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Grey Water Filtering, Storage and Dispensing

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Abstract

5 An apparatus 11 for treating and dispensing water such as grey water, including
a container 13 having an inlet 19 and an outlet 23. The inlet 19 feeds to an inlet
volume contained by water permeable filter means 33 and the outlet 23 fluidly
communicating with the water permeable filter means. The outlet 23 includes an
outlet flow control device in the form of a pump 57 to control of flow of water from
10 the container 13. The apparatus 11 includes a high water level sensor 51 to
detect a high water level in the inlet volume, and a low water level sensor 55 to
detect a low water level in the container 13 outside of the inlet volume. Also
included is a control circuit interfaced to the pump and the level sensors to
control the pump, and to detect filter blockage through relative actuation of the
15 level sensors.

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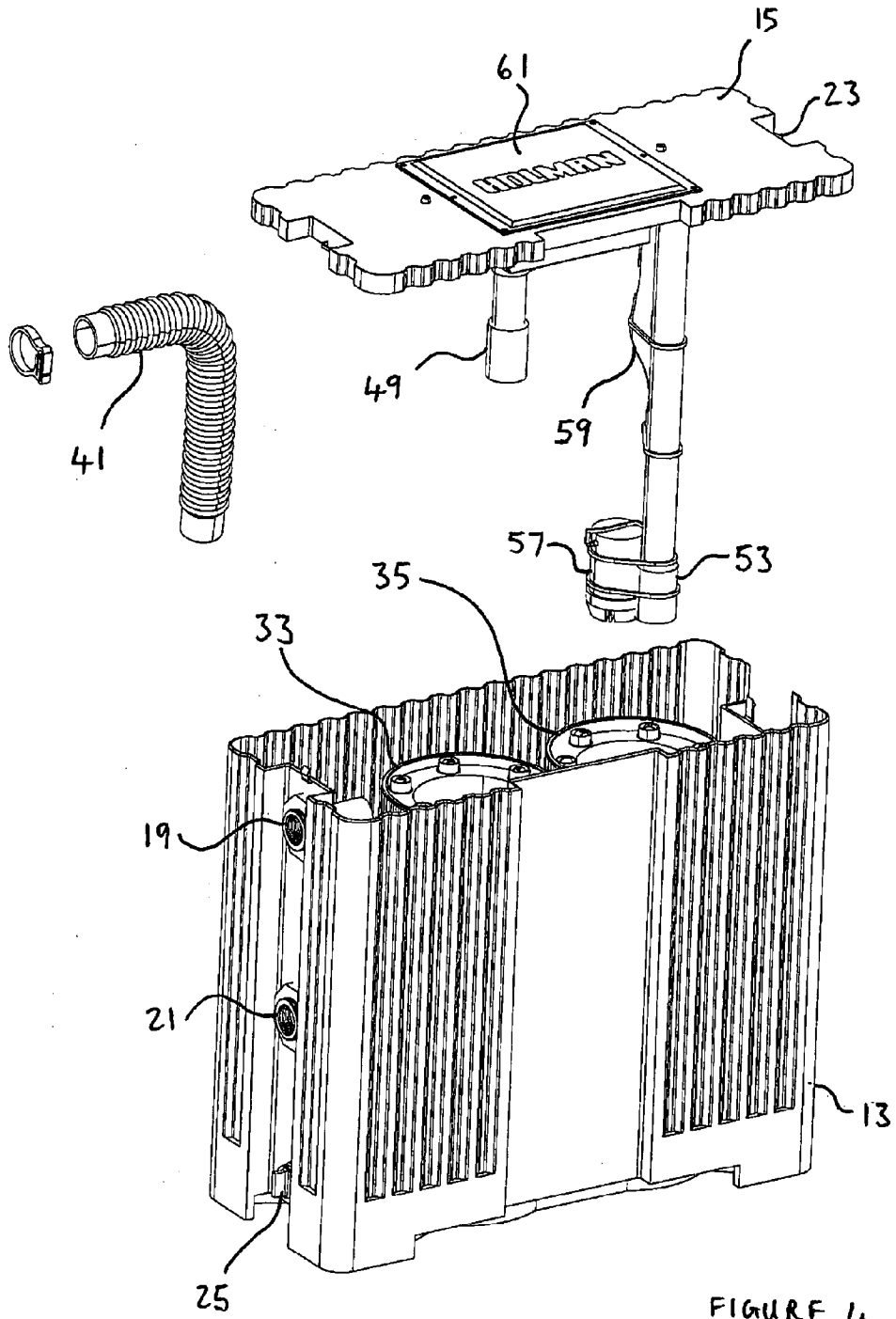


FIGURE 4

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ORIGINAL

COMPLETE SPECIFICATION

STANDARD PATENT

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Invention Title: Grey Water Filtration and Dispensing

The following statement is a full description of this invention, including the best method of performing it known to me:-

"Grey Water Filtration and Dispensing"

Field of the Invention

This invention relates to the treatment and dispensing of water for watering plants and gardens. This invention has particular application in grey water treatment and dispensing for watering purposes, but is also suitable for treatment and dispensing of water from other sources, such as stored rain water.

Background

5 For many years there has been a decline in general rainfall which has been attributed to the adverse effects of global climate change. This decline has prompted the use and recycling of grey water and other secondary water sources for irrigation and commercial purposes. In recent times there has been great interest by home owners to use their own grey water produced within their
10 households for their own irrigation purposes.

Household grey water is generally produced as a by-product of clothes washing, showering, and similar related activities. The water produced is grey only in that it is no longer potable, as it is contaminated with soap or detergent product. It is
15 however well suited for plant and general garden watering.

The storage and distribution of this grey water and for that matter any secondary non-potable water source is well known and several devices have been described in the past that demonstrate this concept and its implementation.
20 None, however, have effectively been able to work as a complete stand-alone, solar or battery powered control system that can be easily installed by the end user and will operate in a similar manner to a conventional domestic irrigation tap timer system with little or no intervention from the end user.

25 A particular problem with dispensing grey water into irrigation reticulation systems is that when dispensed through drippers or drip lines which are required

in the watering of plants, the drippers or drip lines are liable to become clogged with debris from the grey water. This debris can include lint, for example, from clothes washing machine effluent. This gives rise for a need to provide filtration as part of the grey water treatment process. Due to the nature of filtering grey water, there becomes an attendant need to periodically clean the filters as and when they become blocked.

