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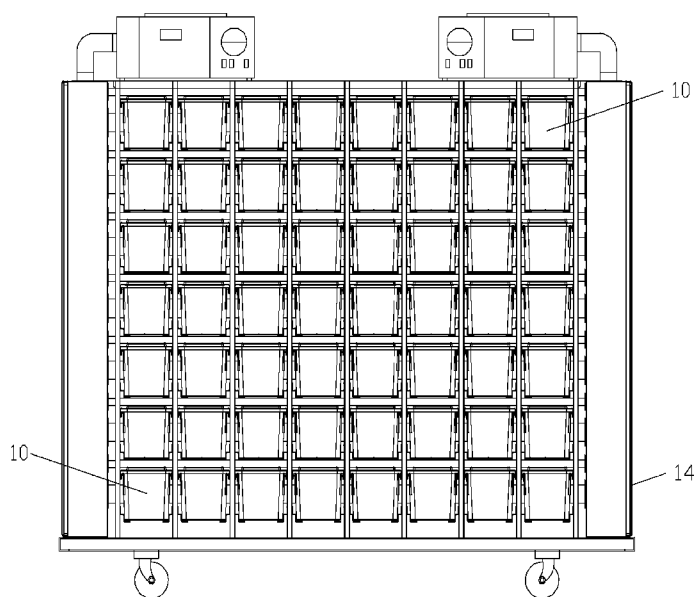


FIG 1

(57) Abstract: A cage system for laboratory animal care has a plastic cage with a removable suspended perforated-bottom, a snap-on plenum cage top and a cage top feeder lid. The removable floor of the cage has perforations that allow both liquid and liquid waste down to the cage bottom. Bedding is placed on top the suspended floor. A filtered air supply is introduced into the wall of the cage below the suspended floor and flows upward through the suspended floor through the cage in a laminar fashion and passes through orifices in the bottom of the lid and out through the filtered opening in the top. A water supply system for the cage is provided. The system is air tight and air in any one cage is isolated from air in all other cages in the system which can be mounted on a rack. Liquids drain out of the cage body possible into the plenums. A plurality of cages are supported in a rack. Several configurations to support the cage within the rack are provided.

Cage for laboratory animal

BACKGROUND OF THE INVENTION

The present invention relates to caging systems for laboratory animal care and more particularly to a cage and system which has controlled ventilation, waste containment and cage construction that will direct airflow through the bedding, thus keeping it dry which will reduce bacteria formation caused by humidity and moisture.

Most all existing ventilated rodent cage systems are made with plastic clear solid-bottom cages. Clear cages are used so it is possible to inspect the condition of the inside of the cage without disturbing the animals. The solid bottom of the cage compartment is used to hold bedding material. The cage ensemble generally consists of a metal wire bar lid containing a feed hopper and water bottle capabilities and a plastic top that holds a piece of filter media. The cages are contained in a rack that holds a plurality of cages either single or double sided. An automatic water system introduces water into the cage for the rodent using lixits or water valves located either outside or inside the cage. It must be monitored for proper water pressure and must be flushed periodically. Problems of leakage, high intracage humidity levels and cage flooding are associated with automatic watering systems. Airflow is introduced into the cage either positive or negative pressure in an attempt to rid the cage of harmful contaminants, mainly ammonia and CO₂. A plenum, either a separate duct system or made up of components of the rack (i.e. the shelves or the tubing uprights), supply the cage with filtered air through a cage mounted or detached air supply diffuser. Air flow in present designs is either transversely across the cage from the front or rear wall, or, from an inlet in the top of the cage to an outlet in the junction of the top of the cage.

The applicant is aware of the following U.S. patents which are related to cages for laboratory animals:

Fricke 2,467,525; Fuller et al 3,063,413; Barney 3,397,676; Holinan 3,924,571; Gland et al 4,085,705; Gass 4,154,196; Nace 4,201,153; Thomas 4,402,280; Picard et al 4,435,194; Sedlacek

4,480,587; LoMaglio 4,526,133; Spengler 4,528,941; Peters et al 4,798,171; Niki 4,844,018; Spina 4,869,206; Niki et al 4,940,017; Sheaffer 4,989,545; Niki et al 5,003,022; Niki et al 5,048,453; Coiro, Sr. et al; 5,148,766; Coiro, Sr. et al 5,307,757; Sheaffer et al 5,311,836; Harr Re 32,113; Semenuk D 351,259; Semenuk D 383,253

Current ventilated caging systems, of which the applicant is aware, for laboratory animal care and use in biomedical research/testing is suboptimal because of the lack of the ability to actually dry the bedding which is the root cause of ammonia gas formation. Present units require 60 or more air changes per hour and have been shown to be ineffective in removing all traces of contaminants. Even small concentrations of ammonia have been shown to cause lesions in the respiratory tracts of mice. In addition, mice are borrowing animals and this behavior leads to prolonged periods with their nasal passages in or very near the bedding which is where the harmful ammonia vapor is forming, and they are burrowing in bedding that can be moisture laden from urination and a leaking water source. Bedding has been deemed as a necessary enrichment for rodents. Present day systems do not address the moisture removal from bedding. Their only attempt to dry the bedding is reduce the cage humidity level by high air change rates in the cage. Due to the high intra-cage ventilation rates required with existing ventilated racks, animal losses can occur due to chilling and dehydration of neonates, hairless and nude strains. While the systems currently in use may provide some biological exclusion, the inability to dry the bedding material, contributes to a lack of animal comfort, and requires an enormous amount of conditioned laboratory air every hour. Filtering air through the bedding attacks the source of ammonia formation whereas other systems only treat the symptoms. By attacking the contamination source, lower amounts of air are required to ventilate the cage effectively. This results in reduced HVAC costs and lower mechanical, electrical and plumbing costs during renovations or new construction due to the smaller system requirements.

In present systems, bedding and nesting materials are placed directly on the floor of the solid-bottom cages, since rodents are nesting and burrowing animals. The primary requirements of bedding materials are: (1) the material must not be harmful to the animal; (2) it must be capable of absorbing moisture without causing dehydration of newborn animals, (3) it must not create excessive dust, (4) it must be economical to use and dispose of. Modern bedding materials are

absorbent, but, the fact that the bedding is absorbing moisture allows the formation of urease bacteria which then produces ammonia. A major goal is to direct airflow in the cage in such a manner that it keeps the bedding dry, eliminating the formation of the urease bacteria, thus, creating a better cage environment. Since the harmful contaminants are kept from forming, airflow requirements can be reduced, drastically reducing energy requirements in the lab. Reduced airflow in the cage will also reduce aerosols from bedding dust which reduces the clogging of the cage outlet filter. When cages are operated in a negative pressure for bio-containment purposes, the clogging of the outlet filter could cause the cage to revert to a positive pressure environment which could release cage air into the room. Dry bedding is more easily removed from the cage during change-out periods than wet bedding which can adhere to the cage, making removal difficult and time consuming. Reduced airflow results in lower intra-cage sound levels which could result in less stress on the animal and encourage a more optimum breeding environment. Thus, there is a need for a laboratory animal cage and a system of cages which solve these problems.

BRIEF SUMMARY OF THE INVENTION

It is an object of the invention to provide a cage for laboratory animal care which has a laminar air flow from bottom to top to permit a healthy environment.

It is still another object of the present invention to provide a cage for laboratory animal care which can exhaust excess water automatically preventing cage flooding.

It is yet another object of the present invention to provide a system of cages in a rack in which the air flow through each individual cage is controlled, adjustable by the user and there is no cross contamination between the cages.

It is still a further object of the present invention to provide a cage for laboratory animal care to permit optimal animal housing flexibility, protect animal and occupational health by providing a barrier at cage level for exclusion, containment or both, validate data reproducibility; and provide for optimal animal comfort and well-being. It will provide a natural environment

promote rapid waste desiccation, eliminate waste contaminant's harmful by-products, save husbandry-related costs, and convey a positive image to the public.

In accordance with the teaching of the present invention there is disclosed an animal cage for laboratory purposes. The cage has a solid floor bottom with a means to suspend a panel, provided with a plurality of perforations formed therein, the perforations to be small enough to allow air to pass through but not allow bedding to fall through above the solid cage floor

In further accordance with the teachings of the present invention, there is disclosed a cage for laboratory animal care. The cage has a body having four walls and a solid floor with another removable perforated floor suspended above the cage floor which defines the living space for the animal. A lid is removably connected to the body. There is provided means for circulating clean air through the cage. The cage is air tight. In at least some embodiments, the cage is air permeable.

Also, there is disclosed a cage for laboratory animal care. The cage has a body having four walls and a solid floor with another removable perforated floor suspended above the cage floor which defines the living space for the animal. A lid is removably connected to the body. An air outlet port is formed in the lid. An air inlet port is formed in one of the walls of the body beneath the suspended floor. Means are provided to circulate air between the air inlet port and the air outlet port.

