(12) UK Patent Application (19) GB (11) 2490381 (13) A

(43) Date of A Publication 31.10.2012

(21) Application No: 1201242.3

(22) Date of Filing: 25.01.2012

(30) Priority Data:
(31) 20110212 (32) 29.04.2011 (33) IE

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(51) INT CL:
E03B 3/02 (2006.01) ***E03B 3/03*** (2006.01)

(56) Documents Cited:
JP 100195936 A **KR 210123189 A**

(58) Field of Search:
INT CL **E03B**
Other: **EPODOC, WPI**

(54) Title of the Invention: **A rain harvesting apparatus**
Abstract Title: **A rain harvesting apparatus**

(57) The present invention relates to a rainwater harvesting apparatus 10 comprising: a chamber 3 for capturing rainwater from a rainwater discharge i.e. a drain pipe 4; a pump 13, and a control means 15 to activate and deactivate the pump. The chamber is divided into a reservoir 6 for storing rainwater and an overflow tank 7 for receiving rainwater overflow from the reservoir. The pump is activated and deactivated according to a level of water in the reservoir and when activated pumps rainwater from the reservoir to a remote vessel. The apparatus collects rainwater which falls onto a surface of a building (2 figure 3) and which falls by gravity into the gutter system and continues to fall gravitationally down a downpipe or downspout of a domestic, commercial, agricultural building or apparatus. The unit is optimally located on the down pipe or downspout. The invention further relates to a method of operating and installing the rainwater harvesting apparatus.

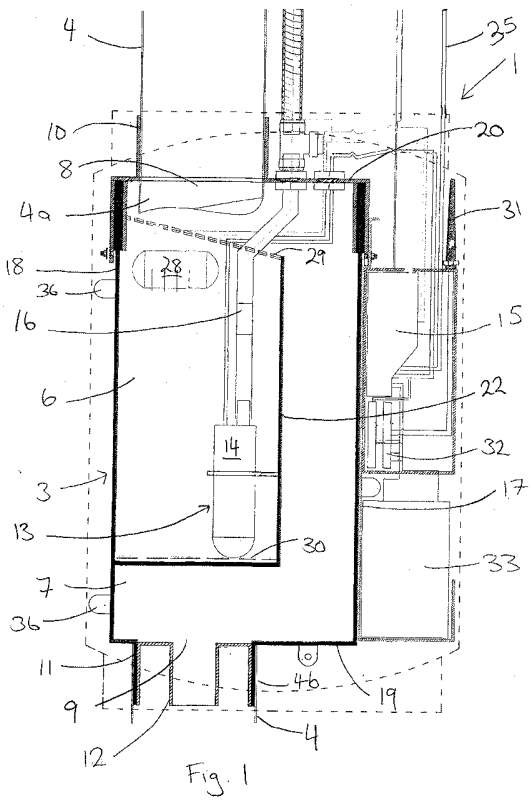

Fig. 1

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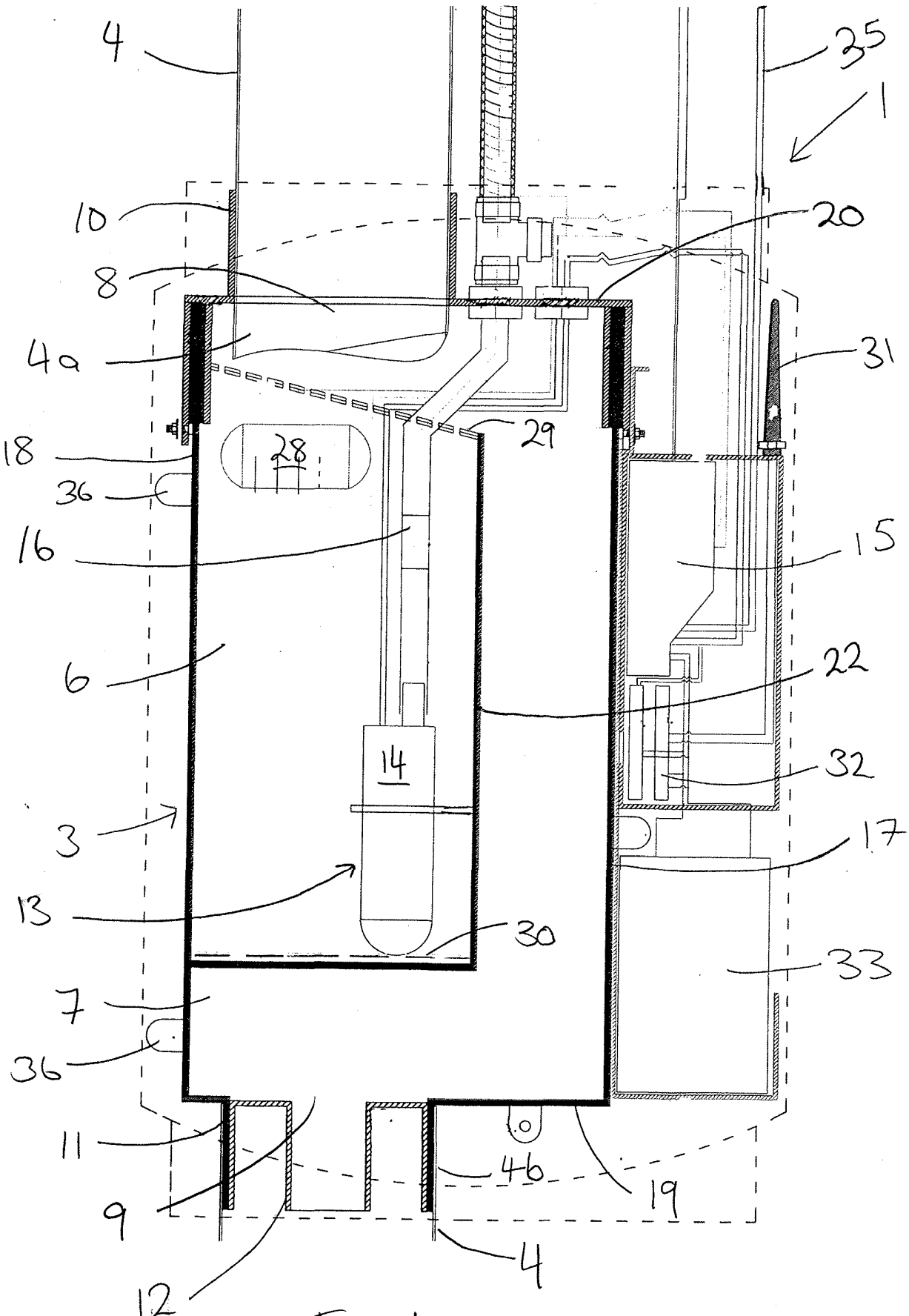
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Fig. 1