The preceding discussion of the background to the invention is intended to facilitate an understanding of the present invention. However, it should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge in Australia or elsewhere as at the priority date of the application.

It is an object of this invention to provide a method and apparatus for filtering and dispensing grey water which overcomes disadvantages inherent in the aforementioned configuration, or at least provides an alternative to hitherto described or known arrangements.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Disclosure of the Invention

This invention is concerned with the early notification of blockage in a filter in a grey water treatment apparatus. In particular, this invention is concerned with the early notification of blockage in a filter in a grey water treatment and dispensing apparatus.

In accordance with the invention there is provided an apparatus for treating and dispensing water, said apparatus including a container to hold water, said container having an inlet and an outlet, said inlet fluidly communicating with an

inlet volume contained by water permeable filter means, and said outlet fluidly communicating with said water permeable filter means; said outlet including an outlet flow control device to allow control of flow of water from said container, wherein said apparatus includes a high water level sensor to detect a high water level in said inlet volume, and said apparatus includes a low water level sensor to detect a low water level in said container outside of said inlet volume, said apparatus having a control circuit interfaced to said outlet flow control device, and to said high water level sensor and said low water sensor, said control circuit arranged to control said outlet flow control device to pass water through said outlet, and arranged to issue an alarm notification if simultaneously said low water level sensor senses a low water level and said high water level sensor senses a high water level, or if said low water level sensor senses a low water level within a predetermined period of said high water level sensor sensing a high water level. The alarm notification may be an audible alarm or visual alarm or combination of both, or may be a notification sent to a remote location via a communications device.

Preferably said control circuit is arranged to control said outlet flow control device to pass water through said outlet on said high water level sensor sensing high water level.

Preferably said permeable filter means comprises a water permeable inlet filter and a water permeable outlet filter, said inlet fluidly communicating with said water permeable inlet filter and said outlet fluidly communicating with said water permeable outlet filter; said inlet volume and said outlet volume fluidly communicating with each other through both said water permeable filters via an intermediate volume in physical communication with both said water permeable filters, and said low water level sensor being located in said outlet volume or in said intermediate volume.

Preferably said control circuit is arranged to control said outlet flow control device to stop water passing through said outlet immediately said low water sensor senses a low water level.

5 Preferably said control circuit is arranged to issue an alarm notification if simultaneously said low water sensor senses a low water level after a predetermined period of time after said high water sensor senses a high water level. The predetermined period of time can be determined by the time taken to completely empty the outlet volume. Alternatively the predetermined period of time may be determined by the time taken to completely empty said container multiplied by from 0.3 to 0.6. Alternatively the predetermined period of time may be determined by the time taken to completely empty said container multiplied by from 0.4 to 0.5. With this arrangement the issuing of an alarm notification will occur if the low water senses a low water level too soon after the high water sensor actuates. In operation, the water level at the high water sensor may have begun to fall, deactivating the high water sensor, but the low water sensing a low water level too soon would be indicative of partial blockage in the filters.

15 Preferably said control circuit is arranged to issue an alarm notification if simultaneously said low water sensor senses a low water level after a predetermined period of time after said high water sensor ceases to sense a high water level. The predetermined period of time may be determined by any of the methods discussed above.

25 Preferably said control circuit is interfaced to a timer circuit to periodically cause said control circuit to control said outlet flow control device to pass water through said outlet to substantially empty at least said outlet volume. In this manner, the apparatus can be substantially emptied of water, for example on a daily basis in order to prevent water from becoming stagnant. This is an important consideration where the apparatus is to be used in the treatment of grey water. This feature may also be employed to provide scheduled watering to plants, and may be provided in addition to or instead of the control circuit controlling the outlet flow control device to pass water through said outlet, on the high water level sensor sensing high water level. Providing actuation of the outlet flow control device independent of the high water level sensor sensing high water level can be employed where the apparatus is provided with a water supply

having a head, where the high water level sensor may sense a high water level nearly all of the time, in which case it would not be desirable to continually empty the apparatus.

- 5 Preferably said outlet flow control device is selected from one or both of a controllable valve and a pump.

10 The pump may be a low voltage D.C. operated pump, which will allow the system to be easily operated using solar generated electricity. However for a typical installation, the system will be operated using a step down transformer or switching power supply to provide a nominal 12 V DC.

15 The controllable valve, if used alone, must be capable of operating with low pressure head, since in such a configuration, water is fed under gravity from the outlet volume. With such an arrangement, the only source of water pressure is that derived via the depth of water within the containment vessel. In this situation the controllable valve should be able to work with both extremely low water heads, of less than 10mm. To provide versatility the controllable valve should be able to work with moderate heads as high as several metres, although the appropriate controllable valve may be selected depending on the arrangement of the container.

25 Ideally, the controllable valve must close off and fully seal within the operation pressure band of the appliance, and should not allow seepage through the mechanism.

30 With a controllable valve capable of operating at low pressure, the control circuit does not require any complex feedback control mechanism and the full voiding of the container is not a cause for concern, as there is no pumping or evacuation device that could fail with low water levels or if it should run dry.

Preferably the appliance is also adapted to prevent the syphoning of water back from the outlet. This may be achieved through the controllable valve itself, or by

an additional one way valve. Where the outlet flow control device to deliver water includes a pump, a one way valve can be used, allowing the appliance to deliver water to pipework located above the appliance water level, without back-flow occurring when the pump is switched off.

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Preferably the said outlet flow control device includes a valve in addition to a pump, where said valve provides a mechanical action to switch on and off said pump. Again the one way valve should be used to prevent back-flow in situations where the water is being delivered to a height greater the appliance.

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Preferably the control circuit also includes a timing function to control said outlet flow control device to deliver water for a predetermined period. In this arrangement, said timing function may also be arranged to control said outlet flow control device to commence delivering water periodically. This is particularly advantageous if the water is used to water plants that require frequent delivery of small amounts of water.

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Preferably said control circuit and said outlet flow control device are adapted to run on low voltage electricity so as to be independent of power provided by power utilities. This may include power derived from solar panels or wind turbines, or from batteries.

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To ensure reliable and uninterrupted operation, preferably the power supply for the pump and the control circuit are isolated and arranged in such a manner that in case of low voltage, due to a weak or flat battery, the appliance will shut down in a way that will inhibit a continuous flow of water from the container.