Additionally, there is disclosed a cage for laboratory animal care. The cage has a body having four walls and a solid floor with another removable perforated floor suspended above the cage floor which defines the living space for the animal. A cage wall has an air inlet port formed between the cage floor and the suspended floor. A lid is removably connected to the body, the lid having an air outlet port formed therein. A clean air supply is connected to the air inlet port wherein the clean air flows through the air inlet port, into the space between the cage floor and suspended floor, the clean air flowing laminarly upwardly through the living space for the animal, through the perforated bedded floor, and out the air outlet port. The air flow removes from the cage, particulate matter, allergens and gases associated with waste products.

In another aspect, there is disclosed a ventilated cage system for laboratory animal care having at least one cage having a body. The body has a top and a removable suspended perforated floor. A separate lid is connected to the top, an air outlet port being formed in the lid, wherein each cage is air tight. An air inlet port is formed in the wall of the cage body below the suspended floor with bedding. A rack is provided for supporting at least one cage. An air supply introduces air into the air inlet port in the body. The air flows laminarly from the removable perforated suspended floor with bedding of each cage, through each cage, and through the air outlet port of each lid. In this manner, fresh air is maintained in at least one cage and waste air is removed from at least one cage.

In still another aspect there is disclosed a cage system for laboratory animal care including at least one cage having a body having a top, four side walls and a removable perforated suspended floor. A lid is removably connected to the top of the body. A rack and means for supporting the at least one cage on the rack is provided.

These and other objects of the present invention will become apparent from a reading of the following specification taken in conjunction with the enclosed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation view of a rack in which are mounted a plurality of cages for laboratory animal care of the present invention.

FIG. 2 is a side elevation view of two cages mounted vertically and connected to the air supply and exhaust system.

FIG. 3 is a schematic diagram of the ventilated cage system of the present invention.

FIG. 4 is a perspective view of the cage.

FIG. 5 is an exploded view of the cage.

FIG. 6 is a partial cross section view of the cage showing the sealant means.

FIG. 7 is a top plan view of a portion of the removable suspended perforated floor.

FIG. 8 is a cross-section view of a portion of the removable suspended perforated floor with bedding, along the lines 8--8 of FIG. 7 showing an animal in the cage.

FIG. 9 is a perspective exploded view of a cage as viewed from the top.

FIG. 10 is the embodiment of FIG. 9 viewed from the bottom.

FIG. 12 is a perspective view of the cage with a water bottle attached externally.

FIG. 14 is a partial cross-section end view showing the cage supported on the rack with the lid on.

FIG. 15 is an end view showing the cage supported from the rack with the lid on.

FIG. 16 is an end view showing the cage supported on the rack with the lid off.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1-5, a plurality of cages 10 are supported on a rack 12. Preferably, the rack 12 is a frame mounted on wheels with a plurality of cage suspension brackets having one or more cages 10 on each bracket.

Each cage 10 is individually connected to an air supply 14 which serves all of the cages 10 in the rack 12. A filter 16 is provided in the air supply. The filter may be a HEPA filter and may also include a prefilter. A blower 20 is disposed in the air supply system to move the air through the cages 10 and the filter 16. The filtered air enters a manifold 18 which is connected by hoses to the individual cages 10. The filter system removes particulate matter and pathogens larger than

0.003 microns in size.

Each cage 10 has a body 22 having four walls and a bottom surface 24 and a removable suspended perforated floor 25 with bedding 19 on top to define a living space for the laboratory animals. A separate lid 26 is removably connected to the top of each body 22. An air outlet port 28 is formed in each lid 26. An exhaust prefilter 36 can be inserted between the lid 26 and a filter retainer 37. The lid rest on a feeder plate 32 which has a plurality of spaced-apart orifices 30 formed therein. Preferably, the orifices are distributed over the entire area of the feeder plate 32.

It is preferred that all corners and the intersections of walls and bottom surface of the cage be rounded to reduce the accumulation of dirt and waste and to facilitate cleaning of the cage. It is preferred that the body of the cage be made of high temperature plastic and that the cage be transparent to permit observation of the animal within the cage.

It is preferred that a feeder plate 32 be disposed between the lid 26 and the body 22 of each cage 10. The feeder plate 32 may be a frame structure which has an angled portion 34 which extends downwardly into the living space of the animal within the body 22 of the cage. The angled portion 34 may have a "V" shape. The feeder plate may be metal or plastic. The feeder plate 32 supports containers of food, water and/or special liquid supplements 38 for the animal. The perforated feeder plate 32 also optimally acts as an air diffuser creating a plenum when coupled with the lid 26.

The body surface (or floor) 24 of the cage 22 is solid. The removable suspended floor 25 is formed having a plurality of spaced-apart perforations 40 (FIGS. 7 and 8). Although not limited to these sizes, it has been found that a satisfactory floor has holes which are approximately 0.055 inches in diameter and suspended approximately 3/4 inch in height above the surface of the cage floor. Air, liquids and liquid waste from the animal passes through the perforations 40 into the cage body.

Preferably, a gasket 48 is fitted between the body 22 of the cage 10 and lid and the body 22 of the cage 10 (FIG. 6). The lid 26 is attached onto the cage 10 and is easily installed and removed

by applying pressure on the lid 26 to snap on and off over the gasket 48. In this manner the lid 26 can be easily replaced with a clean lid saving costly man hours. The gasket 48 may be any sealable closure between the body 22 and the lid 26. By use of similar sealing techniques known to persons skilled in the art, each cage system is air tight and the air flow within each cage is restricted to the specific cage. There is no leakage of air from any cage into the room in which the cage is housed nor is there any air interchange between any cages. Cage to cage contamination is prevented.

The cage body 22 has an inlet port 50 formed therein through which the air entering the cage 10, may flow. Also, water or liquid waste products from the animal may exit from the inlet port 50 or alternately another port 62. The waste air, after flowing out of the outlet port 28 is directed preferably through a hose, to the exhaust filter 15 and the particulates and toxic gases are removed. Air is then resupplied through the inlet filter 16 to the cage system. An adjustable blower 52 in the air supply system is used to control the rate of air flow as needed depending upon the desired conditions and the strain of animal within the cage. Due to the configuration of the cage system and the perforated feeder plate 32 and raised perforated floor 25 with bedding 19 on top of the individual cage, the air flow through each cage is laminar from the bottom of the cage, through the bedding 19, to the top of the cage (FIGS. 2 and 3). In this manner, the animal and bedding 19 is continuously provided with fresh air. The air, after passing through the body 22 of the cage 10, through the raised floor with bedding dries any waste products which may be in bedding 19 or on the floor 24 of the cage 22 and removes or prevents ammonia and other vapors in the system.

A water valve 54 is fitted into the body 22 of the cage 10 and is connected to a water supply 56. The water valve 54 may be manually or automatically controlled to supply the animal with water. The removable suspended perforated floor 25 of the cage and the inlet port 50 of the cage body 22 or other outlet port 62 permit the water to drain from the cage and prevent flooding. The excess water flows to a reservoir 58 and to a drain to be removed from the system.

The cages 10 may be made in a variety of sizes to accommodate laboratory animals of varying sizes.

The intracage airflow system serves as an effective barrier system by preventing the transmission of contaminated particulates and aerosols from cage-to-cage and rack-to-rack. The system uses airflow to prevent or control airborne infection of laboratory animals. The flow of air sweeps the bedding free of gases, particulate matter, allergens and removes them through the filtered outlet port in the lid, keeping the cage environment cleaner than other filtered air cage designs. The HEPA filter (both supply and exhaust) is connected to a baffling system which reduces turbulence and directs the airflow into a distribution plate. This plate houses the connections for the flexible tubing that act as a plenum and either delivers or exhausts air from each cage. Preferably, each tube is of equal length thus supplying or exhausting each cage the same no matter where it is located on the rack. Each tube is housed in a hollow shelf and preferably terminated at the cage with a stainless steel nipple. The air flow to each individual cage is automatically balanced to provide approximately the same air flow into each cage in the system. This may be accomplished by controlling the lengths of the tubing, baffles, varying duct size and other means known to persons skilled in the art.