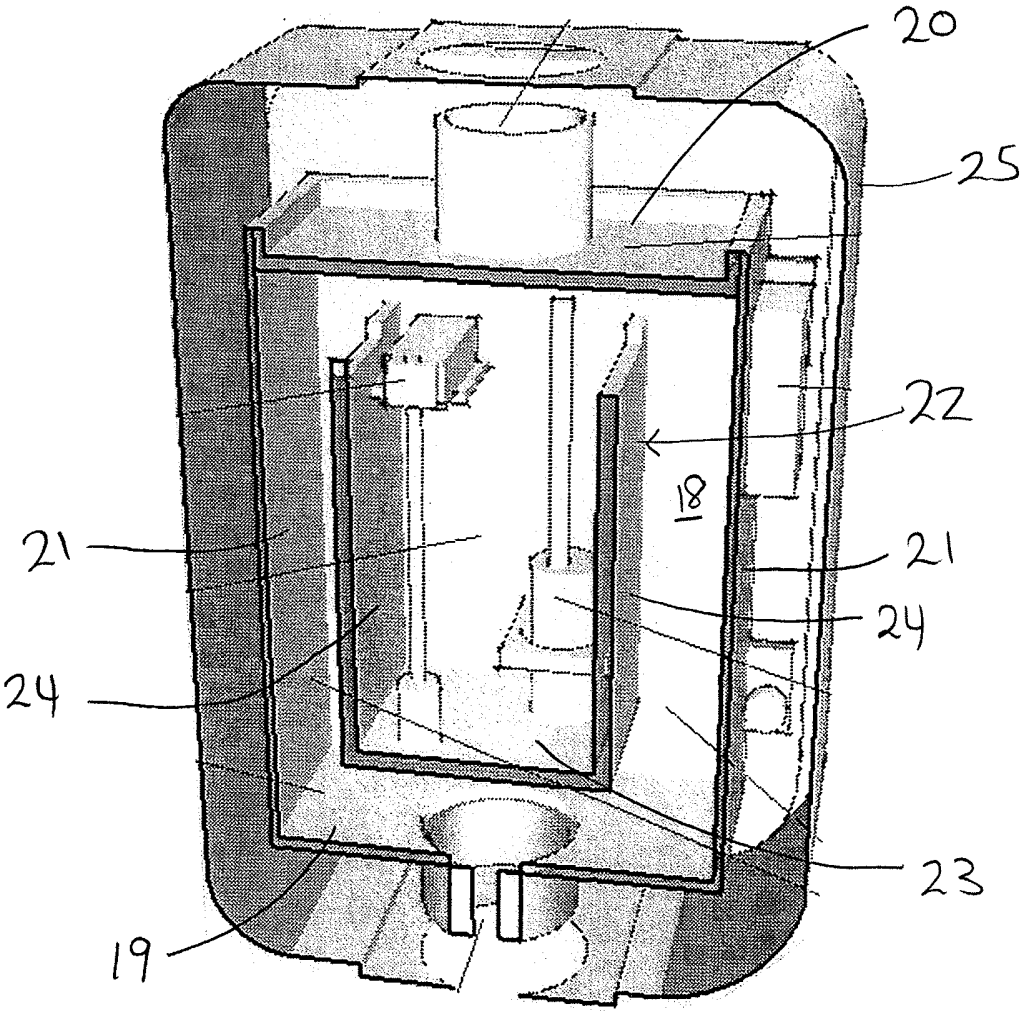

Fig. 2

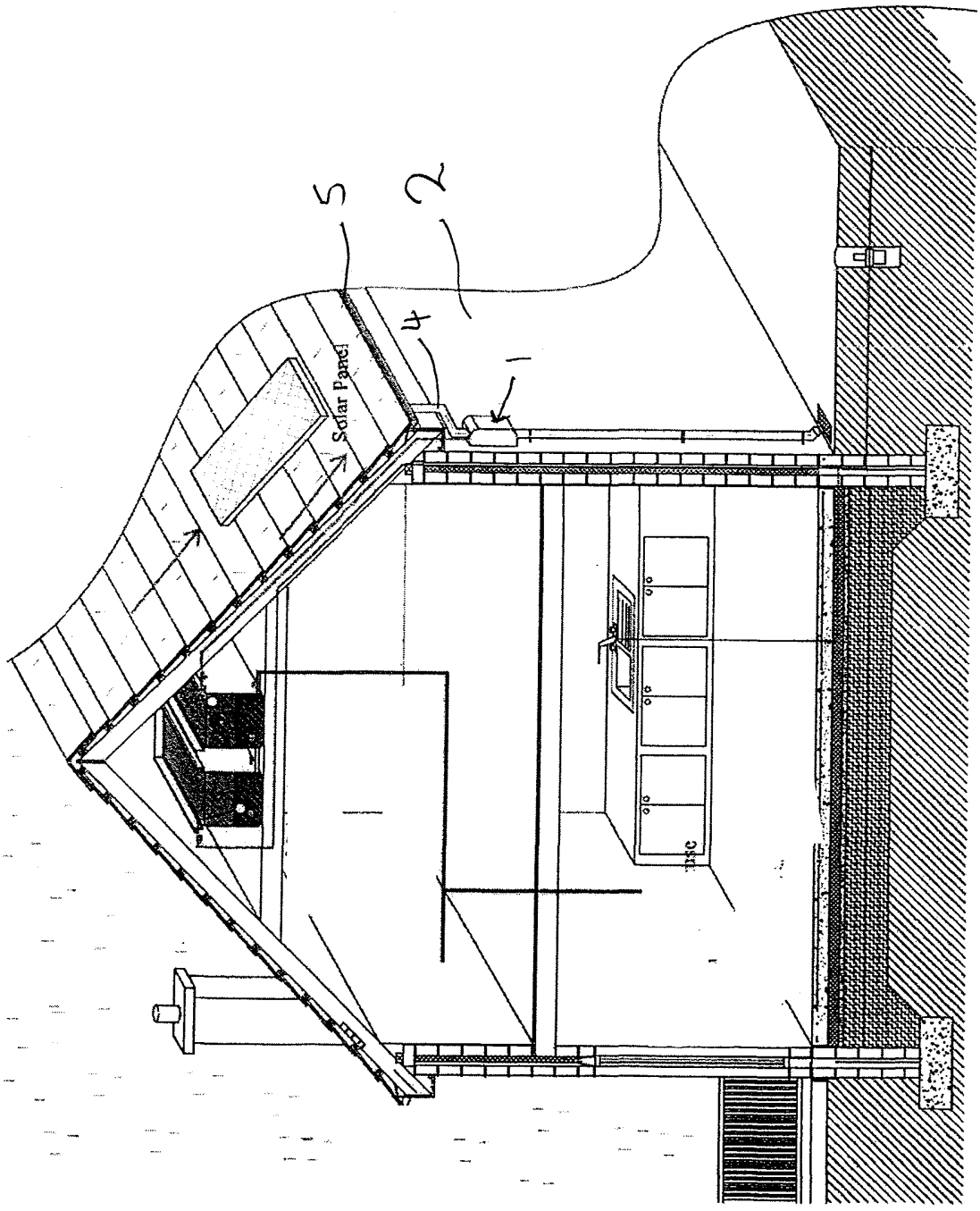

Fig. 3

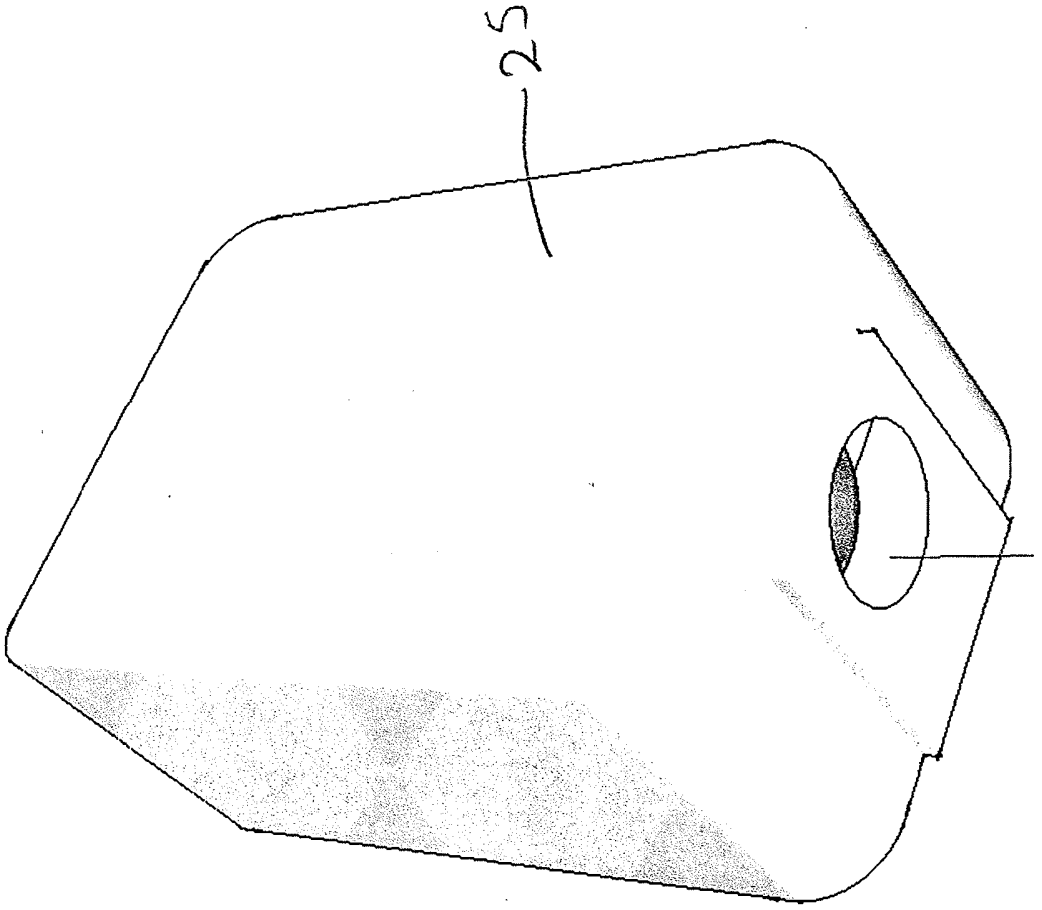

Fig. 4b

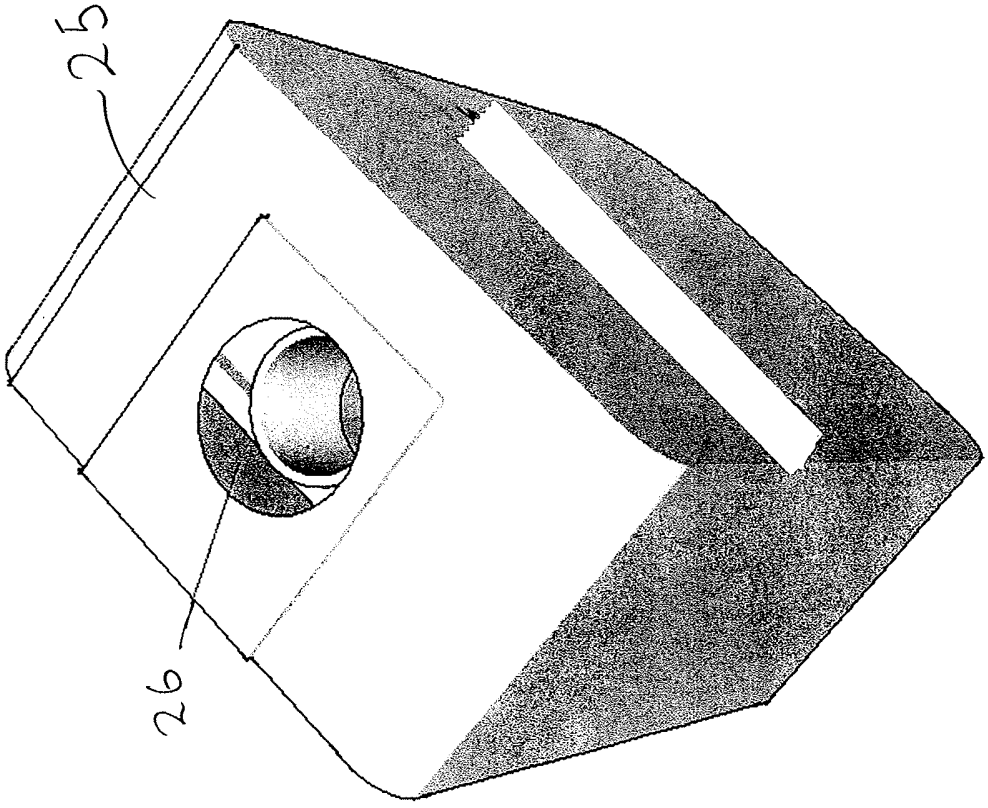

Fig. 4a

A RAIN HARVESTING APPARATUS

FIELD OF THE INVENTION

The present invention relates to a rain harvesting apparatus, and more particularly, a rainwater harvesting apparatus and a method for installing and operating the apparatus in a house, terrace of houses, block of apartments or any building residential or commercial.

BACKGROUND OF THE INVENTION

There are a number of known devices and systems for collecting and storing rainwater for later use in both potable and non-potable applications. However, these systems suffer from a number of drawbacks, including that they are dependent on the amount of rainfall to be effective, they are often very large and cumbersome to install in a building and they are complicated to operate.

It is therefore an object of the present invention to provide a rainwater harvesting apparatus and method for operating and installing a rainwater harvesting apparatus which alleviates the above disadvantages.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a rainwater harvesting apparatus for mounting to a building, the apparatus comprising:

a chamber for capturing rainwater from a rainwater discharge;

pumping means, and

control means to activate and deactivate the pumping means;

wherein the chamber is divided into a reservoir for storing rainwater and an overflow tank for receiving rainwater overflow from the reservoir, and whereby the pumping means is activated and deactivated according to a level of water in the reservoir and when activated pumps rainwater from the reservoir to a remote vessel.

