structure. The structure of the capture unit 400, and the structure and the operating range of the first electrode plate 421, the second electrode plate 422, and the clean module 450 make it easier to be understood with reference to FIG. 4 illustrated as an example.

In the analysis device according to the present invention configured by such a structure, when it is determined that a preset quantity has been reached based on the number of mosquitoes detected by the detection unit 800 to be introduced into the main body 100, for example, assuming that the number of mosquitoes introduced into the main body 100 is set to 3 in order to prevent the unclear analysis from being performed by overlapping of the captured mosquitoes when the photographing unit 500 photographs the images of the mosquitoes, when the detection unit 800 counts the mosquitoes introduced through the inlet unit 200 and determines that the counting number is three, the driving of the suction unit 300 is temporarily stopped so that no more mosquitoes are introduced. In addition, as the second electrode plate 422 swings toward the first electrode plate 421, three mosquitoes, as a predetermined number of mosquitoes, are captured in a narrow space where the first electrode plate 421 and the second electrode plate 422 are in close contact with each other, and in this state, an electric shock operation for mosquitoes may be performed by applying the current from the supply module 430 to the first electrode plate 421 and the second electrode plate 422.

As such, after the mosquitoes are temporarily stunned by electric shock, the second

electrode plate 422 moves downward again so that both upper and lower surfaces of the discharge guide 440 are opened so that the stunned mosquitoes are discharged to be transmitted to the photographing unit 500.

According to an embodiment of the present invention, the photographing unit 500 photographing images and/or videos required for analysis by receiving the temporarily stunned mosquitoes through the capture unit 400 may be configured by including a seating module 520 that is provided below the capture unit 400, more specifically, below the discharge guide 440 to allow the mosquitoes temporarily stunned in the capture unit 400 and discharged through the discharge guide 440 to be seated on the upper end, and a camera module 510 that photographs the mosquitoes seated on the upper end of the seating module 520 to acquire image and/or video information necessary for analysis.

At this time, as illustrated in FIG. 5, the seating module 520 may be configured by including a guide unit 521 that is coupled to the transfer unit 600 capable of reciprocating between the capture unit 400 and the photographing unit 500 to reciprocate between the capture unit 400 and the camera module 510 by the driving of the transfer unit 600, and a panel unit 522 that is provided in the guide unit 521 and provided to be exposed to the upper portion of the guide unit 521 so that the temporarily stunned mosquitoes discharged from the discharge guide 440 are seated on the upper end, and becomes a background of a mosquito image photographed by the camera module 510.

In addition, the seating module 520 may further include a motor unit 523 that may be provide at one side of the guide unit 521 to generate a rotational force, and a rotational shaft unit 524 that has one side connected to the motor unit 523 and the other side extended to be connected to the panel unit 522 so that the panel unit 522 is rotatable in a vertical direction by the rotational force of the motor unit 523. As a result, after the photographing of the mosquitoes is completed in the analysis device, the motor unit 523 is driven to rotate the panel unit 522, so

that the mosquitoes that have been seated on the upper end of the panel unit 522 may be collected by the collection unit 700.

At this time, the guide unit 521 may further include a through hole T formed to penetrate in a vertical direction so that the upper and lower surfaces may be opened at the position where the panel unit 522 is provided. The panel unit 522 may be provided to be positioned above the through hole T, but provided inside the through hole T so that the mosquitoes discharged from the discharge guide 440 may be stably seated, so that it is preferred that the inner surface of the through hole T serves as a guard covering the circumference of the panel unit 522 to prevent the mosquitoes from escaping while moving.

As such, the through hole T is formed in the guide unit 521, so that after the photographing for the mosquitoes in the analysis device is completed, the mosquitoes seated on the upper end of the panel unit 522 rotated so that the upper and lower surfaces are inverted may be discharged to the collection unit 700 located below the guide unit 521 through the opened lower surface of the through hole T.