FIGS. 9 and 10 show another embodiment of the cage 10. The body 22 has four walls and a removable suspended perforated floor 25 with bedding 19 on top, to define the living space for the laboratory animal. A lid 26 is removably connected to the top of the body 22 and. An air outlet 28 is formed in the lid and an air inlet 50 is formed in the body of the cage below the raised suspended floor. Preferably, the surface of the feeder plate 32 has a plurality of spaced-apart orifices 30 formed therein to facilitate laminar flow of the air through the cage 10. A water valve 54 is formed in one of the walls of the body 22. The cage 10, preferably is formed of a transparent plastic. Thus, the embodiment of FIGS. 9 and 10 is very similar to the embodiment of FIGS. 4 and 5. However, the feeder preferably is omitted from the embodiments of FIGS. 4 and 5, although it could be included. The lid 26 has handles 60 formed thereon to assist in removing and attaching the lid 26 from the body 22. Also, the air inlet in the body will function as a water overflow outlet 62 to drain water and liquid waste from the cage body (FIG. 9). It is preferred that the water overflow outlet operate automatically so that there is very little accumulation of liquid in the cage body.

As previously described, the cage 10 has a source of water 56 connected to the water valve 54 to provide automatic water feed to the laboratory animal. As shown in FIG. 12, a water bottle 38 may be connected to the water valve 54 where the water bottle 38 is external to the cage 10. This arrangement permits the water to be replenished when necessary without opening the cage 10. Each cage 10 may be disposed in the rack 12 with the respective water valve 54 directed outwardly from the rack 12 such that each externally connected water bottle 38 is readily accessible to an attendant. This construction is especially useful for situations where special diets or additives in the water are provided to the laboratory animals and the water bottles are easily and rapidly accessible.

The cages 10 of the present invention may be supported in the rack 12 in several ways (FIGS. 14-16). The cage body 22 with the lid 26 attached, is supported by a shelf 68 beneath the cage 10, without contacting the shelf 66 above the cage 10 (FIG 14). Alternately, (FIG 15) the cage body 22 with the lid 26 may be attached to a shelf 66 of the rack using tracks, clips or other means known to persons having ordinary skill in the art. In yet another configuration, the lid 26 is removed and the top of the body 22 may be attached to a shelf 66 of the rack using tracks, clips or other means known to persons having ordinary skill in the art.

Devices may be secured (snap-on) to the removable suspended perforated floor. These devices are made from appropriate non-toxic material that favors isolation, nest building and thigmotactic behaviors, as well as providing protective or escape mechanisms for submissive animals. The airflow flowing through the bedding prevents the formation of harmful contaminants thus reducing the need for higher airflows in other designs which are addressing the symptoms and not the cause of the formation of contaminants, saving considerable costs on HVAC and larger mechanical systems. Additionally, the elimination of bedding results in considerable cost savings. A central HEPA filtering unit may be mounted on each rack, room mounted to supply several racks or centrally located in a facility to supply many rooms with racks. These systems are all equipped with visual and audible alarms and monitors to alert facility personnel of problems or failures of air flow, temperature, humidity, water leakage, or filters. A battery-operated power supply system can be provided in the event of a power failure.

In summary, one or more embodiments of the cage system of the present invention provides one or more of the following unique features:

bedding free cage uses a perforated floor

a plenum lid

the lid has spaced-apart orifices for air flow

an adjustable blower to vary the air supply and exhaust

unit can accommodate various animal strains by user adjusted airflow

separates air and water from the exhaust (prevents cage flooding)

air is supplied into top of cage and removed at bottom. Air flow direction is laminarly downward.

air is supplied into the bottom of the cage beneath the suspended perforated floor and removed at the top. Air flow direction is laminarly upward.

closed system maintains an approximately neutral pressure in the cage

closed system maintains either positive, negative or neutral pressure in the cage

airflow is delivered and exhausted via a unique distribution system which automatically balances the airflow in each cage

maintains and monitors temperature and humidity at cage level

maintains and temperature and humidity at cage level

snap-on enrichment devices

battery back-up for the HEPA unit

monitors and alarms when problems occur

centralized air supply at room or facility level

sealed cages

a water valve connected to a source of water

a water bottle external to the cage connected to the water valve

water and waste liquid automatically drain from the waste tray

liquid and liquid waste automatically drain from the cage body

alternate means for supporting the cages in the rack.

Obviously, many modifications may be made without departing from the basic spirit of the present invention. Accordingly, it will be appreciated by those skilled in the art that within the scope of the appended claims, the invention may be practiced other than has been specifically described herein.

List of Parts

10 Cages

12 rack

14 air supply
16 filter
17 Air Exhaust
18 Manifold air supply
19 Bedding
20 Blower air supply
22 Cage Body
24 Bottom of cage
25 Raised floor
26 Lid
28 Air outlet
30 holes in Feeder plate
32 Feeder Plate
34 Wire bar Feeder/Water bottle holder
36 Exhaust Filter
37 Exhaust filter Retainer
38 Water Bottle
40 Holes in Raised Floor
48 Gasket for Lid
50 Air Inlet Port
52 Air Supply Valve
54 Water Valve
56 Water Supply
58 Water Reservoir
60 Handles
62 Water Overflow Outlet
66 Shelf above the cage
68 Shelf beneath the cage

What is claimed is:

1. In an animal cage for laboratory purposes, the improvement wherein the cage has a removable, suspended interior floor provided with a plurality of perforations formed therein and creating a plenum inside the cage allowing air to flow laminarly through the perforations to dry the bedding placed on top the raised floor. Liquids or liquid waste from the animal will substantially fall through the perforations in the raised floor preventing the cage from flooding due to autowatering system failure.
2. The animal cage of claim 1, wherein the cage is a substantially air tight ventilated cage and the ventilating air is in communication with the raised floor.
3. The animal cage of claim 1, wherein the cage has a lid removably connected thereto.
4. The animal cage of claim 1, further comprising a water valve fitted into a wall of the cage.
5. The animal cage of claim 4, wherein a water bottle is connected to the water valve externally of the cage such that water is available to the animal within the cage.
6. The animal cage of claim 1, wherein the cage is formed of transparent material.
7. A cage for laboratory animal care, the cage comprising:

a body having four walls a floor and a removable suspended perforated floor defining living space for the animal,

the removable perforated floor having plurality of perforations formed therein, the perforations being small enough for air and liquid passage but not allowing bedding to fall through

a lid removably connected to the body,

means for circulating clean air through the cage, and the cage being air tight.

8. A cage for laboratory animal care, the cage comprising:

a body having four walls a floor and a removable suspended perforated floor with bedding on top defining living space for the animal,

a removable perforated floor with bedding detachably suspended above solid floor of the body, the body having an air inlet port formed therein and below the suspended floor,

a lid removably connected to the body, the lid having an air outlet port formed therein, and

a clean air supply connected to the air inlet port wherein the clean air flows through the air inlet port into the body, the clean air flowing laminarly upward through the suspended perforated floor, through the living space for the animal, into the lid and out the air outlet port, the air flow removing from the cage, particulate matter, allergens and gases associated with waste products.

9. The cage of claim 8, further comprising a water valve formed in one of the walls of the cage, the water valve being connected to an external source of water for providing water to the laboratory animal.

10. The cage of claim 10, wherein a water bottle is connected to the water valve externally of the cage.

11. The cage of claim 8, further comprising a water overflow outlet formed in the bottom of the cage body, wherein liquid waste and water are drained from the cage.

12. The cage of claim 8, wherein the cage may be mounted in a rack for supporting the cage, the rack further having means to support a plurality of cages.

13. The cage of claim 8, wherein the cage is formed of a transparent material.

14. A cage for laboratory animal care, the cage comprising:

a body having four walls, a floor and a removable suspended perforated floor defining living space for the animal,

a lid removably connected to the body,

an air outlet port being formed in the lid,

an air inlet port formed in one of the walls of the body and below the suspended perforated floor,

means to circulate air between the air inlet port and the air outlet port.

15. The cage of claim 14, wherein the suspended floor is perforated

16. The cage of claim 14, further comprising a water valve formed in one of the walls of the body, the water valve being connected to an external source of water.

17. The cage of claim 14, wherein a water bottle is connected to the water valve externally of the cage.

18. A ventilated cage system for laboratory animal care comprising:

at least one cage having a body having a top and a bottom, a separate lid connected to the top, an air outlet port being formed in the lid,

a removable perforated floor suspended above the bottom, wherein each cage is air tight, an air inlet port formed in the cage body below the suspended floor,

a rack for supporting the at least one cage,

an air supply introducing air into the air inlet port in the body, the air flowing laminarly through the suspended floor, through each cage, through the lid of each cage, and through the air outlet port of each lid wherein fresh air is maintained in at least one cage and waste air is removed from at least one cage.

19. The cage system of claim 18, wherein the body of the at least one cage has a removable suspended perforated floor.

20. The cage system of claim 18, further comprising the lid having a bottom surface, the bottom surface having a plurality of orifices formed therein wherein the air flow through the cage is uniformly distributed.