In another embodiment of the invention, the pumping means is activated when the reservoir has a set level of rainwater stored therein and the remote vessel has capacity to receive rainwater from the reservoir, and deactivated when the reservoir does not have the set level of rainwater stored therein or the remote vessel does not have capacity to receive rainwater from the reservoir.

In another embodiment of the invention, the reservoir is in fluid communication with the overflow tank within the chamber so that rainwater flows directly to the overflow tank when the reservoir is full of rainwater.

Preferably, all rainwater received in the reservoir is stored until it is pumped to the remote storage vessel on activation of the pumping means.

In another embodiment of the invention, the chamber comprises an inlet arranged for directing the rainwater discharge into the reservoir, and an outlet through which rainwater flows out of the overflow tank.

In another embodiment of the invention, the rainwater discharge is from a downpipe or downspout of the building.

Preferably, the inlet is configured for coupling to an open end of the downpipe or downspout of the building which operates as a rainwater discharge.

Preferably, the outlet is configured for coupling to an end of a downpipe or downspout of the building so that rainwater overflow is direct to the downpipe or downspout.

Preferably, the outlet is provided in or adjacent a base of the chamber.

In another embodiment of the invention, the apparatus is adapted to be integrated with an existing rainwater downpipe.

In another embodiment of the invention, the chamber is enclosed in a housing unit having fixings for connection to a building adjacent a rainwater downpipe.

In another embodiment of the invention, sensor means is provided to detect the level of water in the reservoir and/or remote vessel.

