

## WHAT IS CLAIMED IS:

1. Apparatus for automatic loading of pupae into cartridges for growing, hatching into adults and dispersal of the adults, comprising:
  - a source of pupae in liquid;
  - a cartridge for hatching said pupae into adults and placement in a dispersal machine for dispersal of said adults, said cartridge having at least one drainage hole covered in netting at a lower end; and
  - a water tray; and wherein said cartridge is configured to support a liquid phase for said pupae, wherein said cartridge, when filled with pupae may be placed in said water tray to retain water in said cartridge, and wherein, following hatching of said pupae, said cartridge drainable via said at least one drainage hole to provide a dry environment for said adults.
2. Apparatus according to claim 1, further comprising a suction tube connected to said source of pupae to suck pupae from said source for filling said cartridge, or comprising a suction tube connected to a robot arm to direct said suction tube to said pupae, or comprising a scoop configured to scoop up said pupae from said pupae source.
3. Apparatus according to claim 2, further comprising a measuring cup configured to collect pupae from said suction tube, thereby to fill a measured dose of said pupae into said cartridge.
4. Apparatus according to claim 3, wherein said measuring cup comprises a sensor for detecting when said cup is full.
5. Apparatus according to claim 4, wherein said sensor is one member of the group consisting of: a weight detector, a proximity detector, an ultrasonic sensor, a capacitive sensor and a camera.
6. Apparatus according to claim 2, wherein said suction tube comprises one member of the group consisting of a propeller-free pump, a Venturi pump, a pipette and a piston.

7. Apparatus according to any one of the preceding claims, wherein said cartridge comprises upper doors, said upper doors comprising an upper door latch mechanism for robot operation.

8. Apparatus according to claim 7, wherein said cartridge further comprises lower doors facing said upper doors, said lower doors comprising a lower door latch mechanism for robot operation.

9. Apparatus according to any one of the preceding claims, wherein said cartridge comprises at least one feeding hole, said feeding hole containing a liquid absorbent material for holding sugar water.

10. Apparatus according to any one of the preceding claims, wherein said pupa source comprises water holding said pupae and an air current mechanism configured to blow across said water to concentrate said pupae for collection.

11. Apparatus according to any one of claims 1 to 9, wherein said pupa source comprises water holding said pupae and a net configured to move across said water to concentrate said pupae at one side of said pupa source for collection.

12. Apparatus according to any one of the preceding claims comprising a cartridge expulsion mechanism, said cartridge expulsion mechanism comprising a funnel, an air pressure source and an outlet, the expulsion mechanism configured to open doors of a cartridge at two opposite ends and provide a wave of air pressure to expel insects from within said cartridge via said outlet for dispersion.

13. Apparatus according to any one of the preceding claims, comprising a plurality of cartridges placed together in a magazine, and a pupa filling robot configured to direct pupa from said pupa source to succeeding ones of said cartridges, thereby to fill all cartridges of said magazine with pupae.

14. Apparatus according to claim 13, further comprising a closing robot configured with a door contact and a latch contact, to close and latch upper doors of said cartridges after said filling of said magazine.

15. Apparatus according to claim 13 or claim 14, further comprising a feeding robot, said feeding robot comprising a liquid dispenser for dispensing sugar water to said cartridges, said feeding robot configured to direct said liquid dispenser to feeding holes in successive cartridges of said magazine to dispense sugar water for each cartridge.

16. Apparatus according to any one of claims 13 to 15, further comprising a magazine expulsion mechanism, said magazine expulsion mechanism comprising a funnel, an air pressure source and an outlet, the expulsion mechanism configured to open doors of successive cartridges of said magazine at two opposite ends and provide a wave of air pressure to expel insects from within said cartridge via said outlet for dispersion.

17. Apparatus according to claim 16, wherein said magazine expulsion mechanism is slidably mounted for controllable travel along a height of said magazine to reach respective ones of said successive cartridges.

18. Apparatus according to claim 16, wherein said magazine expulsion mechanism is at a fixed height and said magazine is mounted for controllable travel to present respective ones of said successive cartridges to said magazine expulsion mechanism.

19. Apparatus according to any one of the preceding claims wherein said cartridge comprises a plurality of rounded cells.

20. Apparatus according to any one of the preceding claims further comprising a suction tube, a sensor, and a pick up robot, said sensor configured to detect pupae or clusters of pupae in said pupa source, and said robot being configured to align said suction tube with said detected pupae or clusters, and said suction tube applying suction when aligned, thereby to pick up pupae from said source to place in a respective cartridge.

21. Apparatus for drawing adult insects or pupae from a source for placing in a cartridge, the apparatus comprising:  
a suction tube;  
a propeller-free pump associated with said suction tube to apply suction along said suction tube.

22. Apparatus according to claim 21, wherein said propeller-free pump is one member of the group consisting of a Venturi pump, a pipette and a piston.
23. Apparatus according to claim 21 or claim 22, further comprising a sensor to sense locations of insects or pupae, and a robot arm attached to a first end of said suction tube to direct said suction tube to said sensed locations.
24. Apparatus for loading and then expelling insects, comprising:  
a queue of cartridges piled one on top of another in a second axis perpendicular to said first axis, the cartridges filled with insects;  
an expulsion unit, configured to expel insects from said cartridges placed in said expulsion unit; and  
a transport unit configured to transport said cartridges of said queue in a third axis, said third axis being perpendicular to both of said first and second axes.
25. Apparatus according to claim 24, wherein said queue is a plurality of queues, and said transport unit is a conveyor, each said queue having a respective conveyor, the apparatus further comprising a transfer unit configured to transport cartridges between said queues and from a foremost queue to said expulsion unit.
26. Apparatus according to claim 25, wherein said transfer unit is configured to move said cartridges between conveyors and from said conveyors to said expulsion unit.
27. Apparatus according to any one of claims 24 to 26, wherein said cartridges comprise upper doors and lower doors opposite said upper doors, said upper and lower doors being openable by said expulsion mechanism.
28. Apparatus according to any one of claims 24 to 27, wherein said expulsion mechanism comprises a funnel, an air pressure source and an outlet, the expulsion mechanism configured to open doors of successive cartridges of said magazine (which is this "said magazine" if the magazine was deleted?) at two opposite ends and provide a wave of air pressure to expel insects from within said cartridge via said outlet for dispersion.