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Preferably said appliance utilises passive switch elements for the control of the valve and tank sensing system. Using passive switches to control reduces the overall current consumption of the appliance compared with using sensing and associated active circuitry. This in turn allows for longer battery life between replacement of conventional cells or greater times between charges for

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rechargeable cells.

5 Preferably said control circuit is interfaced with a moisture sensor, and said control circuit is arranged to exert over-riding control over said outlet flow control device, to prevent water flow or to prevent excessive water flow when moisture is sensed. This arrangement would have application in dispensing grey water to plants and gardens.

10 Preferably said inlet volume is contained against overflow into said intermediate volume, in the event of excess flow of water into said inlet or blockage of said inlet filter.

15 Preferably said inlet filter is cylindrical in configuration and said inlet communicates with the interior of said cylindrical inlet filter.

Preferably said outlet filter is cylindrical in configuration and said outlet communicates with the interior of said cylindrical outlet filter.

20 Preferably said cylindrical inlet filter and said cylindrical outlet filter are arranged side by side, with the exteriors thereof in said intermediate volume in said container.

25 Preferably said cylindrical inlet filter and said cylindrical outlet filter are sealingly engaged at their top ends to a lid for said container, when said lid is fitted thereto, and said lid houses said inlet.

Preferably said cylindrical inlet filter and said cylindrical outlet filter are sealingly engaged at their bottom ends to the base of said container.

30 Alternatively said cylindrical inlet filter and said cylindrical outlet filter are open at their top ends, and said container is arranged with an overflow outlet, which discharges overflow if the water level in said container exceeds a predetermined level. The predetermined level is set to prevent water over-flowing the cylindrical

inlet filter and said cylindrical outlet filter, which would allow debris in the water to bypass the filters.

5 Preferably said outlet flow control device is a submersible pump, and said outlet is housed in said lid. The submersible pump is most preferably suspended from said lid. The submersible pump may conveniently be a 12 volt operated bilge pump as used in recreational boating. These typically have a discharge flow rate of from 5 to 35 litres per minute, or higher. The flow rate chosen will be a practical compromise between the desired flow rate and the current drawn by the pump, with a view to minimizing the current draw while achieving maximum flow rate.

15 Preferably said inlet filter and said outlet filter have a filter flow rate of at least 0.1 litres per second per square metre of filter media, when clean. Ideally, the filters will support a flow rate which matches the discharge rate from the appliance. This could range from 0.1 litres per second, up to 1 or 2 litres per second. The filters should exhibit low resistance to flow of water through the filter medium, as the water is un-pressurised. The filter medium may be a woven or non-woven fabric, which is supported on a frame. The fabric is most preferably a spray bonded non-woven fabric 40 mesh to 400 mesh with a density of from 18 to 250 grams/square metre.

Brief Description of the Drawings

A preferred embodiment of the invention will now be described in the following description of a grey water treatment and dispensing appliance, made with reference to the drawings in which:

25 Figure 1 is a perspective view from above of the grey water treatment and dispensing appliance according to the first embodiment of the invention;

Figure 2 is a perspective view from below of the appliance of figure 1;

Figure 3 is a cut-away view (with the housing omitted) of the appliance of figure 1;

Figure 4 is an exploded perspective view of the appliance showing internal parts which are attached to the lid thereof;

5 Figure 5 is a further exploded perspective view from above of the appliance of figure 1 showing a cover for control circuitry removed and showing the filters, one of which is partially disassembled;

Figure 6 is a side view of the lid assembly of the appliance with submersible pump and ductwork removed, and showing the level switches partially disassembled; and

10 Figure 7 is a plan view of the lid assembly of the appliance of figure 1, showing the cover for control circuitry removed.

Best Mode(s) for Carrying Out the Invention

The embodiment is a self contained treatment plant for grey or non-potable water, storage tank and dispenser for dispensing treated water to water plants and gardens, and is indicated generally at 11 in figure 1. The plant has a container 13 which holds water, and a lid 15, both forming an enclosure. The container 13 is formed of injection-moulded plastic and has vertically extending corrugations 17 and other surface geometry changes, to provide rigidity against outward deflection of the walls thereof, due to the weight of water. The plastic may advantageously be polypropylene, although any UV stabilised plastic that has sufficient impact resistance may be used.

20 The container 13 has an inlet connector 19 to which a fitting can be connected for the supply of water, such as grey water, for example. An overflow connector 21 is provided for the connection of a pipe to discharge excess water directly from the container 13. The lid 15 has an outlet pipe and connector 23 for delivery of water under pressure, which can be connected to reticulation for watering plants via drippers or a seep hose. The outlet pipe and connector includes a one-way valve (not shown), which prevents back flow into the plant, of dispensed water. The container 13 is provided with connectors and drain plugs 25 at opposing ends thereof, near the base 27 of the container 13, and a

connector and drain plug 29 in the base 27, with the plug 31 thereof accessible from the inside of the container.

5 The container holds two cylindrical filter canisters, being an inlet filter 33 and an outlet filter 35. The inlet filter 33 and outlet filter 35 are each sealingly received in a circular recess located in the base 27 to hold the filters in sealing engagement therewith. Referring to figure 2, the outline 37 of the circular recesses for receiving the filters can be seen. In figure 2 it can be seen that the base 27 of the container 13 is formed with ribs 39 to provide rigidity against warping, to prevent distortion of the base which could cause the seal between the filters and the base to fail.

15 The inlet connector 19 leads internally to a hose 41 which delivers water to the inside of the inlet filter 33 (the inside of the inlet filter being the inlet volume). The inlet filter 33 has a cylindrical filter wall 43, through which water can percolate into the main part of the container, and ensuring all the incoming water must pass through the inlet filter. Any debris in the water will be entrained within the inlet filter 33. The water will also percolate through the cylindrical filter wall 43a of the outlet filter 35, into the outlet volume, located on the inside of the outlet filter 35. The cylindrical filter walls 43 and 43a are formed of a spray bonded non-woven fabric, and allows flow of water therethrough at a rate of about 0.5 litres per second.