Preferably, the control means is communicatively coupled to the sensor means and provides activation signals to activate and deactivate the pumping means in response to water levels sensed in the reservoir and/or the remote vessel.

Preferably, the control means is operable to deactivate the pumping means when the remote storage vessel has no capacity to receive rainwater from the reservoir. Preferably, rainwater entering the chamber flows to the overflow tank when the pumping means is deactivated and the remote storage vessel and reservoir have no capacity to receive rainwater.

In another embodiment of the invention, the pumping means is coupled to the remote vessel by conduit means, whereby rainwater is transferred from the reservoir to the remote vessel via the conduit means on activation of the pumping means.

Preferably, the chamber comprises a front wall and a back wall spaced apart by a base and two side walls, and the chamber is divided into the reservoir and an overflow tank by a dividing member arranged within the chamber.

Preferably, the dividing member comprises a base wall and two side walls arranged to form a substantially U-shaped member which is positioned in the chamber such that it extends between the front and back walls to form the reservoir.

Alternatively, the dividing member comprises a container which is located in the chamber to form the reservoir.

In another embodiment of the invention, a filter is provided to divert leaves and other debris away from the reservoir.

In another embodiment of the invention, the remote vessel is a water storage tank. Such a water storage tank may be optionally located in an attic space in the building, or in another location in or around the building and either above or below ground.

