

CULTURING DEVICE FOR INSECT PROTEIN PRODUCTION

BACKGROUND OF INVENTION

1. Field of the Invention

[0001] The present invention relates generally to a culturing device for insect protein production, and more particularly to a culturing device which can automatically culture insects and improve the quality of organic substances in a cyclic manner.

2. Description of Related Art

[0002] Organic wastes such as food wastes, dead animals or animal excrement may cause serious pollution and damage to the environment. Therefore, organic wastes are usually burned or buried. Both processing methods are not environment-friendly and may cost a lot of resources. In recent years, phoragers are used to process the aforementioned organic wastes and the achievements are remarkable. The organic waste is used to feed phoragers such as black soldier flies. The residues and excrement of black soldier flies are very good natural soil-improving material, which can solve the problem of soil acidification. Moreover, when the black soldier flies grow into pupae, they contain abundant protein and can be used as feed for the poultry industry. Phoragers can only solve the environmental problem of organic wastes, but also improve the quality of soil. Moreover, it can become a good source of feed. Therefore, this method for processing organic wastes are advocated strongly and considerable sources are invested for relevant researches. Many techniques in connection with this method are disclosed. Examples include ROC Patent No. 108122388, 109127384, 109206229, 110213377, 108144532 and 111203728. After extensive research and development, the inventor of the present invention also developed a culturing device to use phoragers to

improve the quality of organic wastes and to provide pupae as feed. Moreover, it can automatically produce eggs for proliferation and produce larvae for further utilization.

SUMMARY OF THE INVENTION

[0003] Therefore, the object of the present invention is to provide a culturing device for insect protein production with good usability and convenience.

[0004] The culturing device for insect protein production according to the present invention has a box, and a feeding unit, a hatching unit, a conveying unit, a flipping unit, a diapause unit, and a vibration and distribution unit respectively configured inside the box, wherein: the feeding unit is used to process organic substances, and to supply organic substances to the conveying unit, the hatching unit is used to hatch the eggs to produce insects, and to mix the insects into the organic substances, the conveying unit is used to transport the mixture to the flipping unit, the flipping unit slowly turns and moves the organic substances and insects, during the movement, the insects eat the organic substances and grow into pupae, a small part of the pupae and organic substances enter the diapause unit, while the majority of the pupae and organic substances enter the vibration and distribution unit, the pupae inside the diapause unit grow and become adults, and fly into the hatching unit for mating and oviposition, while those pupae and organic substances entering the vibration and distribution unit are separated and collected. The present invention can not only improve the quality of the organic substances, but also produce pupae to be used as high-protein feed. More importantly, it can provide adult insects internally for further oviposition. Therefore, the present invention has good usability and convenience.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005]

Fig. 1 is a perspective view of the culturing device for insect protein production according to the present invention.

Fig. 2 is a partial sectional view of the culturing device for insect protein production according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0006] Depicted in Figs. 1 and 2 is a preferred embodiment of the culturing device for insect protein production 1 according to the present invention, which is used to culture insects such as black soldier flies or yellow meal worms. The aforementioned insects can eat organic substances such as kitchen wastes, dead animal bodies or excrement. In the present invention, eggs of the insects are hatched into larvae inside the culturing device 1, and the larvae grow into pupae. Part of the pupae further grow and become adult insects for further oviposition inside the device. The culturing device 1 has a box 2, and a feeding unit 3, a hatching unit 4, a conveying unit 5, a flipping unit 6, a diapause unit 7, and a vibration and distribution unit 8 respectively configured inside the box 2. The feeding unit 3 is used to heat, stir and ferment the wasted organic substances to produce organic substances to feed insects, and to supply the organic substances to the conveying unit 5. The hatching unit 4 is used to hatch the eggs into insects, and mix the insects into the organic substances. It has a hatching chamber 41, at least one water supply container 42 configured inside the hatching chamber 41, and a light source 43 located on the upper side of the inside of the hatching chamber 41. An insect outlet 411 is formed on the lower part of the hatching chamber 41. The insects hatched out from the hatching chamber 41 will fall into the conveying unit 5

through the insect outlet 411.

[0007] The conveying unit 5 has a material barrel 51 located under the insect outlet 411 and a conveyor belt 52 connected with the material barrel 51. The material barrel 51 is used to receive the organic substances from the feeding unit 3 and the insects from the hatching chamber 41. The conveyor belt 52 can transport the organic substances and insects inside the material barrel 51 to the flipping unit 6. The flipping unit 6 has a rotary cylinder 61, and a plurality of stirring plates 62 fixed inside the rotary cylinder 61. The conveyor belt 52 transports the organic substances and insects into the rotary cylinder 61. During the rotation of the rotary cylinder 61, the stirring plates 62 flip the organic substances and insects and push them toward the vibration and distribution unit 8. During the rotation of the rotary cylinder 61, the organic substances and insects are turned slowly and are pushed gradually forward by the stirring plates 62. During the movement, the insects eat the organic substances and grow into pupae. A small part of the pupae and organic substances fall into the diapause unit 7, while the majority of the pupae and organic substances enter into the vibration and distribution unit 8. The aforementioned diapause unit 7 is configured on the upper part of the output end of the rotary cylinder 61, and has a diapause belt 71 that rotates and moves in cycles. During the rotation of the rotary cylinder 61, a small part of the organic substances and pupae will fall into the diapause belt 71. When the pupae on the belt grow and become adults, they will be guided by the light source 43 and fly back to the hatching chamber 41 for mating and oviposition. After a period of time, the diapause belt 71 is turned in cycles and the organic substances on the belts will fall into the rotary cylinder 61. The vibration and distribution unit 8 is located at the output end of the rotary cylinder 61, and has an upper

sieve 81 and a lower sieve 82, capable of vibration and respectively configured at an upper and lower position, as well as a collecting net 83. The upper sieve 81 is used to sift out sundries of larger granules, while the lower sieve 82 is used to sift out the pupae. The collecting net 83 is used to receive the organic substances passing through the lower sieve 82. Then, workers can collect the sundries, pupae, and organic substances respectively.