25 As more water flows into the inlet 19, the container 13 will fill with water. The overflow connector 21 has an upwardly extending pipe 45 open at the top 47, so that water will overflow through the top 47. The overflow assembly 21, 45, 47 prevents the container 13 over-filling. The top 47 of the overflow assembly is lower than the top of the inlet filter 33, which as far as is practical, avoids overflow over the top of the inlet filter 33, which would result in debris bypassing the inlet filter 33. In an alternative embodiment, the overflow assembly may be dispensed with, and control of water admitted to the inlet 19 may be implemented instead. Such an alternative embodiment would require a header tank in order to store excess unprocessed water, and might be implemented where the water

being processed was gathered from roof guttering rather than grey water. While the filters may overflow in the present embodiment, hence requiring the overflow assembly, an alternative embodiment may have the filters sealingly engaged with the lid of the container so physical overflow would not occur.

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Also extending into the inlet volume, within the inlet filter is a housing 49 containing a float/switch assembly 51 being a high water level sensor. Extending into the outlet volume is a housing 53 containing a float/switch assembly 55 being a low water level sensor, and a submersible pump 57 connected to an outlet pipe 59 to discharge water through the outlet 23, when the pump 57 is actuated.

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The lid 15 has a central cover 61 which protects control electronics from dust and water. Referring to figure 5 and 7, the control electronics comprises a timer 63 which can have start times programmed to start the submersible pump 57, and a control circuit 65 which is interfaced with the high water level float/switch assembly 51, and to the low water level float/switch assembly 55. The control circuit 65 is arranged to over-ride operation of the pump 57 when a low water level is detected in the outlet volume within the outlet filter 35. In addition the control circuit 65 is arranged to start the pump 57 when a high water level is detected in the inlet volume inside the inlet filter 33, by the float/switch assembly 51. The pump 57 is controlled to run until a low water level is detected by the low water level float/switch assembly 55, or alternatively may be controlled to run for a shorter period when set to do so by the timer 63.

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In normal operation, when the pump 57 starts, the water level within the outlet volume inside the outlet filter 35, will fall. The water level in the container 13 (the intermediate volume), and the water level within the inlet volume inside the inlet filter 33 will also fall as permeation through the filters takes place, subject to rate of top-up through the inlet 19. When the low water level float/switch assembly 55 detects a low water level, the pump 57 will be stopped. Should the low water level float/switch assembly 55 detect a low water level simultaneously with the high water level float/switch assembly 51 detecting a high water level, this is

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indicative of a blocked filter condition, which is detected by the control circuit 65, which issues a warning indication in the form of a sounding buzzer, augmented by a warning light, to warn that the filter needs to be cleaned.

- 5 Similarly, should the low water level float/switch assembly 55 detect a low water level too soon after the high water level float/switch assembly 51 ceases to detect a high water level, this is indicative of a partially blocked filter condition, which is detected by the control circuit 65, which issues a warning indication. The control circuit 65 includes a timer which times out a three minute interval,
- 10 once the high water level float/switch assembly 51 ceases to detect a high water level. If the low water level float/switch assembly 55 detects a low water level within this interval, the control circuit 65 issues a warning indication. The timing of the interval is determined by the time that would be taken for the outlet volume and part of the intermediate volume to empty under operation of the pump 57.
- 15 For the embodiment where the total capacity of the plant is 50 litres, the interval time for the given pump rate would be the time to evacuate less than half of the capacity of the plant. This would be indicative of the filters being partially blocked and needing to be cleaned, since the outlet volume should be replenished by capacity in the inlet volume and intermediate volume at a rate that
- 20 should not allow the outlet volume to empty within the interval. It will be appreciated that other factors may influence the interval time, beyond the pump rate. For example where the discharge rate from connected drippers restricts the flow rate, this may require the interval time to be increased.
- 25 In certain applications, it may be sufficient to not include the feature of the alarm occurring in circumstances where the low water level float/switch assembly 55 detect a low water level simultaneously with the high water level float/switch assembly 51 detecting a high water level, instead relying solely on the feature of the alarm occurring when the low water level float/switch assembly 55 detects a
- 30 low water level too soon after the high water level float/switch assembly 51 has detect a high water level.

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5 All of the control electronics and the submersible pump are operable from a low voltage 12 volt supply, allowing the end user to connect the plant to electricity using a self-contained power supply which can be plugged into mains electricity. Alternatively, the plant may be powered by rechargeable battery which is connected to a solar panel or wind turbine or a combination of both.

The plant has a 50 litre water capacity, and stands approximately 0.6 metres tall.

10 The water treatment and dispensing plant of the embodiment provides for filtration of grey water, and automated pumping and control of grey water and stored tank water for irrigation of pot plants, gardens, lawns and vegetable patches. An alternative embodiment may be arranged to operate dispensing water under gravity, through an electrically operated valve, dispensing with the need for a pump. Such a valve would need to be a low head valve with low head
15 loss and water tight shut off under zero or minimal water pressure. The embodiment may operate using a low voltage remote power supply.

20 The applications for the embodiment are not limited to just non potable water sources, and may readily find application in the control of water for livestock, aviaries, air conditioners and remote water supplies in the building and construction industry.

25 It should be appreciated that the scope of the invention is not limited to the particular embodiment disclosed herein, and that the skilled addressee will readily appreciate that changes may be made without departing from the spirit and scope of the invention.

The Claims Defining the Invention are as Follows

1. An apparatus for treating and dispensing water, said apparatus including a container to hold water, said container having an inlet and an outlet, said inlet fluidly communicating with an inlet volume contained by water permeable filter means, and said outlet fluidly communicating with said water permeable filter means; said outlet including an outlet flow control device to allow control of flow of water from said container, wherein said apparatus includes a high water level sensor to detect a high water level in said inlet volume, and said apparatus includes a low water level sensor to detect a low water level in said container outside of said inlet volume, said apparatus having a control circuit interfaced to said outlet flow control device, and to said high water level sensor and said low water sensor, said control circuit arranged to control said outlet flow control device to pass water through said outlet, and arranged to issue an alarm notification if simultaneously said low water level sensor senses a low water level and said high water level sensor senses a high water level.
2. An apparatus as claimed in claim 1 wherein said control circuit is arranged to issue an alarm notification if simultaneously said low water sensor senses a low water level after a predetermined period of time after said high water sensor senses a high water level.
3. An apparatus as claimed in claim 1 wherein said control circuit is arranged to issue an alarm notification if simultaneously said low water sensor senses a low water level after a predetermined period of time after said high water sensor ceases to sense a high water level.
4. An apparatus for treating and dispensing water, said apparatus including a container to hold water, said container having an inlet and an outlet, said inlet fluidly communicating with an inlet volume contained by water permeable filter means, and said outlet fluidly communicating with said water permeable filter means; said outlet including an outlet flow control device to allow control of flow of water from said container, wherein said

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apparatus includes a high water level sensor to detect a high water level in said inlet volume, and said apparatus includes a low water level sensor to detect a low water level in said container outside of said inlet volume, said apparatus having a control circuit interfaced to said outlet flow control device, and to said high water level sensor and said low water sensor, said control circuit arranged to control said outlet flow control device to pass water through said outlet, and arranged to issue an alarm notification if said low water level sensor senses a low water level within a predetermined period of said high water level sensor sensing a high water level.