21. A cage system for laboratory animal care comprising:

at least one cage having a body having a top, four side walls and a solid floor and a removable suspended perforated floor,

the suspended perforated floor having a plurality of perforations formed therein,

a removable perforated floor suspended above the floor of the cage body,

a lid removably connected to the top of the body,

a rack and means for supporting the at least one cage on the rack.

22. The cage system of claim 21, wherein the lid is removed and the top of the body is attached to the rack.

23. The cage system of claim 21, wherein the lid is removed and the bottom of the body is attached to the rack.

24. The cage system of claim 21, wherein the lid is removed and the sides of the body is attached to the rack.

25. The cage system of claim 23, wherein the body is detached from the lid and the lid supported on the rack spaced apart from, and above the body.

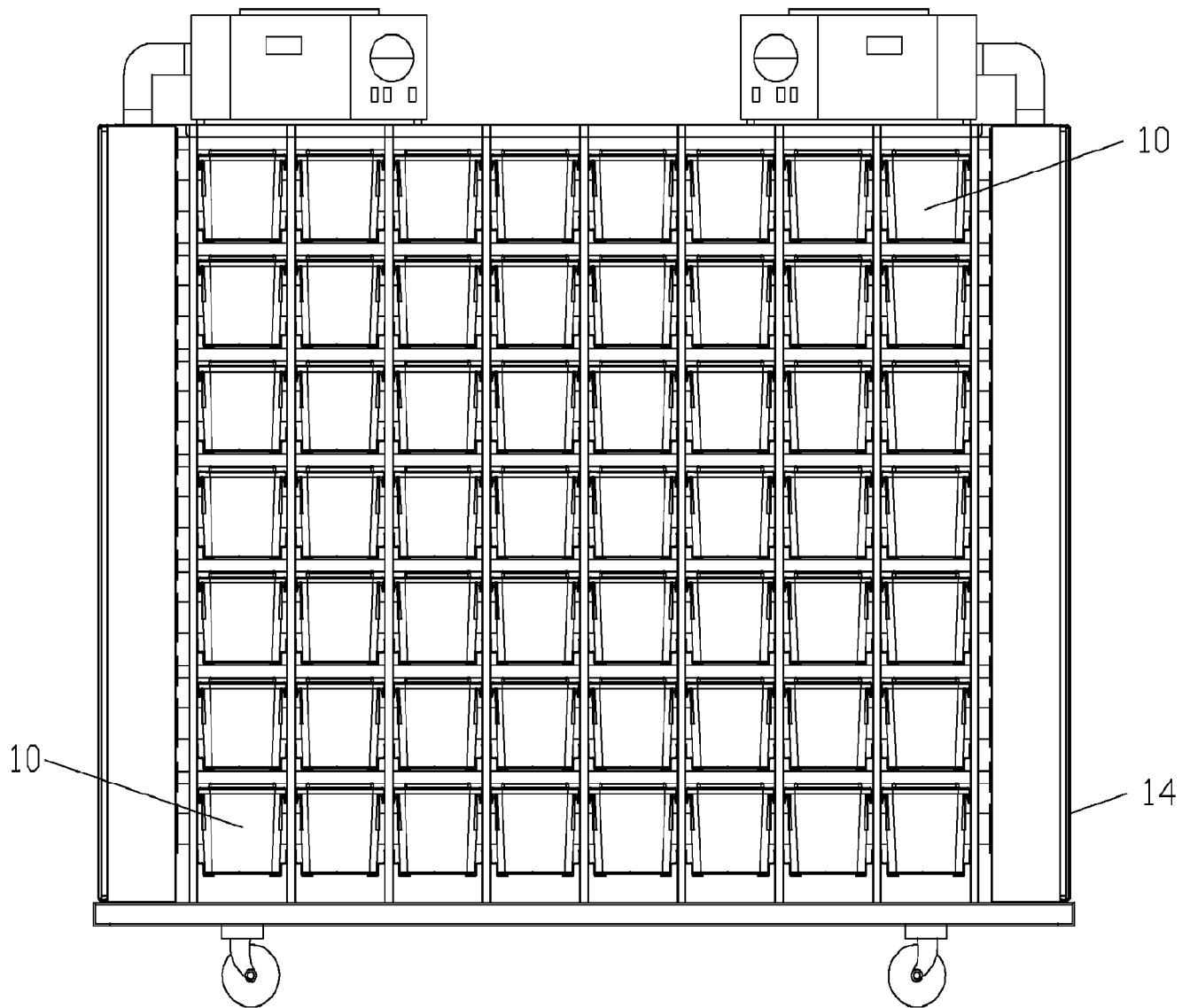


FIG 1

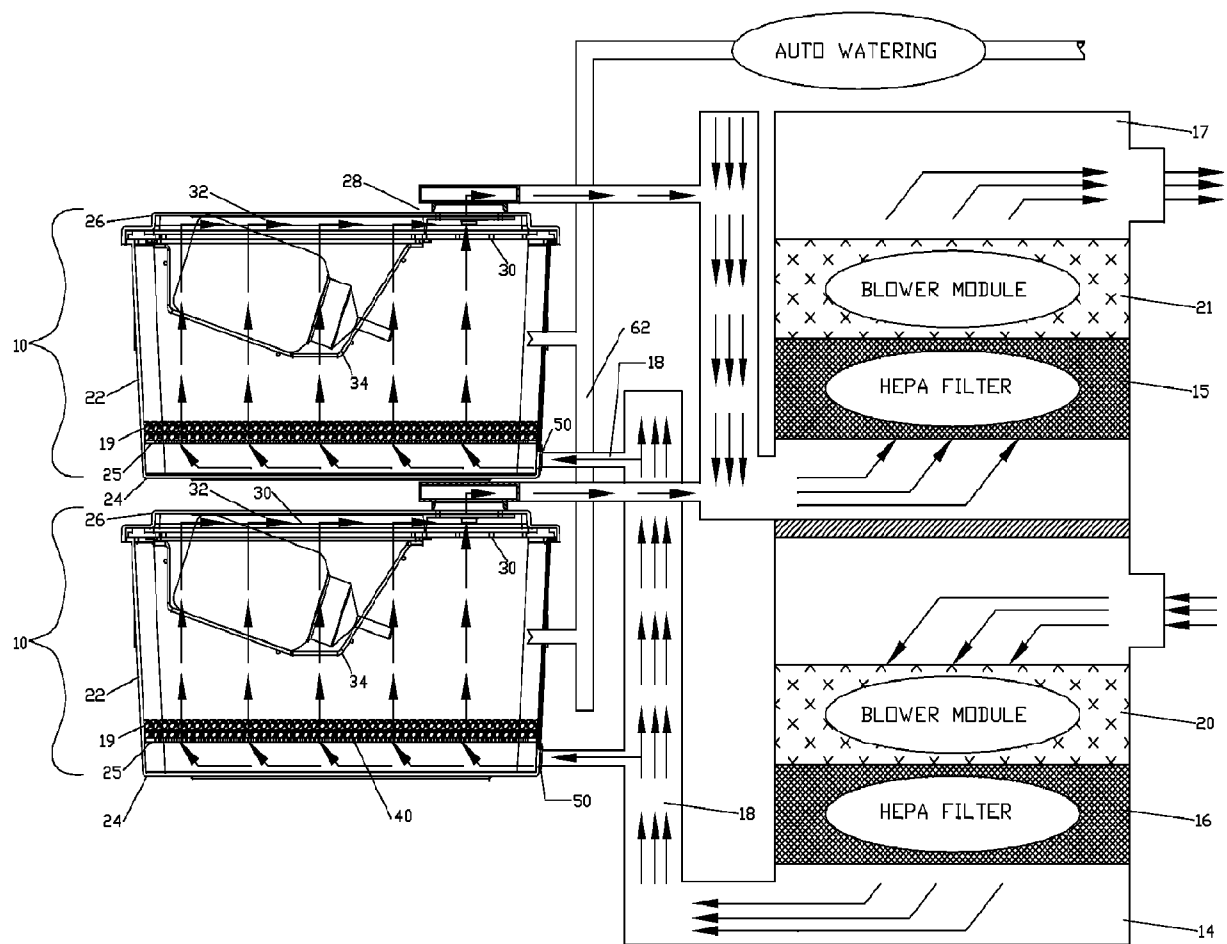


FIG 2

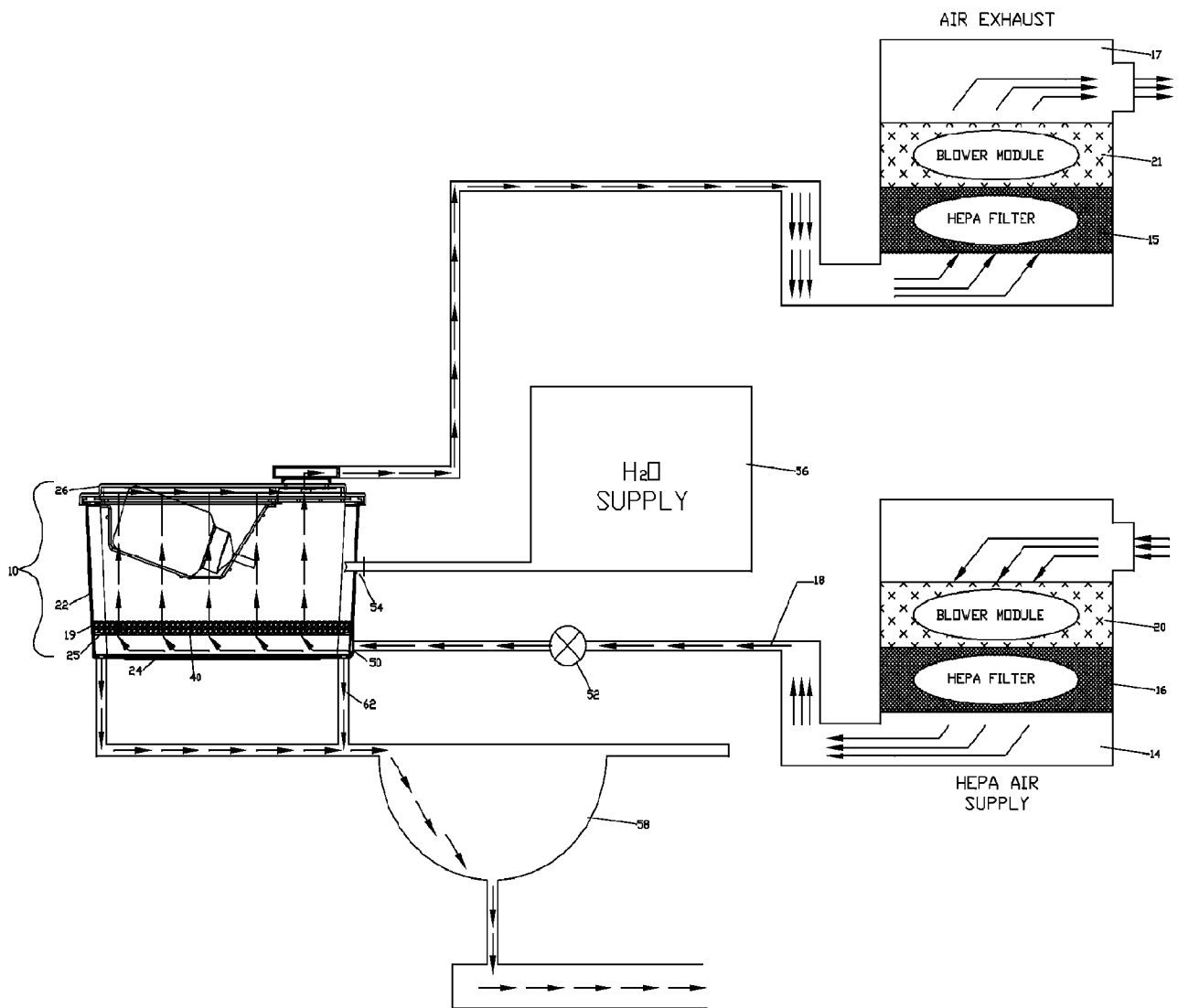


FIG 3

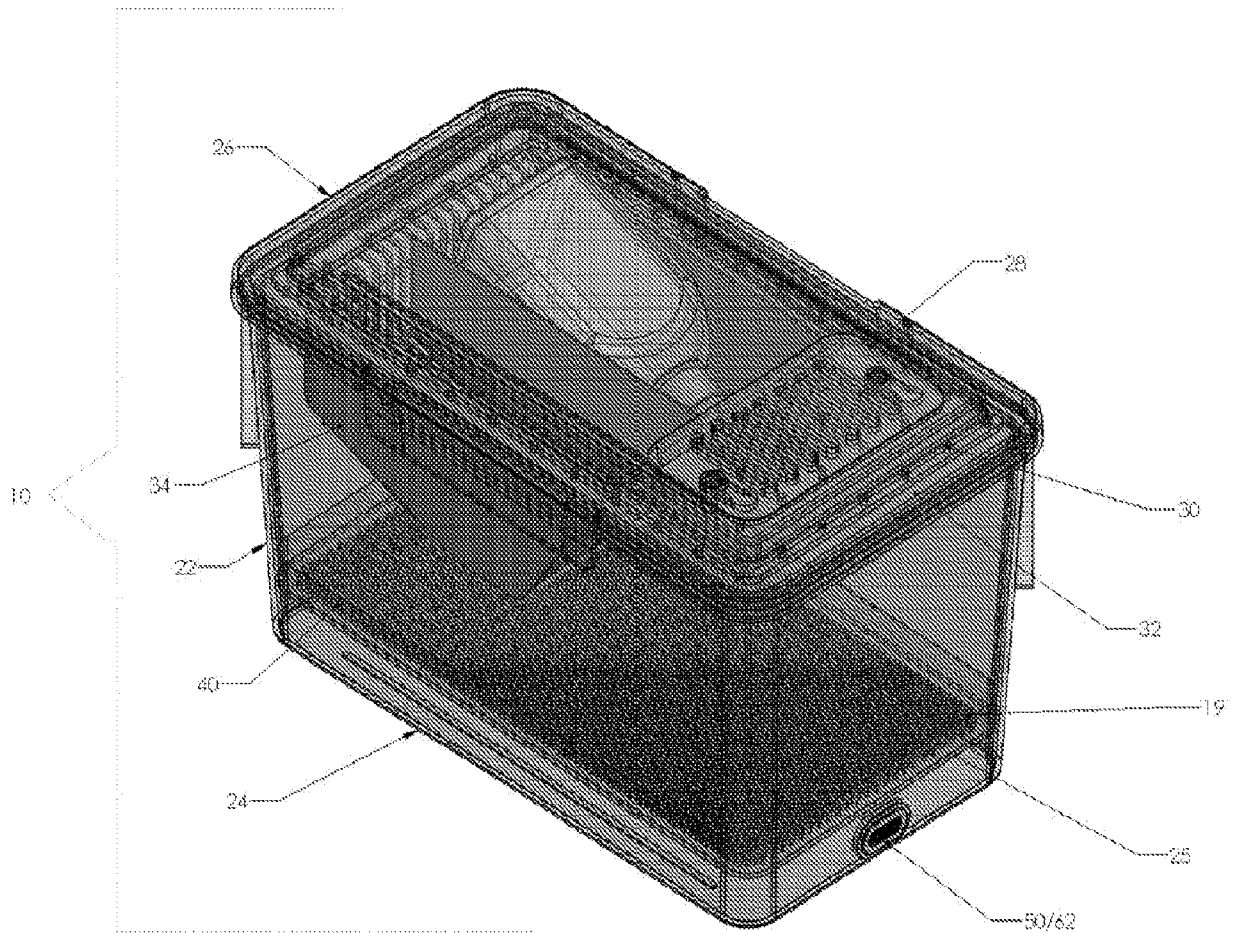


FIG 4

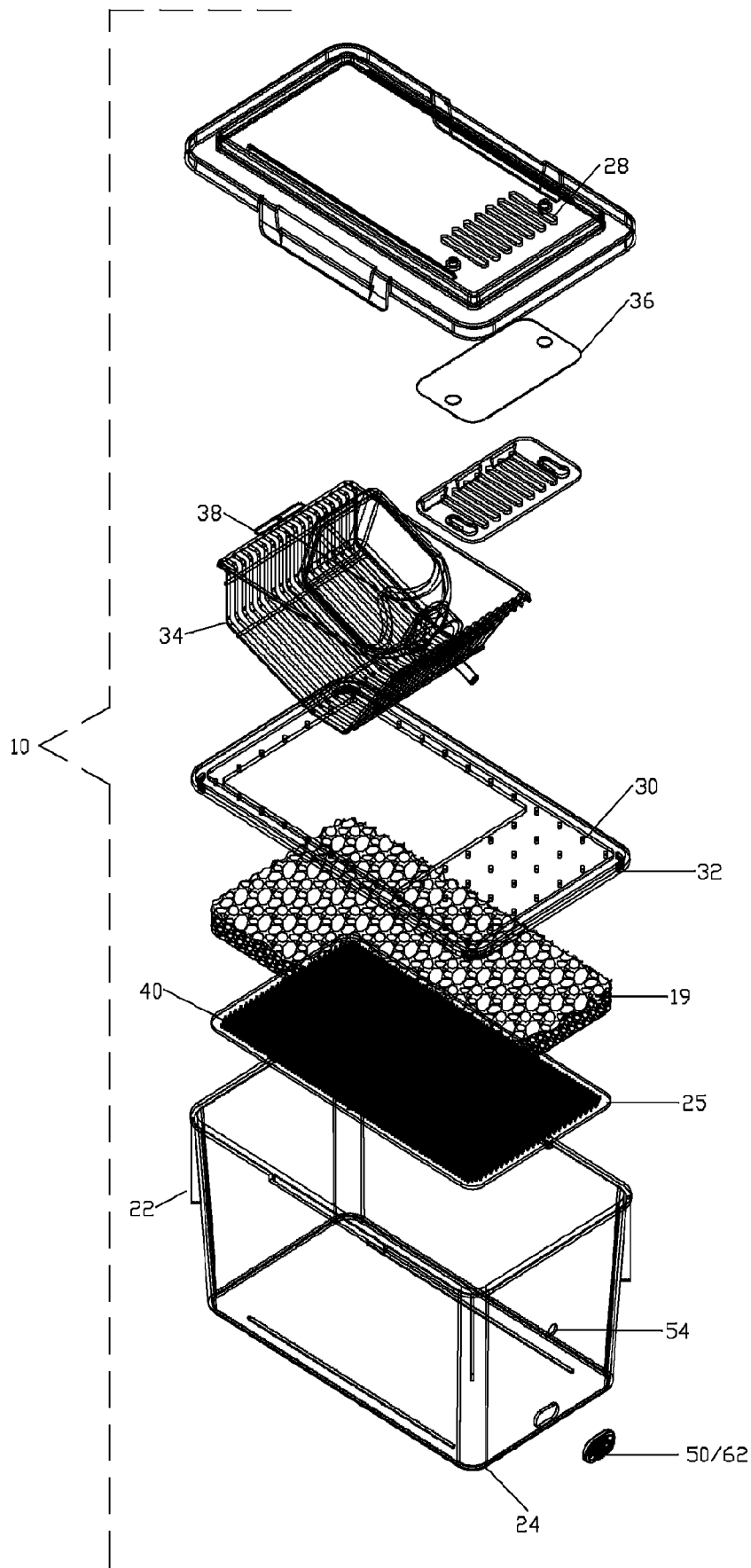


FIG 5

SUBSTITUTE SHEET (RULE 26)

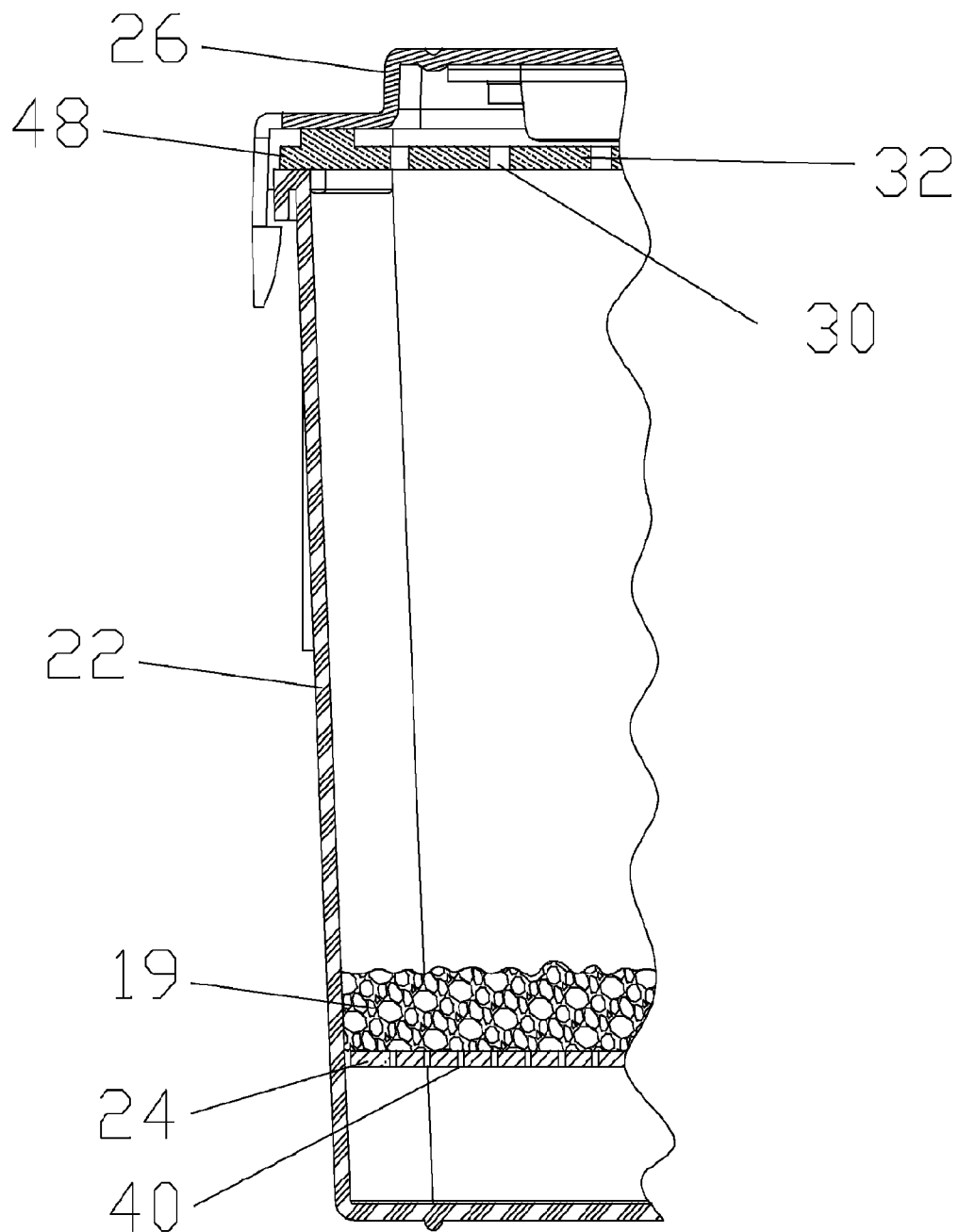
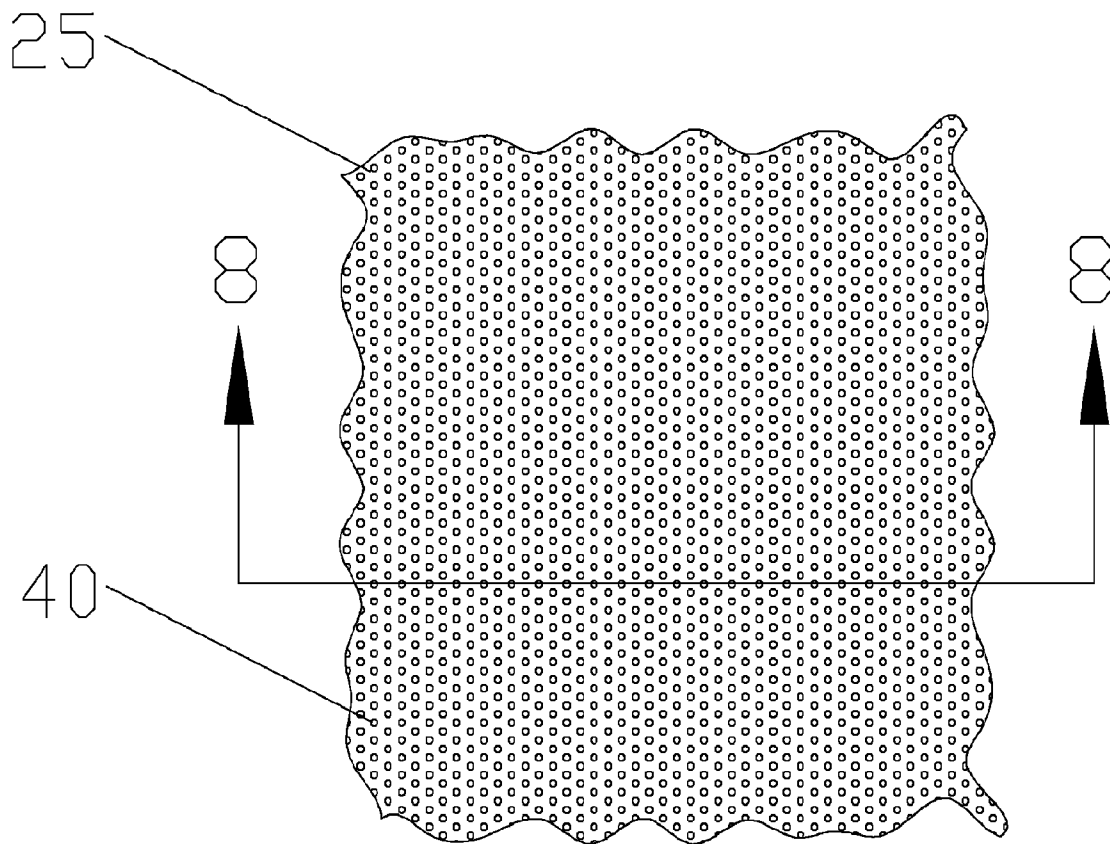
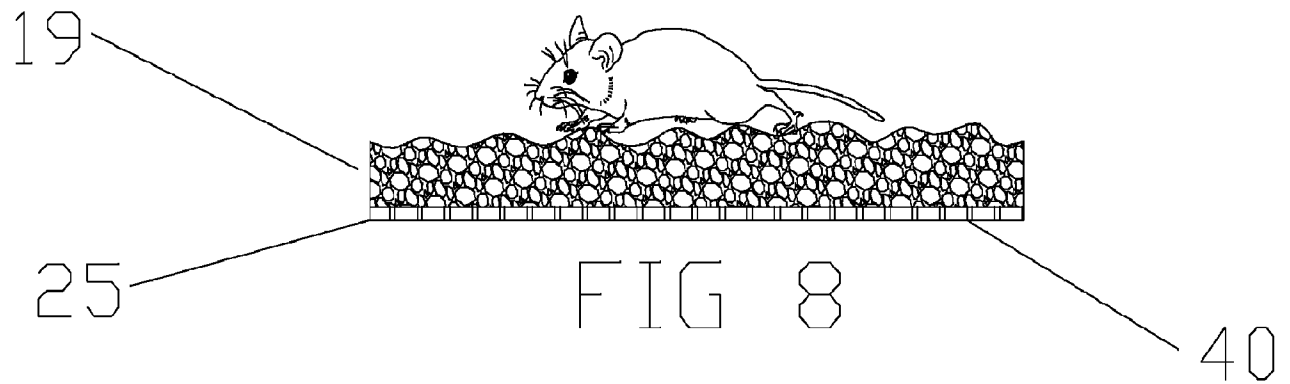