According to an embodiment of the present invention, the guide unit 521 may further include a spray hole S that is formed to pass through the inside, wherein one side may be connected by a pneumatic generator and a hose provided in the main body 100, and the other side may be formed to communicate with one surface of the through hole T so that high-pressure air generated from the pneumatic generator may be sprayed toward the through hole T.

The spray hole S may be formed in a horizontal direction inside the guide unit 521, and at this time, the forming angle may be formed in a horizontal direction that is completely parallel or in a horizontal direction that is inclined downward toward the through hole T. The spray hole S serves as a passage and a nozzle so that the high-pressure air may be sprayed toward the panel unit 522 provided in the through hole T.

For example, the spray hole S may be formed to pass through the guide unit 521 so that one side is opened to communicate with the outside and the other side may be opened to communicate with one side of the inner surface of the through hole T. In addition, an air hose coupled to extend from the pneumatic generator that may be provided inside the main body 100 is coupled to one side, so that the high-pressure air generated from the pneumatic generator may be sprayed by the spray hole S toward the panel unit 522 provided in the inner space of the through hole T.

In the analysis device, after the photographing of the mosquitoes is completed through the camera module 510, the seating module 520, more specifically the guide unit 521 is located at the upper portion of the collection unit 700 so that the panel unit 522 provided in the guide unit 521 is rotated so as to be vertically inverted. In addition, the mosquitoes that have been seated on the upper end of the panel unit 522 are discharged to the collection unit 700 through the through hole T, and simultaneously, the pneumatic generator is driven to spray the high-pressure air to the panel unit 522 through the spray hole S. Accordingly, the analysis device may facilitate the maintenance of cleanliness by clearly washing the surface of the panel unit 522 without the stuck mosquitoes.

At this time, when the panel units 522 rotates to discharge the mosquitoes that have been seated on the upper end, the surface facing the spray hole S is inclined upward so that the flow of the high-pressure air sprayed through the spray hole S is naturally directed toward the collection unit 700, so that it is preferred to perform the stable collection of the mosquitoes.

As such, in the present invention, a series of processes for collecting the mosquitoes that have been photographed and washing the panel unit 522 to keep cleanliness may be more easily understood with reference to FIG. 7.

In addition, the rotation direction of the panel unit 522 may be reciprocated in both directions so that one of the upper and lower surfaces becomes the background of the image to

be photographed, but is not limited thereto, and it is also possible to make the lifetime of the panel unit 522 last longer by allowing the upper and lower surfaces to alternately serve as the background of the image.

In the case of conventional pest analysis devices such as mosquitoes, the capture unit for capturing pests and the photographing unit for photographing the captured pests are located in the same space to be inevitably vulnerable to mosquito remnants or contamination. As a result, there were many problems in which obscure and unclear images were photographed, thereby making analysis impossible or errors occurring. However, as described above, in the case of the present invention having a structure in which the photographing unit 500 and the capture unit 400 are separated and provided in different spaces, and each operation is completely separated, it should be recognized that these conventional problems may be effectively solved.

In addition, the analysis device may further include an information processing unit capable of receiving and storing image information photographed from the camera module 510, analyzing the stored information, and transmitting the analyzed information to a central server, and it should be recognized that the information processing unit has been constructed with a wireless communication network for smooth communication with a central server.

As described above, to perform maintenance and smooth management of cleanliness for each structure and perform accurate analysis by acquiring clear images by attracting and capturing only specific target objects and temporarily stunning the objects to prevent damage to the bodies of the target objects, the operation process of the vector mosquito automatic analysis device capable of accurate analysis according to the present invention may be more easily understood with reference to FIG. 6, and the cleaning process of the panel unit 522 may be more easily understood with reference to FIG. 7.

As described above, the prepared embodiment of the present invention has been as

described, and in addition to the embodiments described above, a fact that the present invention can be materialized in other specific forms without departing from the gist or scope thereof will be apparent to those skilled in the art. Therefore, the aforementioned embodiments are not limited but should be considered to be illustrative, and accordingly, the present invention is not limited to the above description and may be modified within the scope of the appended claims and a range equivalent thereto.