In another embodiment of the invention, rainwater received in the reservoir is stored until it is pumped to the remote storage vessel on activation of the pumping means.

In another embodiment of the invention, the apparatus comprises a temperature sensor to detect the temperature of water in the reservoir.

Preferably, a heating element is provided in the reservoir.

Preferably, the heating element is activated and deactivated on detection of a temperature of water in the reservoir reaching a set level.

In another embodiment of the invention, the apparatus comprises a processor unit operable to monitor data collected by the apparatus, including real time data on rainwater in the chamber, water temperature, faults and the like.

In another embodiment of the invention, the chamber comprises water tight seals at the inlet and outlet thereof. Preferably, the chamber is watertight.

Preferably indictors are provided on the housing to show a status of operating parameters of the apparatus. Such indicators may be LED type indicators.

Preferably, the apparatus comprises a rechargeable battery for providing power to the components of the apparatus, including the pumping means, and the apparatus additionally includes a photovoltaic solar panel for recharging the battery.

Preferably, the apparatus includes integrated electronic and smart technology means allowing for full control maintenance, fault control, data collection and transition and/or advanced telephony services, including a GSM monitoring system having an SMS text message generating means.

In a further aspect of the invention there is provided a method of installing a rainwater harvesting apparatus, the method comprising the steps of:

excising a portion of a rainwater downpipe of a building to provide an excised pipe portion and two spaced apart sections of the pipe, each having an open pipe end;

positioning the chamber in the space between the spaced apart sections of pipe;

coupling an inlet of the chamber to one of the pipe ends;

coupling an outlet of the chamber to the other of the pipe ends, and

coupling conduit means from the pumping means to the remote vessel.

In another embodiment of the invention, the method comprises the further step of: securing the apparatus to a surface, such as a wall of the building.

In a still further aspect of the invention there is provided a method of operating a rainwater harvesting apparatus, the method comprises the steps of:

determining a level of rainwater in the reservoir, and

activating and deactivating the pumping means to pump rainwater from the reservoir to the remote vessel according to the level of rainwater in the reservoir.

In another embodiment of the invention, the method comprises the further steps of: determining a level of rainwater in the remote vessel, and activating and deactivating the pumping means to pump rainwater from the reservoir to the remote vessel according to the levels of rainwater in the reservoir and the remote vessel.

In another embodiment of the invention, the pumping means is activated when the reservoir has a set level of rainwater stored therein and the remote vessel has capacity to receive rainwater from the reservoir, and the pumping means is deactivated when the reservoir does not have a set level of rainwater stored therein or the remote vessel is full of rainwater.

In another embodiment of the invention, the pumping means is only activated when the reservoir is full of rainwater.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention will now be described with reference to the accompanying drawings which show, by way of example only, embodiments of a duvet cover according to the invention. In the drawings:

Fig. 1 is a sectional diagrammatic of an apparatus according to the invention;

Fig. 2 is a sectional perspective view of the apparatus shown in Fig. 1;

Fig. 3 is a perspective view of the apparatus of Figs. 1 and 2 installed to a downpipe of a building, and

Figs. 4a and 4b are perspective views of a housing for the apparatus shown in Figs. 1 and 2.

For the sake of simplicity, hereinafter, like numerals will be used for describing like elements of various embodiments and modifications of the invention.

Referring to the drawings, there is shown a rainwater harvesting, collection and distribution apparatus, indicated generally by the reference numeral 1 for mounting to a building 2 (see Fig. 3). The apparatus 1 comprises a chamber 3 for capturing rainwater from a rainwater discharge, which in the instance is shown as a downpipe, indicated generally by the reference numeral 4, coupled to a roof gutter 5. Such a discharge may however be provided as a downpipe, downspout or any surface which can capture and transfer water to a discharge edge. The chamber 3 is enclosed in a housing unit 25 and comprises fixings 36 for connection to a building adjacent a rainwater downpipe.

The chamber 3 comprises a front wall 17 and a back wall 18 spaced apart by a base wall 19, a top wall 20 and two side walls 21, and is divided by dividing member 22 arranged within the chamber 3 into a reservoir 6 for storing rainwater and an overflow tank 7 for receiving rainwater overflow from the reservoir 6. In the instance shown, the dividing member 22 comprises a base wall 23 and two side walls 24 arranged to form a substantially U-shaped member which is positioned in the chamber 3 such that it extends between the front wall 17 and the back wall 18 of the chamber 3 to form the reservoir 6.

Alternatively, the dividing member 22 may be provided as a vessel or container which is located in the chamber 6 and adapted to form a reservoir. The reservoir 6 is in fluid communication with the overflow tank 7 within the chamber 3 so that rainwater flows directly to the overflow tank 7 when the reservoir 6 is full of rainwater and does not have capacity to receive more rainwater from the downpipe 4.

The chamber 3 comprises an inlet 8 arranged for directing the rainwater discharge from the downpipe 4 into the reservoir 6, and an outlet 9 through which rainwater flows out of the overflow tank 7. A filter 29 is provided to divert leaves and other debris away from the reservoir 6. In the instance shown, the outlet 9 is provided in or adjacent the base of the chamber 3, although it will be understood that such an outlet could be positioned at any optimal location as required or as desired. The chamber 3 comprises water tight seals at the inlet and outlet so that the chamber is a watertight fully sealed unit with no openings.

The apparatus 1 is adapted to be integrated with an existing rainwater downpipe 4 of a building 2 after a portion of the downpipe 4 has been excised, thereby leaving two open pipe ends 4a, 4b. An inlet adaptor or coupler 10 is located in the inlet 8 for coupling the apparatus 1 to one of the open ends 4a of the downpipe 4 and an outlet coupler 11 is provided in the outlet 9 for coupling to another end 4b of the downpipe 4. A large to small pipe adaptor 12 may be located in the outlet coupler 11 to regulate the exit of rainwater from the chamber 3 as required. The housing 25 is adapted with a corresponding inlet 26 and an outlet 27 through which the pipe ends 4a, 4b may connect to the chamber 3.