5. An apparatus as claimed in any one of the preceding claims wherein the predetermined period of time is determined by the time taken to completely empty said container multiplied by from 0.3 to 0.6.
6. An apparatus as claimed in any one of the preceding claims wherein said control circuit is arranged to control said outlet flow control device to pass water through said outlet on said high water level sensor sensing high water level.
7. An apparatus as claimed in any one of the preceding claims wherein said permeable filter means comprises a water permeable inlet filter and a water permeable outlet filter, said inlet fluidly communicating with said water permeable inlet filter and said outlet fluidly communicating with said water permeable outlet filter; said inlet volume and said outlet volume fluidly communicating with each other through both said water permeable filters via an intermediate volume in physical communication with both said water permeable filters, and said low water level sensor being located in said outlet volume or in said intermediate volume.
8. An apparatus as claimed in any one of the preceding claims wherein said control circuit is arranged to control said outlet flow control device to stop water passing through said outlet immediately said low water sensor senses a low water level.

9. An apparatus as claimed in claim 7 or 8 wherein said low water level sensor is located in said outlet volume.
- 5 10. An apparatus as claimed in any one of the preceding claims wherein said control circuit is interfaced to a timer circuit to periodically cause said control circuit to control said outlet flow control device to pass water through said outlet to substantially empty at least said outlet volume.
- 10 11. An apparatus as claimed in any one of the preceding claims wherein said outlet flow control device is a pump.
12. An apparatus as claimed in any one of claims 1 to 10 wherein the said outlet flow control device includes a valve in addition to a pump, where
15 said valve provides a mechanical action to switch on and off said pump.
13. An apparatus as claimed in claim 11 or 12 including a one way valve in the outlet to prevent the syphoning of water back from the outlet.
- 20 14. An apparatus as claimed in any one of the preceding claims wherein the control circuit also includes a timing function to control said outlet flow control device to deliver water for a predetermined period.
- 25 15. An apparatus as claimed in claim 14 wherein said timing function may also be arranged to control said outlet flow control device to commence delivering water periodically.
- 30 16. An apparatus as claimed in claim 14 or 15 wherein said control circuit is interfaced with a moisture sensor, and said control circuit is arranged to exert over-riding control over said outlet flow control device, to prevent water flow or to prevent excessive water flow when moisture is sensed.

- 5
17. An apparatus as claimed in any one of the preceding claims wherein said inlet filter is cylindrical in configuration and said inlet communicates with the interior of said cylindrical inlet filter, said outlet filter is cylindrical in configuration and said outlet communicates with the interior of said cylindrical outlet filter, and said inlet filter and said outlet filter are arranged side by side, with the exteriors thereof in said intermediate volume in said container.
- 10
18. An apparatus as claimed in claim 18 wherein said cylindrical inlet filter and said cylindrical outlet filter are open at their top ends, and said container is arranged with an overflow outlet, which discharges overflow if the water level in said container exceeds a predetermined level.
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19. An apparatus as claimed in claim 18 wherein said overflow outlet communicates with said intermediate volume to prevent water level in said apparatus exceeding said predetermined level.
- 20
20. An apparatus as claimed in claim 18 or 19 wherein said outlet is housed in said lid and said outlet flow control device is a submersible pump suspended from said lid.
- 25
21. An apparatus as claimed in any one of the preceding claims wherein said inlet filter and said outlet filter each have a filter flow rate of at least 0.1 litres per second per square metre of filter media, when clean.
22. An apparatus for treating and dispensing water substantially as herein described with reference to the drawings.