[Explanation of Reference Numerals and Symbols]

100: Main body	200: Inlet unit
300: Suction unit	310: Suction fan
320: Discharge fan	400: Capture unit
410: Case	420: Electric shock module
421: First electrode plate	422: Second electrode plate
423: Rotation unit	430: Supply module
440: Discharge guide	450: Clean module
500: Photographing unit	510: Camera module
520: Seating module	521: Guide unit
522: Panel unit	523: Motor unit
524: Rotational shaft unit	600: Transfer unit
700: Collection unit	800: Detection unit
S: Spray hole	T: Through hole

WHAT IS CLAIMED IS:

1. A vector mosquito automatic analysis device capable of accurate analysis comprising:

a main body that forms an appearance and a hollow space therein;

an inlet unit that is provided in the main body, extends to be exposed to the outside, and provides a passage through which external mosquitoes are introduced into the main body;

a detection unit that is provided at one side of the inlet unit and has an infrared light sensing structure for detecting and automatically counting the mosquitoes introduced into the main body through the inlet unit;

a suction unit that is provided in the main body to suck external air containing the mosquitoes to be introduced into the main body through the inlet unit;

a capture unit that is provided between the inlet unit and the suction unit to communicate with each other to capture and temporarily stun the mosquitoes introduced into the main body through the inlet unit;

a photographing unit that is provided in the main body to be dualized with the capture unit and photographs the mosquitoes to acquire information required for analysis;

a transfer unit that reciprocates between the capture unit and the photographing unit to transfer the mosquitoes temporarily stunned in the capture unit to the photographing unit; and

a collection unit that performs collecting and destroying operations of the mosquitoes that have been photographed.

2. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, wherein the suction unit is hollow therein, and has one side connected to the upper end of the capture unit and the other side connected to one side of the main body, and includes:

a suction fan that is provided at a connection portion with the capture unit to generate

a suction force so that external air is smoothly introduced into the main body through the inlet unit; and

a discharge fan that is provided at a connection portion with the main body to generate a discharge force so that the external air introduced into the main body is discharged to the outside of the main body again,

so that the suction unit allows air to circulate and flow in one direction in the main body together with the inlet unit and the capture unit.

3. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, wherein the suction unit is able to be linked with the capture unit, so that driving is temporarily stopped during the operation of stunning the mosquitoes captured by the capture unit.

4. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, wherein the capture unit comprises:

a case that has one side communicating with the inlet unit, a top surface communicating with the suction unit, and a bottom surface formed in an opened shape;

an electric shock module that is provided inside the case and provided between the inlet unit and the suction unit to filter and temporarily stun the mosquitoes introduced together with external air;

a supply module selectively supplying current to the electric shock module; and

a discharge guide that discharges the mosquitoes temporarily stunned and captured in the electric shock module to be transmitted to the photographing unit.

5. The vector mosquito automatic analysis device capable of accurate analysis of claim

4, wherein the electric shock module comprises:

a first electrode plate that is provided to block a space in which the capture unit and the suction unit communicate with each other in order to prevent the mosquitoes introduced into the capture unit together with external air from indiscriminately escaping to the suction unit and has a conductor having a mesh network shape;

a second electrode plate that is provided to block the upper end of the discharge guide in order to prevent the mosquitoes introduced into the capture unit from indiscriminately escaping through the discharge guide and has a conductor having a mesh network shape; and

a rotation unit that connects the first electrode plate and the second electrode plate, wherein the second electrode plate is able to swing up and down so that the second electrode plate is selectively in close contact with the first electrode plate or the upper end of the discharge guide is opened.

6. The vector mosquito automatic analysis device capable of accurate analysis of claim 5, wherein the first electrode plate and the second electrode plate have different electrodes, and when the first electrode plate and the second electrode plate are in close contact with each other, each positive electrode and negative electrode interact with each other to temporarily stun the mosquitoes captured between the first electrode plate and the second electrode plate by electric shock.