Also shown is pumping means 13, which comprises a pump 14 which is submersible in the rainwater captured in the reservoir 6, and control means 15 to activate and deactivate the pumping means 13 according to water levels in the reservoir 6 and/or a remote vessel (not shown). The remote vessel is a water storage tank which may be optionally located in an attic space in the building, or in another location in or around the building and either above or below ground. The reservoir 6 is coupled to the remote vessel by conduit means 16 which extends from the pump 14 out of the reservoir 6 to the remote vessel so that rainwater is transferred from the reservoir 6 to the remote vessel by the pump 14 via the conduit means 16 on activation of the pumping means 13.

Sensor means, indicated generally by the reference numeral 28, is provided to detect the level of water in the reservoir 6. Senor means is also provided to detect the level of water

in the remote vessel. The control means 15 is communicatively coupled to the sensor means 28 in the reservoir 6 and sensor means in the remote vessel and provides signals to activate and deactivate the pumping means 13 in response to water levels sensed in the reservoir and/or the remote vessel. Electronic Electric Field Sensor Technology water level controls which turn on the pump when the water reaches the maximum tank water capacity and is operable to switch the pump off when the water reaches a predetermined low water level.

The control means 15 is operable to activate the pumping means 13 when the reservoir 6 has a set level of rainwater stored in it and when the remote storage vessel has capacity to receive rainwater from the reservoir 6. Otherwise the pumping means 13 is deactivated and any rainwater which enters the apparatus via pipe end 4a is allowed to overflow from the reservoir 6 to the overflow tank 7 and returned to the downpipe 4b via a flexible pipe. All rainwater received in the reservoir 6 is stored until it is pumped to the remote storage vessel on activation of the pumping means 13.

The apparatus 1 further comprises a temperature sensor, which may be integrated with level sensor 28, to detect the temperature of water in the reservoir 6. A heating element, shown as dotted line 30, is provided in the reservoir 6 and is activated and deactivated on detection of a temperature of water in the reservoir reaching a set level.

The control unit 15 is provided as a computing processor operable to monitor data collected by the apparatus 1, including real time data on rainwater in the chamber, water temperature, faults and the like. The apparatus 1 includes integrated electronic and smart technology means allowing for full control maintenance, fault control, data collection and transition and/or advanced telephony services, including a GSM monitoring system having an SMS text message generating means. An antenna 31 to facilitate wireless communications with other computing devices is provided on the apparatus, as is a global positioning system unit 32. System indictors are provided on the housing 25 to show a status of operating parameters of the apparatus 1. Such indicators may be LED type indicators.

The apparatus 1 also comprises a rechargeable battery 33 for providing power to the components of the apparatus 1, including the pumping means 13, and the apparatus additionally includes a photovoltaic solar panel 35 for recharging the battery.

The present invention also relates to method of installing a rainwater harvesting, collection and distribution apparatus 1. The method includes the initial step of excising a portion of a rainwater downpipe 4 of a building to provide an excised portion and the two remaining sections of the pipe 4 each having an open pipe end 4a, 4b. Next, an inlet 8 of the chamber 3 is coupled to one of the pipe ends 4a and an outlet of the chamber 8 is coupled to the other pipe end 4b and conduit means 16 from the reservoir 6 is coupled to the remote vessel. The apparatus 1 is then secured to a surface, such as a wall of the building.

The present invention also relates to method of operating a rainwater harvesting apparatus 1, the method comprises the steps of: determining a level of rainwater in the reservoir 6, and activating and deactivating the pumping means 13 to pump rainwater from the reservoir 6 to the remote vessel according to the level of rainwater in the reservoir 6. The pumping means 13 is activated when the reservoir is full of rainwater, or at least when the reservoir 6 has a sufficient amount of rainwater stored therein. Otherwise the pumping means 13 is deactivated and any rainwater which enters the apparatus via pipe end 4a is allowed to overflow from the reservoir 6 to the overflow tank 7 and returned to the downpipe 4b via outlet 9. All rainwater received in the reservoir 6 is stored until it is pumped to the remote storage vessel on activation of the pumping means 13.

Optionally, the method comprises the further step of determining a level of rainwater in the reservoir 6 and in the remote vessel, and activating and deactivating the pumping means 13 to pump rainwater from the reservoir 6 to the remote vessel according to the levels of rainwater in the reservoir 6 and in the remote vessel. In such a step the pumping means 13 is activated when the reservoir 6 has a set level of rainwater stored therein, and when the remote vessel is not full of water and so can receive rainwater from the reservoir 6.

Otherwise the pumping means 13 is deactivated and any rainwater which enters the apparatus via pipe end 4a is allowed to overflow from the reservoir 6 to the overflow tank 7 and returned to the downpipe 4b via outlet 9. All rainwater received in the reservoir 6 is stored until it is pumped to the remote storage vessel on activation of the pumping means 13.

The present invention thus collects rainwater which falls onto a surface of a building or other and which falls by gravity into the gutter system and continues to fall gravitationally down the downpipe or downspout of a domestic, commercial, agricultural building or apparatus. The unit which is located on the down pipe/downspout at the top middle or bottom, inline or adjacent to the down pipe or downspout collects and retains indefinitely all the rainfall which enters the downpipe or downspout in a water collection reservoir, the collected rainwater is retained until such time at the water level has increased to a predefined level which is monitored and controlled by a capacitive water level sensor.

Once the water level activates the sensor a condition is sent through the capacitive sensor to the master control means which then collates the data from the reservoir and the water level in the storage tank or vessel.

Should the water level in the water storage tank have sufficient available capacity to accept the rainwater from the reservoir in the chamber the master control means sends an activation control condition to the submersible pump in reservoir which switches the pump on and pumps the water to the storage vessel. When the water level in the reservoir has reduced the decrease in water level is detected by the water level sensor which switches off the water pump. Should the condition arise by where the water level in the storage tank has no capacity to receive any additional rainwater the control means sends a signal to keep the pump switched off. The water level in the reservoir in the unit is retained and any additional rainwater which enters the unit is allowed to overflow to the secondary overflow tank which is then returned into the existing downpipe via an outlet 9.