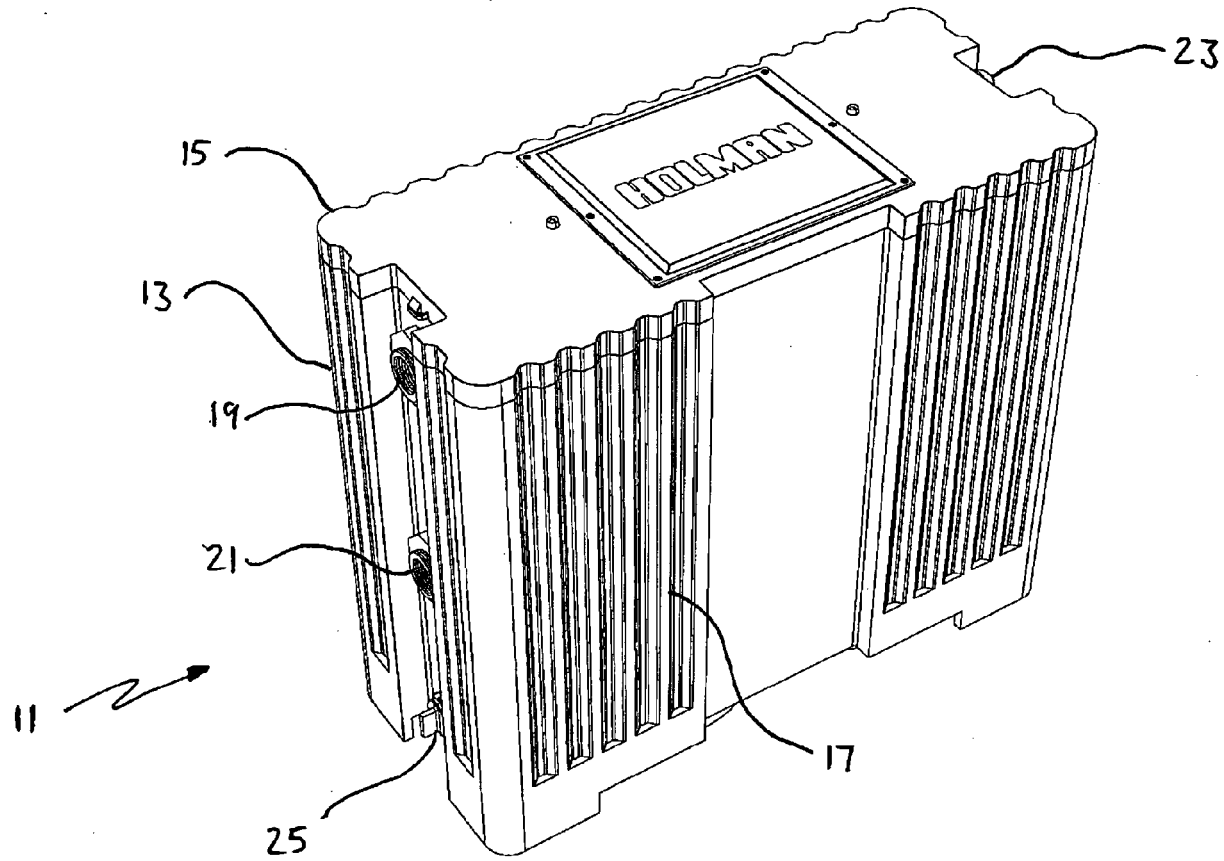
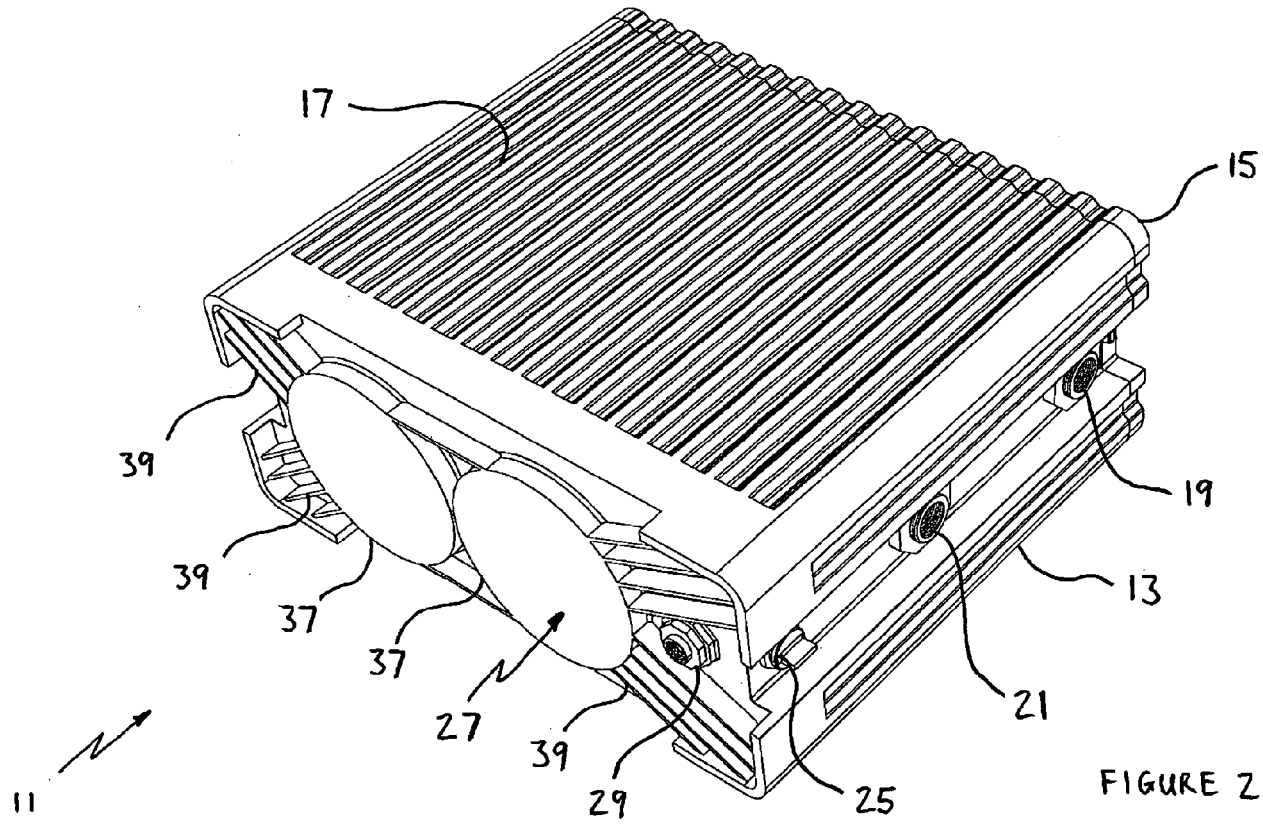
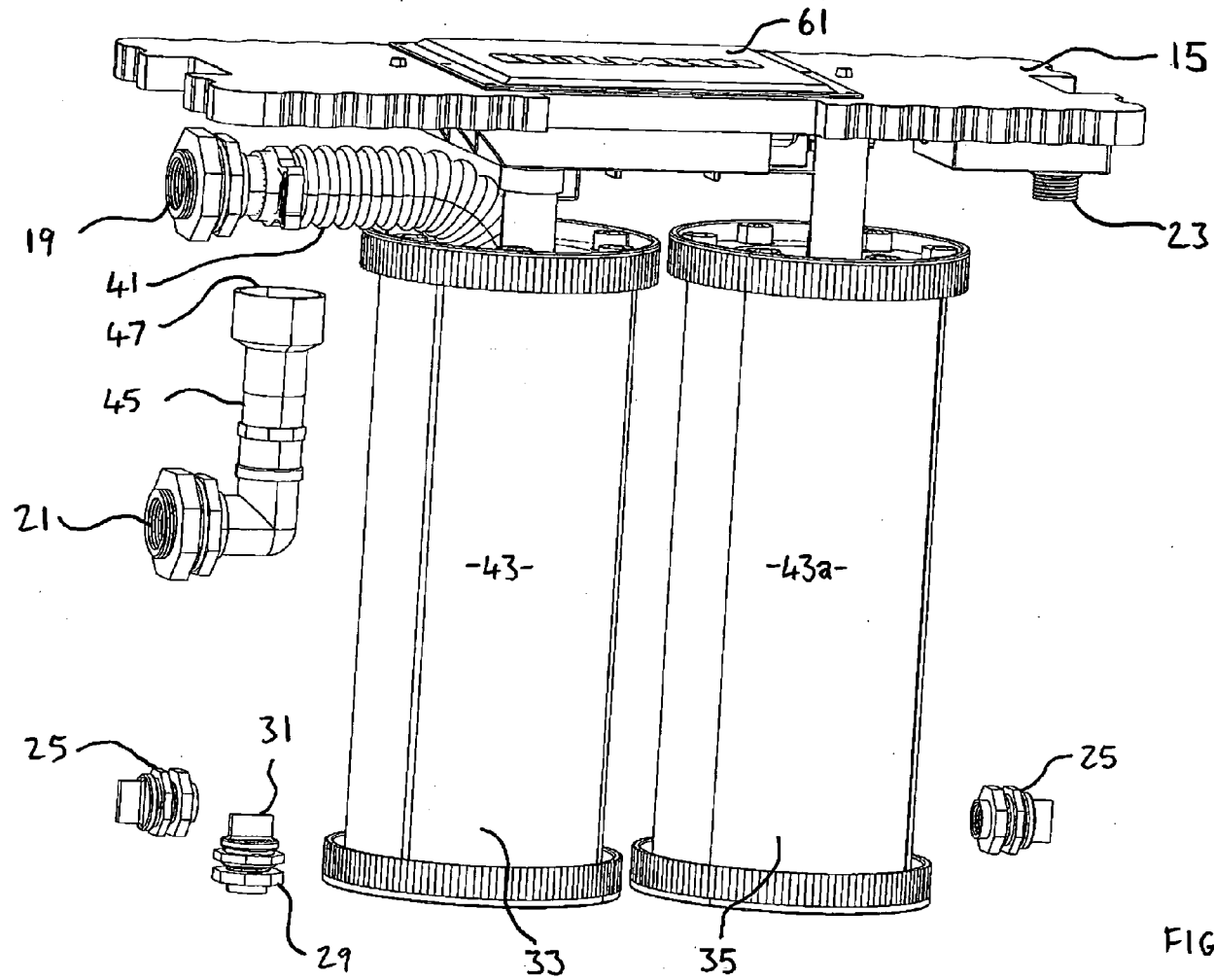