FIG 6



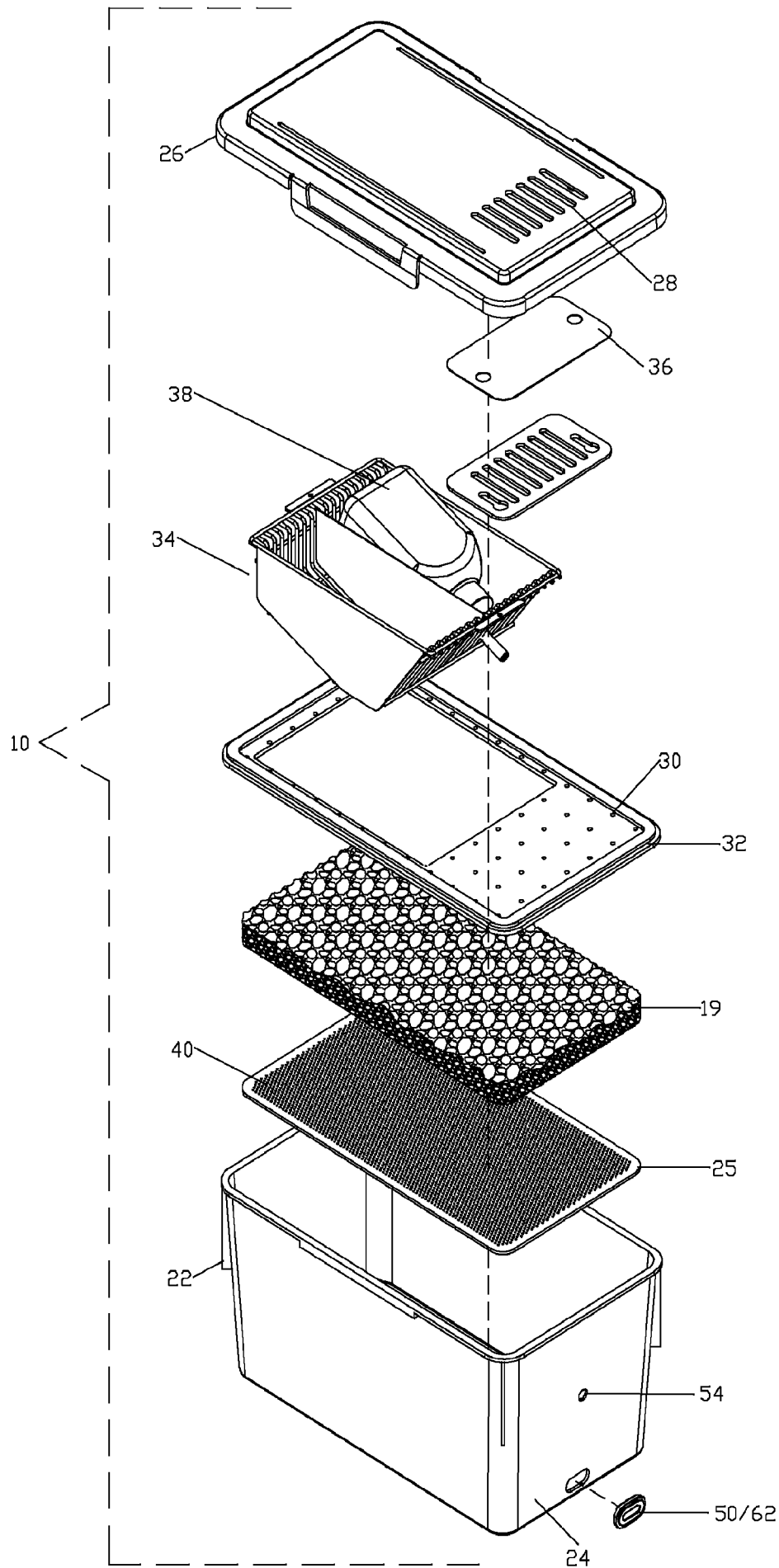


FIG 9

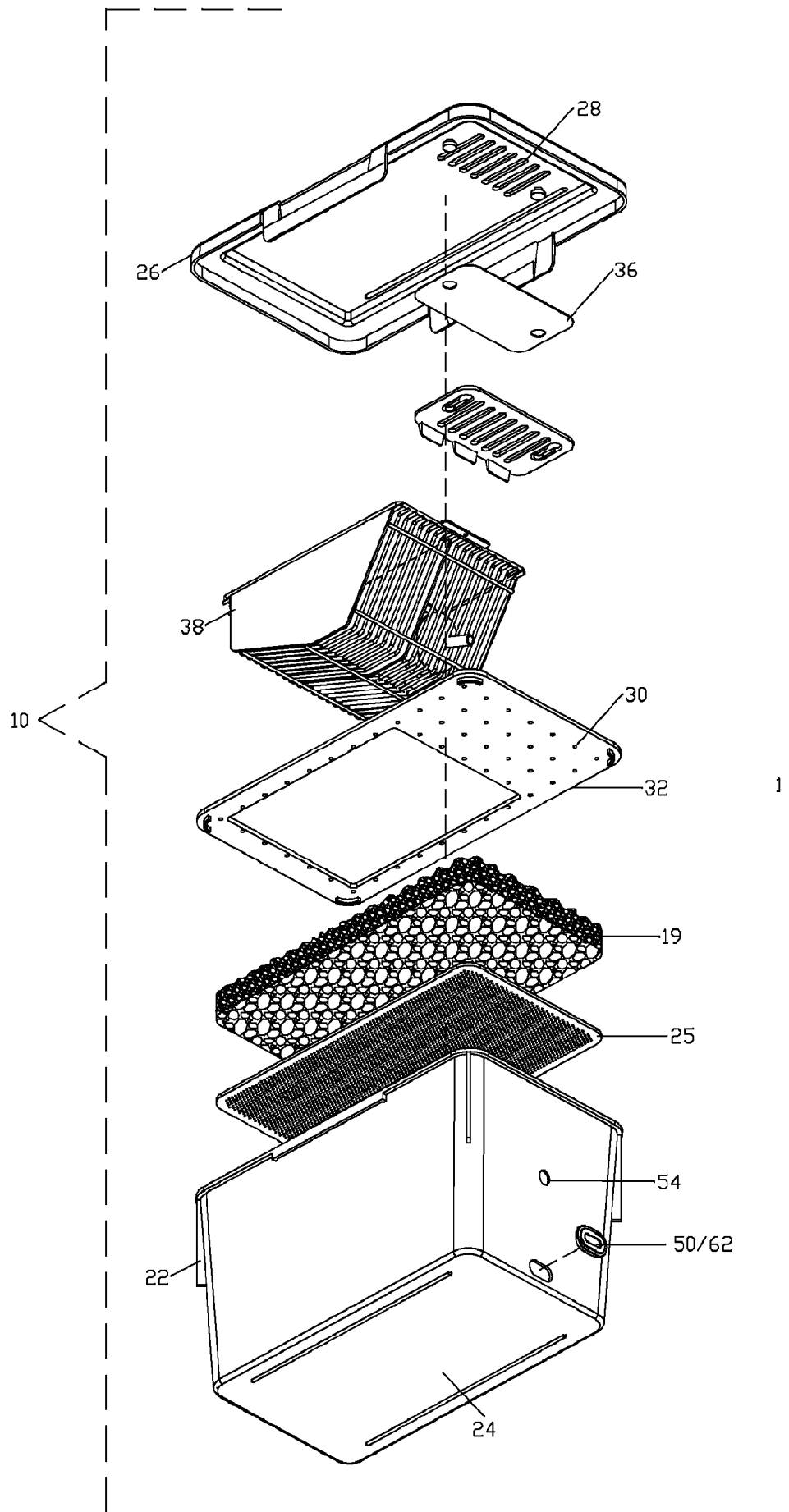


FIG 10

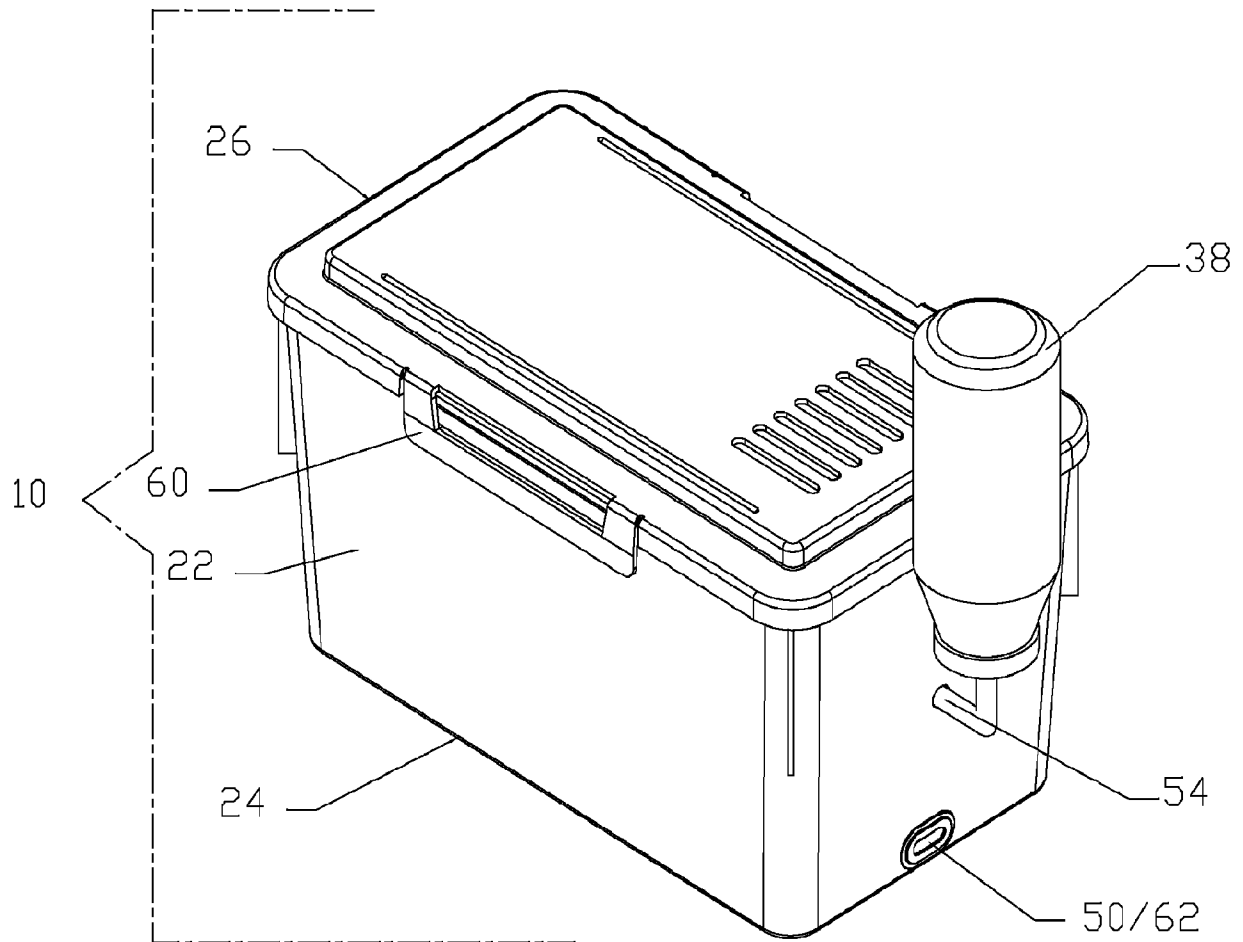