[0008] The operation of the different units of the culturing device 1 according to the present embodiment is designed based on the growth stages of the insects from eggs to larvae and to pupae. Firstly, eggs are placed inside the hatching chamber 41 of the hatching unit 4. When the eggs are hatched and produce larvae, the feeding unit 3 supplies organic substances into the material barrel 51. Now, the larvae fall into the material barrel 51 through the insect outlet 411 of the hatching chamber 41 and are transported by the conveyor belt 52 to the rotary cylinder 61. The rotary cylinder 61 turns slowly, and the larvae and organic substances are gradually pushed forward by the stirring plates 62. During this process, the larvae eat the organic substances and grow gradually into pupae. During the rotation of the rotary cylinder 61, a small part of the pupae and organic substances will fall onto the diapause belt 71 from the rotary cylinder 61. Now, the pupae on the diapause belt 71 continue to grow and become adults. Then, the adult insects are guided by the light source 43 inside the hatching chamber 41 and fly back to the hatching chamber 41 for mating and oviposition, and further provide larvae to repeat the above process of production. The water supply containers 42 can supply drinking water inside the hatching chamber 41 for the adult insects. The majority of the pupae and organic substances inside the rotary cylinder 61 are pushed

forward and fall into the upper sieve 81, lower sieve 82 and collecting net 83 of the vibration and distribution unit 8 for respective collection of the sundries, pupae and organic substances. From supply of organic substances, hatching of eggs, mixing and flipping of larvae and organic substances, to the final separation of pupae and organic substances, the culturing device 1 disclosed in the present invention can automatically produce high-quality organic substances and pupae in cycles. Moreover, the adult insects inside the device can fly back to the hatching chamber 41 to lay eggs for further utilization. Therefore, the present invention can only improve the quality of wasted organic substances, but also produce pupae to be used as high-protein feed. More importantly, it can provide adult insects internally for further oviposition and further utilization. For this reason, the present invention has good usability and convenience.

CLAIMS:

1. A culturing device for insect protein production, having a box, and a feeding unit, a hatching unit, a conveying unit, a flipping unit, a diapause unit, and a vibration and distribution unit respectively positioned inside the box, wherein: the feeding unit is used to process the organic substances, and supplies the organic substances to the conveying unit, the hatching unit is used to hatch the eggs to produce insects, and mix the insects into the organic substances, the mixture is conveyed by the conveying unit to the flipping unit, the flipping unit slowly turns the organic substances and insects, and gradually pushes them to move forward, during the movement, the insects eat the organic substances and grow into pupae, a small part of the pupae and organic substances enter the diapause unit, while the majority of the pupae and organic substances enter the vibration and distribution unit, the pupae inside the diapause unit grow and become adults, and fly into the hatching unit for mating and oviposition, while the pupae and organic substances entering the vibration and distribution unit are separated and collected.
2. The culturing device for insect protein production defined in Claim 1, wherein said hatching unit has a hatching chamber, at least one water supply container configured inside the hatching chamber, and a light source located on the upper side inside the hatching chamber, an insect outlet is formed on the lower side of the hatching chamber, the insects hatched out from the hatching chamber fall into the conveying unit through the insect outlet.
3. The culturing device for insect protein production defined in Claim 2, wherein said conveying unit has a material barrel located under the

insect outlet, and a conveyor belt connected to the material barrel, the material barrel is used to receive the organic substances from the feeding unit and the insects from the hatching chamber, the conveyor belt can transport the organic substances and insects from the material barrel to the flipping unit.

4. The culturing device for insect protein production defined in Claim 3, wherein said flipping unit has a rotary cylinder and a plurality of stirring plates fixed inside the rotary cylinder, the conveyor belt conveys the organic substances and insects to the rotary cylinder, the rotary cylinder and the stirring plates flip the organic substances and insects and push them toward the vibration and distribution unit.
5. The culturing device for insect protein production defined in Claim 4, wherein said diapause unit is configured on the upper position of the output end of the rotary cylinder, and has a diapause belt that can move in cycles, during rotation of the rotary cylinder, a small part of the organic substances and pupae will fall onto the diapause belt, when the pupae on the diapause belt become adults, they will be guided by the light source and fly back into the hatching chamber for mating and oviposition.
6. The culturing device for insect protein production defined in Claim 5, wherein said vibration and distribution unit is located on the output end of the rotary cylinder, and has an upper sieve and a lower sieve capable of vibration and respectively positioned on the upper side and lower side, and a collecting net, through which sundries, pupae and organic substances can be respectively screened out.