FIGURE 1



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FIGURE 3

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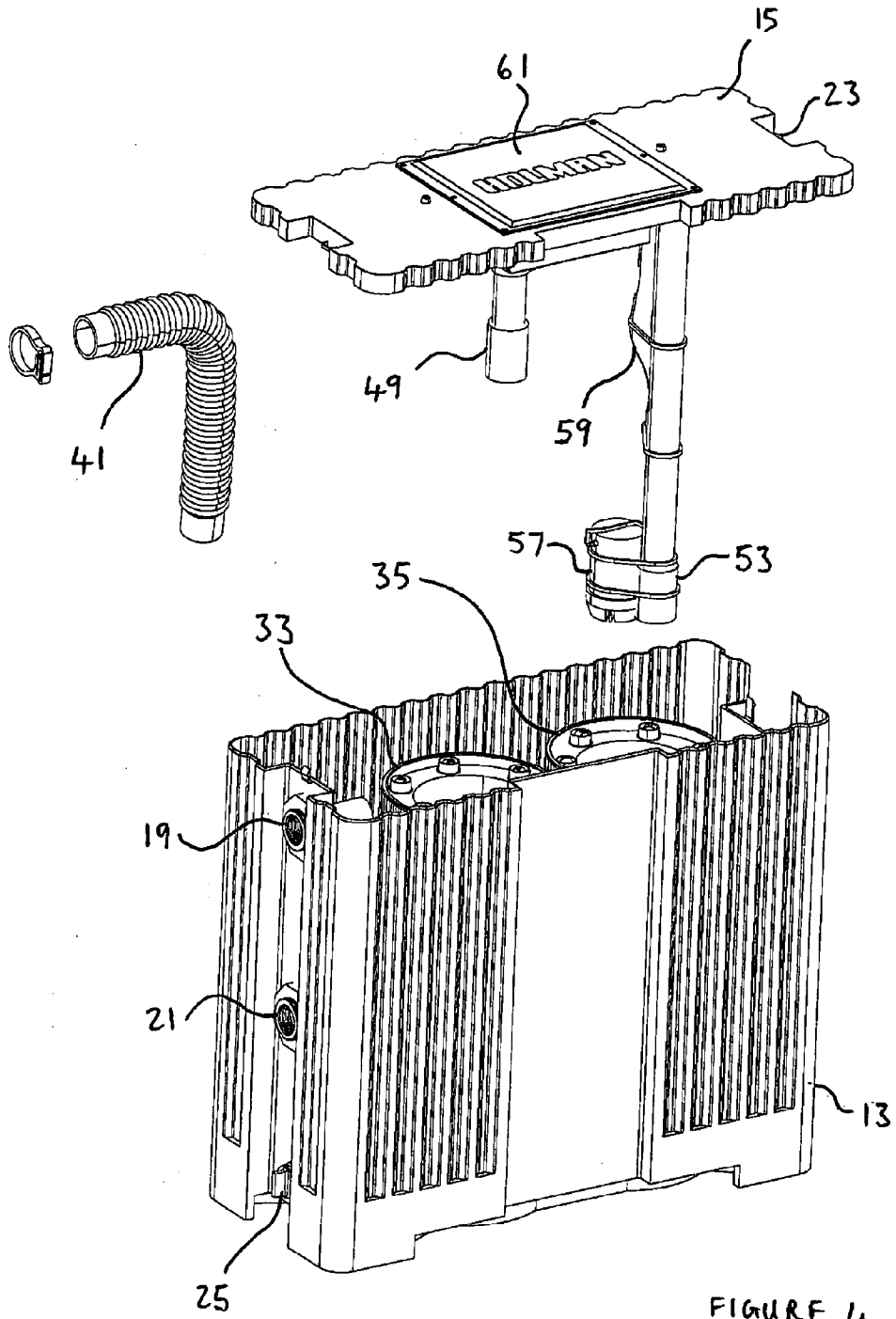