FIG 12

FIG 14

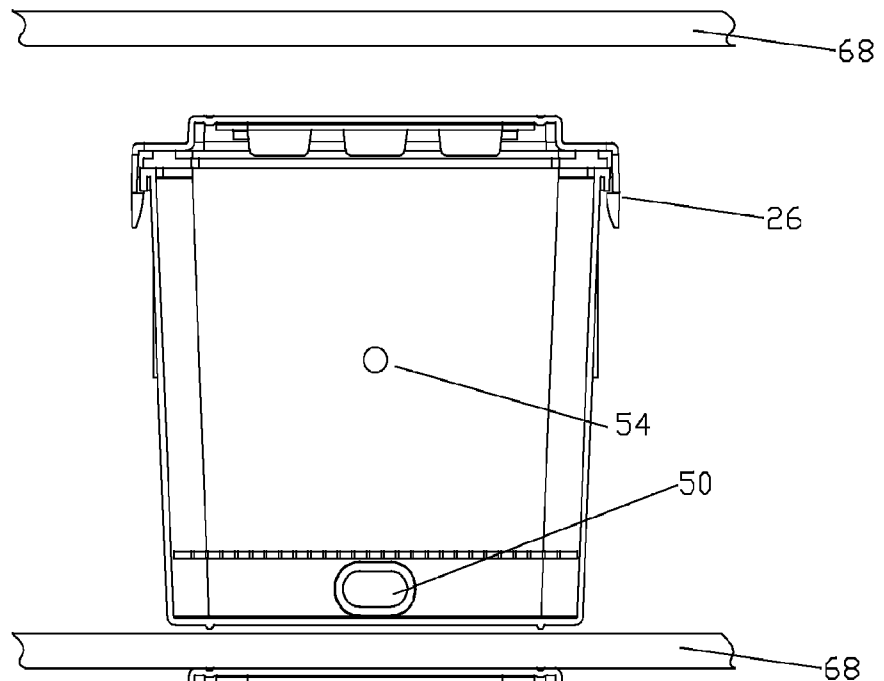


FIG 15

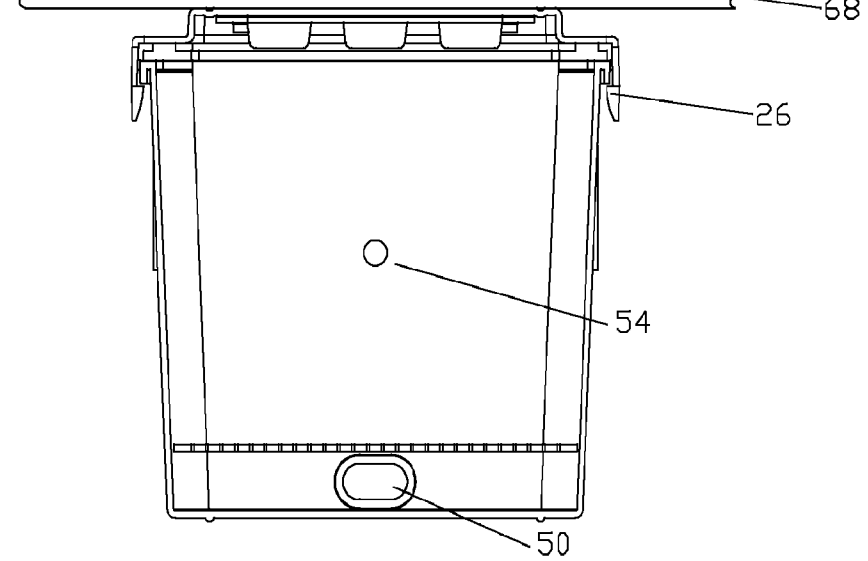


FIG 16