7. The vector mosquito automatic analysis device capable of accurate analysis of claim 5, wherein the capture unit further comprises:

a clean module that is provided in at least one of the first electrode plate and the second electrode plate and has a wiper shape to facilitate the maintenance of cleanliness of the electric shock module while dropping the stuck mosquitoes so that there is no mosquito that may

remain in the electric shock module during the discharging operation of the stunned mosquitoes.

8. The vector mosquito automatic analysis device capable of accurate analysis of claim 5, wherein when the analysis device determines that a preset quantity has been reached based on the number of mosquitoes detected by the detection unit, the second electrode plate swings toward the first electrode plate, and the current is applied from the supply module to the first electrode plate and the second electrode plate to perform an electric shock operation for the mosquitoes.

9. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, wherein the photographing unit comprises:

a seating module that allows the mosquitoes temporarily stunned in the capture unit and discharged to be seated on the upper end; and

a camera module that photographs the mosquitoes seated on the seating module to acquire image information necessary for analysis.

10. The vector mosquito automatic analysis device capable of accurate analysis of claim 9, wherein the seating module comprises:

a guide unit that is coupled to the transfer unit to reciprocate between the capture unit and the camera module; and

a panel unit that is provided to be exposed to the upper portion of the guide unit to be seated with the temporarily stunned mosquitoes and becomes a background of a mosquito image to be photographed.

11. The vector mosquito automatic analysis device capable of accurate analysis of

claim 10, wherein the seating module further comprises:

a motor unit that is provide at one side of the guide unit to generate a rotational force;
and

a rotational shaft unit that has one side connected to the motor unit and the other side extended to be connected to the panel unit so that the panel unit is rotatable in a vertical direction by the rotational force of the motor unit,

wherein after the photographing of the mosquitoes is completed, the motor unit is driven to rotate the panel unit, so that the mosquitoes that have been seated on the upper end of the panel unit are collected by the collection unit.

12. The vector mosquito automatic analysis device capable of accurate analysis of claim 11, wherein the guide unit further comprises:

a through hole formed to penetrate so that the upper and lower surfaces are opened at a position where the panel unit is provided,

wherein after the photographing of the mosquitoes is completed, the mosquitoes seated on the upper end of the rotating panel unit are discharged through the through hole to the collection unit located at the lower portion of the guide unit.

13. The vector mosquito automatic analysis device capable of accurate analysis of claim 12, wherein the guide unit further comprises a spray hole that is formed to pass through the inside, whose one side is connected by a pneumatic generator and a hose provided in the main body, and the other side is formed to communicate with one surface of the through hole so that high-pressure air generated from the pneumatic generator is sprayed toward the through hole.

14. The vector mosquito automatic analysis device capable of accurate analysis of claim 13, wherein after the photographing of the mosquitoes is completed in the analysis device, the seating module is located at the upper portion of the collection unit so that the panel unit is rotated and the mosquitoes that have been seated on the upper end of the panel unit are discharged to the collection unit through the through hole and simultaneously, the pneumatic generator is driven to spray the high-pressure air to the panel unit through the spray hole to be washed without stuck mosquitoes.

15. The vector mosquito automatic analysis device capable of accurate analysis of claim 14, wherein when the panel unit rotates to discharge the mosquitoes seated on the upper end, the surface facing the spray hole is inclined upward so that the flow of the high-pressure air sprayed through the spray hole is directed toward the collection unit to perform the stable collection of the mosquitoes.

16. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, further comprising:

an information processing unit that receives and stores image information photographed from the camera module, analyzes the stored information, and transmits the analyzed information to a central server.

17. The vector mosquito automatic analysis device capable of accurate analysis of claim 1, further comprising:

a pest injection module that is provided in the main body and injects carbon dioxide gas to the outside through the inlet unit so that only the mosquitoes are selectively attracted from the outside through the inlet unit to be introduced into the main body.