Each cycle is detected by the master control means and is recorded. All data held by the control means is retained until a request to transfer is received by a GSM unit coupled to the apparatus. Once the GSM unit receives command it then transmits the data to a monitoring station.

The present invention thus system works by utilising the rainwater run off from the existing gutters which enter the downpipe and catch it in the unit reservoir. On acknowledging the build up of water in the reservoir the pump automatically switches on and begins pumping the rainwater back up into the existing storage tank in the attic or roof space of a building. When the water in the reservoir is empty or the flow of water to the tank is stopped it is picked up by a number of sensors mechanically and electronically which switch the pump

off. The unit operates on a 12 volt loop and is powered by a small photovoltaic solar panel. The solar panel charges a deep cycle battery which allows the system to operate at night when it rains.

The rainwater collected in the reservoir from the roof is pumped up to the tank and a filter removes any unwanted material. The rainwater can be further treated on request by the use of an inline UV filter which kills off bacteria. For systems which are supplied to certain target markets, a GSM monitoring system can be added. The GSM unit can monitor the unit and send weekly reports to the monitoring station via text message SMS. Items recorded will include total water pumped on an individual week or day, pump status, battery status, solar cell status and will notify the monitoring station of any fault of potential issue with the unit.

The invention is a rain water harvesting, collection and distribution unit for use with or with out a standard electrical supply. It is a passive mechanism for managing mains water and rainwater connection to a users building services. The apparatus consists of a wall mounted water chamber which captures rainwater from existing rainwater gutters and downpipes or downspouts and any surface which has the ability to capture and transfer water to a discharge edge. The reservoir has incorporated into it a mechanism to measure the water level and communicate with the integrated smart electronic systems to control multifunctional inputs pump control, temperature control, cycle control, live data streaming and data collection, fault reporting and information sharing, metering. The water is then pumped to a storage vessel elsewhere in the roof space using a powered pump which can be connected to the existing electrical supply or operated from a renewable power source not including the existing power supply. The unit includes integrated electronic and smart technology allowing full control maintenance, fault control, data collection and transition, advanced telephony services. Water filtration and down pipe/downspout filter. The position of the unit is on a wall at the upper end of the down pipe under the eaves where possible. The existing down pipe/down spout discharges into the unit reservoir and activates the monitoring system. The unit then fills to a desired level, once the predetermined level has been reached the unit switches on the pump which then distributes the water to the desired location in the roof space. The tanks are then connected using the existing pipe infrastructure of the building. Monitored water levels are recorded by the unit and control system applied. A facility to turn off mains water and rainwater harvesting may be installed at the storage tank. The unit is a

completely autonomous unit which can operate without main electricity. A photovoltaic solar panel is placed on the roof which powers a back up battery in the unit as well as powering the unit during daylight hours.

The collection unit is positioned inline or adjacent to the downpipe or at the top, middle or at ground level internally or externally of a building. Anti-bacterial coating is optionally on the reservoir and overflow tank and are insulated. The battery pack includes a backup battery and the control system is charged by the battery, as are the water level and temperature sensors. A small diameter distribution pipe (¼ Inch up to 1 inch) is operable as a conduit means which pumps the collected water in reservoir up to the attic into existing storage tank or additional water storage tank in the attic space or into a storage tank elsewhere in on or around the property above or below ground. Non return valves are provided at the outlet of the pump on the small diameter water pipe inlet and at the inlet at the tank location in the attic space. Inline and adjacent water filters which can facilitate potable and non potable water requirements are included. Electronic water level and valve switch on and shut off control systems are positioned on or adjacent to the rainwater inlet to the chamber or within the downpipe discharging into the chamber, at a main water inlet pipe (municipal, water scheme or private public well supply) and outlet supply pipe to the house.

Buoyant water level control systems and shut of valves are also used. Additional water tanks are also installed and plumbed into existing system linking existing and new water storage tanks thus increasing storage capacity.

The components of the apparatus are all contained within the housing, which consists of a unique purpose designed housing unit comprising a fire proof contoured cover which is attached to a back plate which is then secured to the wall or to the downpipe/downspout. The cover contains a LED indicators located to the front and sides of the unit. The cover and back board/base plate are both insulated units. The unit as a whole has removable elements (grommets) which facilitate the connection of round square rectangular and other downpipe shapes and sizes located at the top and bottom of the unit. The base plate/backboard has facility to support both primary and secondary small reservoirs, back up battery, control systems etc incorporated into the unit design.

Additional features included in the apparatus is water monitoring systems, water metering systems, data collection systems, bluetooth capability, software update capability, security monitoring systems, external safety and access lighting systems, attic light and water antifreeze systems, mains water monitoring system, mains water anti freeze systems. The apparatus may also be coupled to a collection surface other than a roof to collect rainwater and pump to a water storage vessel.

Aspects of the present invention have been described by way of example only and it should be appreciate that additions and/or modifications may be made thereto without departing from the scope thereof as defined in the appended claims.

CLAIMS:

1. A rainwater harvesting apparatus comprising:

a chamber for capturing rainwater from a rainwater discharge;

pumping means, and

control means to activate and deactivate the pumping means;

wherein the chamber is divided into a reservoir for storing rainwater and an overflow tank for receiving rainwater overflow from the reservoir, and whereby the pumping means is activated and deactivated according to a level of water in the reservoir and when activated pumps rainwater from the reservoir to a remote vessel.

2. A rainwater harvesting apparatus as claimed in Claim 1, in which the pumping means is activated when the reservoir has a set level of rainwater stored therein and the remote vessel has capacity to receive rainwater from the reservoir, and deactivated when the reservoir does not have the set level of rainwater stored therein or the remote vessel does not have capacity to receive rainwater from the reservoir.