29. Apparatus for filling a cartridge with adult insects from an insect source, the apparatus comprising:

- an air pressure source;
- an aiming mechanism configured to aim said air pressure source at one or more adult insects; and
- a collecting mechanism configured to collect insects knocked towards said collecting mechanism by said air pressure source.

30. Apparatus according to claim 29, wherein said air pressure source is configured to provide a directable blade of moving air.

31. Apparatus according to claim 30, wherein said aiming mechanism comprises a camera.

32. Apparatus according to claim 29, wherein said air pressure source is a suction source provided through said collecting mechanism.

33. Apparatus according to any one of claims 29 to 32, further comprising a counting device for counting numbers of said adult insects passing through said collecting device, thereby to supply cartridges with predetermined numbers of insects.

34. Apparatus according to claim 33, wherein said counting device is based on a sensor, said sensor being one member of the group consisting of one or more capacitive sensors and one or more cameras.

35. Apparatus according to any one of claims 29 to 34, further comprising a plurality of cartridges for collecting said insects, and a directing arm configured to move one member of the group consisting of an output end of said collecting device between said cartridges, and an input end of said collecting device.

36. A cartridge for holding adult insects, the cartridge comprising openable doors at a first end and at a second end opposite said first end, and at least one feed opening, the feed opening containing a liquid absorbent material held within said feed opening.

37. The cartridge of claim 36, further comprising a first layer of netting inside said layer of liquid absorbent material.

38. The cartridge of claim 37, wherein said liquid absorbent layer is located between said first layer of netting and one other layer of netting.

39. Apparatus for automatic loading of pupae into cartridges for growing, hatching into adults and dispersal of the adults, comprising:

- a source of pupae;
- one or more cartridges for hatching said pupae into adults and placement in a dispersal machine for dispersal of said adults; and
- a collecting mechanism for collecting said pupae from a predetermined part of said source and dispensing collected pupae into said one or more cartridges; and
- a gathering mechanism configured to gather said pupae into said predetermined part for said collecting.

40. Apparatus according to claim 39, wherein said gathering mechanism comprises an air pressure source to blow across said pupa source to concentrate said pupae at said predetermined part for collection.

41. Apparatus according to claim 39, wherein said gathering mechanism comprises a net configured to move across said source to concentrate said pupae at said predetermined part for collection.

42. Apparatus for loading and then expelling insects, comprising:
- a first queue of magazines extending in one axis, each magazine comprising a plurality of cartridges piled one on top of another in a second axis perpendicular to said first axis, the cartridges filled with insects;
  - an expulsion unit, configured to expel insects from cartridges of a magazine placed in said expulsion unit; and
  - a first transport element, configured to transport said cartridges from magazines of said queue to said expulsion unit.

43. Apparatus according to claim 42, wherein said transport element is a conveyor belt, said conveyor belt extending in a third axis, said third axis being perpendicular to both of said first and second axes.

44. Apparatus according to claim 42 or claim 43, comprising at least one additional queue of magazines and an additional conveyor belt associated with said at least one additional queue, said conveyor belt configured to transport cartridges from said at least one additional queue to said first conveyor.

45. Method for automatic loading of pupae into cartridges for growing, hatching into adults and dispersal of the adults, comprising:

- obtaining pupae in water;
- collecting said pupae;
- measuring said collected pupae;
- placing a measured number of said pupae in water in a cartridge;
- automatically feeding said insects using a robot arm to insert liquid feed into a liquid absorbing substance in a feeding hole of said cartridge;
- waiting until said pupae have hatched into adult insects;
- draining said cartridge by raising said cartridge and allowing to drain through a drainage hole; and
- opening both ends of said cartridge and applying an air pressure source to expel said adult insects from said cartridge.

46. The method of claim 45, comprising carrying out said draining at a temperature below 10 degrees Celsius or below 9 degrees Celsius or below 6 degrees Celsius.

47. The method of claim 45, or claim 46, comprising

- providing said cartridges as a magazine of multiple cartridges and placing said magazines in one or more queues with an expulsion unit;
- transporting the cartridges to the expulsion unit;
- opening the cartridges at first and second opposite ends; and
- providing air pressure to expel said adult insects from the cartridges.

48. The method of any one of claims 45 to 47, wherein said automatically feeding is repeated at least once.

49. Apparatus for filling a cartridge with adult insects from an insect source, the apparatus comprising:

- an air pressure source, configured to knock insects down;
- a collecting mechanism configured to collect insects being knocked down; and
- a robot arm configured to move said collecting mechanism to catch said insects being knocked down.

50. Method for filling cartridges with adult insects, comprising: providing pupae in water;

- closing first ends of the cartridges over said pupae;
- allowing said pupae to emerge as adults into the cartridges;
- closing doors at said first ends of the cartridges; and
- removing the cartridges with said adults therein.