FIGURE 4

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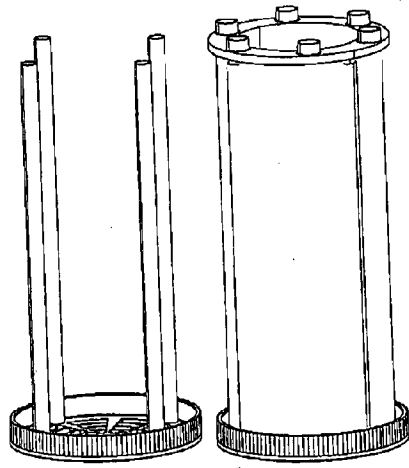
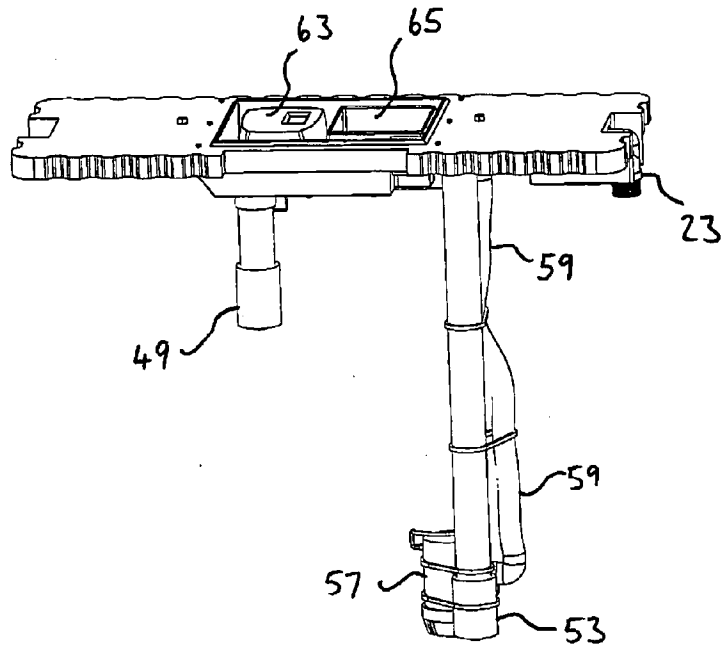


FIGURE 5

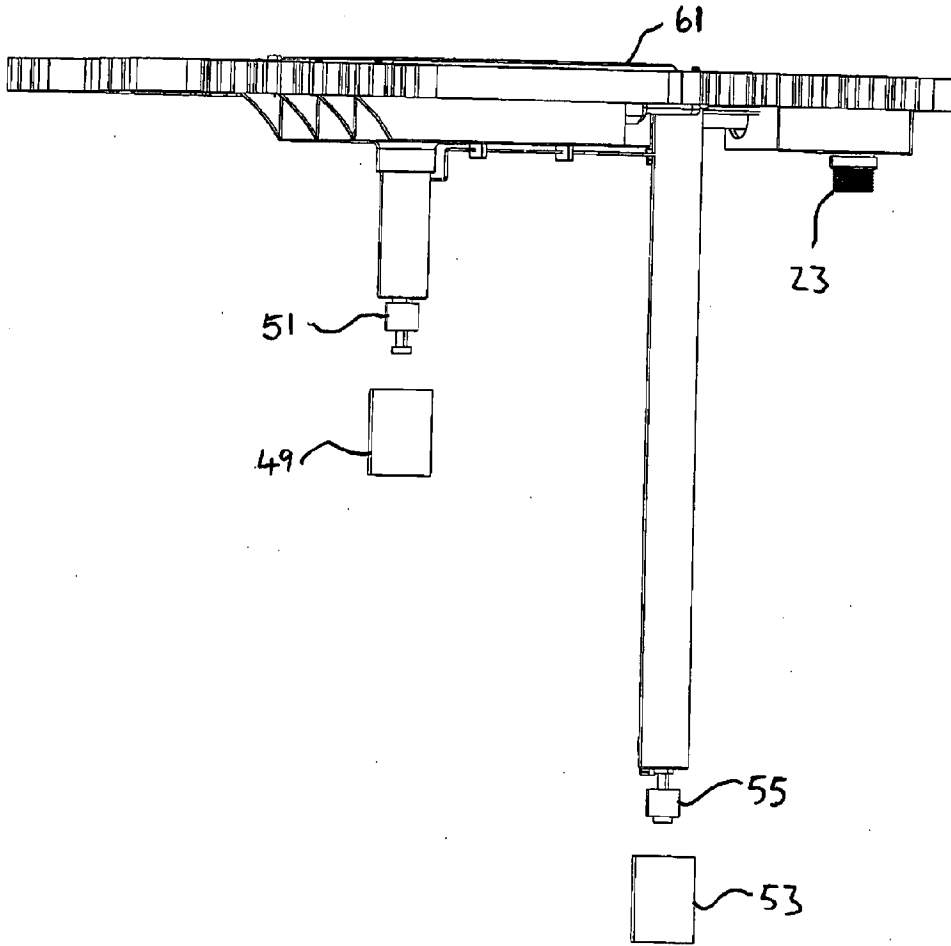


FIGURE 6

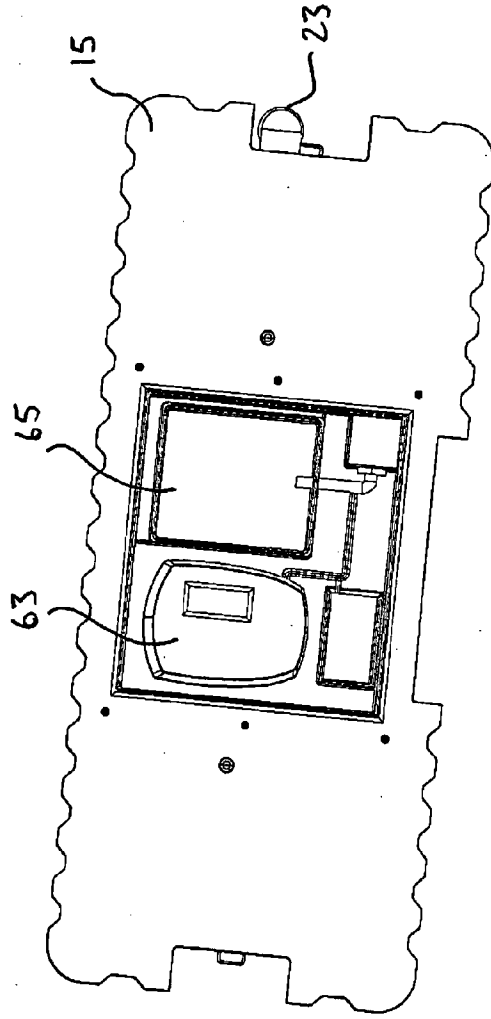


FIGURE 7