3. A rainwater harvesting apparatus as claimed in Claim 1 or Claim 2, in which the reservoir is in fluid communication with the overflow tank within the chamber so that rainwater flows directly to the overflow tank when the reservoir is full or has no capacity to receive rainwater.

4. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which rainwater received in the reservoir is stored until it is pumped to the remote storage vessel on activation of the pumping means.

5. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the rainwater discharge is from a downpipe of a building.

6. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the chamber comprises an inlet arranged for directing the rainwater discharge into the reservoir, and an outlet through which rainwater flows out of the overflow tank.

7. A rainwater harvesting apparatus as claimed Claim 6, in which the inlet is configured for coupling to an open end of the downpipe of the building which operates as a rainwater discharge.

8. A rainwater harvesting apparatus as claimed in Claim 6 or Claim 7, the outlet is configured for coupling to an end of a downpipe of the building so that rainwater overflow from the overflow tank is directed back down to the downpipe.

9. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which, the chamber is enclosed in a housing unit having fixings for connection to a building.

10. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which, sensor means is provided to detect the level of water in the reservoir and/or remote vessel.

11. A rainwater harvesting apparatus as claimed in Claim 10, in which control means is communicatively coupled to the sensor means and provides activation signals to activate and deactivate the pumping means in response to water levels sensed in the reservoir and/or the remote vessel.

12. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the pumping means is coupled to the remote vessel by conduit means, whereby rainwater is transferred from the reservoir to the remote vessel via the conduit means on activation of the pumping means.

13. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the chamber comprises a front wall and a back wall spaced apart by a base and two side walls, and the chamber is divided into the reservoir and an overflow tank by a dividing member arranged within the chamber.

14. A rainwater harvesting apparatus as claimed in Claim 13, in which the dividing member comprises a base wall and two side walls arranged to form a substantially U-shaped member which is positioned in the chamber such that it extends between the front and back walls to form the reservoir.

15. A rainwater harvesting apparatus as claimed in Claim 12, in which the dividing member comprises a container which is located in the chamber to form the reservoir.

16. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which a filter is provided to divert leaves and other debris away from the reservoir.

17. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the remote vessel is a water storage tank.

18. A rainwater harvesting apparatus as claimed in any one of the preceding claims, further comprising a temperature sensor to detect the temperature of water in the reservoir.

19. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which a heating element is provided in the reservoir, and whereby the heating element is activated and deactivated on detection of a temperature of water in the reservoir reaching a set level.

20. A rainwater harvesting apparatus as claimed in any one of the preceding claims, further comprising a processor unit operable to monitor data collected by the apparatus, including real time data and operating parameters of the apparatus including water temperature and faults.

21. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the chamber comprises water tight seals such that the chamber is watertight.

22. A rainwater harvesting apparatus as claimed in any one of the preceding claims, further comprising indictors to show a status of operating parameters of the apparatus.

23. A rainwater harvesting apparatus as claimed in any one of the preceding claims, further comprising a rechargeable battery for providing power to the components of the apparatus, including the pumping means, and whereby the apparatus additionally includes a photovoltaic solar panel for recharging the battery.

24. A rainwater harvesting apparatus as claimed in any one of the preceding claims, in which the apparatus comprises integrated electronic and smart technology means allowing for full control maintenance, fault control, data collection and transition and/or advanced telephony services, including a GSM monitoring system having an SMS text message generating means.

25. A method of operating a rainwater harvesting apparatus as claimed in any one of the preceding claims, the method comprising the steps of:

determining a level of rainwater in the reservoir, and

activating and deactivating the pumping means to pump rainwater from the reservoir to the remote vessel according to the level of rainwater in the reservoir.

26. A method of operating a rainwater harvesting apparatus as claimed in Claim 25, the method comprises the further steps of:

determining a level of rainwater in the remote vessel, and activating and deactivating the pumping means to pump rainwater from the reservoir to the remote vessel according to the levels of rainwater in the reservoir and the remote vessel.

27. A method of operating a rainwater harvesting apparatus as claimed in any one of Claims 25 or 26, the method comprising the further steps of: activating the pumping means when the reservoir has a set level of rainwater stored therein and the remote vessel has capacity to receive rainwater from the reservoir, and deactivating the pumping means when the reservoir does not have a set level of rainwater stored therein or the remote vessel is full of rainwater.

28. A method of installing a rainwater harvesting apparatus as claimed in any one of the preceding claims, the method comprising the steps of:

excising a portion of the rainwater downpipe to provide an excised pipe portion and two spaced apart sections of the pipe, each having an open pipe end;

positioning the chamber in the space between the spaced apart sections of pipe;

coupling an inlet of the chamber to one of the pipe ends;

coupling an outlet of the chamber to the other of the pipe ends, and

coupling conduit means from the pumping means to the remote vessel.

29. A method of installing a rainwater harvesting apparatus as claimed in Claim 28, the method comprises the further step of: securing the apparatus to a surface, such as a wall of the building.

30. A rainwater harvesting apparatus substantially as herein described with reference to and as illustrated in the accompanying diagrams.

31. A method of operating a rainwater harvesting apparatus substantially as herein described with reference to and as illustrated in the accompanying diagrams.

32. A method of installing a rainwater harvesting apparatus substantially as herein described with reference to and as illustrated in the accompanying diagrams.

Application No: GB1201242.3 **Examiner:** Mr Haydn Gupwell

Claims searched: 1-32 **Date of search:** 15 February 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1, 3-7, 10-12, 16-18, 20, 22, 23, 24 & 26	JP10195936 A (TAKAI NOBORU) see abstract and figures noting chamber comprising a reservoir A, overflow tank B and pump 16.
Y	1, 3-7, 10-12, 16-18, 20, 22, 23, 24 & 26	KR210123189 A (KIM JAE YOUNG) see abstract and figures noting use of rainwater tank comprising pump 41, level sensors, 31 and controller 32 which activates/deactivates the pump in response to the rainwater level.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

E03B

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

International Classification:

Subclass	Subgroup	Valid From
E03B	0003/02	01/01/2006
E03B	0003/03	01/01/2006