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(54) Title: Water saving apparatus

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WATER SAVING APPARATUS

The present invention relates to an apparatus for reducing water wastage, in particular to an apparatus for reducing water wastage due to leakage and/or burst pipes.

Water is a valuable resource and is supplied to most homes, businesses, farms, schools and public areas. It is supplied through a network of pipes, pumps, fittings and flow control devices such as taps, valves and ball cocks. Unfortunately many of these flow control devices develop leaks, albeit from wear and tear or adverse weather conditions and as a result water is wasted, damage to property may occur and there is an added penalty of excess water charges placed upon the consumer. For example, a pinhole of 1 mm diameter in a water pipe typically causes loss of 360 litres of water over a 12 hour period. A running tap can use up to 10 litres of water per minute, 14,400 litres per day.

Accordingly, there exists a need for a water saving apparatus that can be used in all areas as listed above to detect water leakage and minimise water wastage and reduce cost.

It is an object of the present invention to provide an apparatus which seeks to alleviate the aforementioned problems.

Thus according to a first aspect, the invention provides an apparatus for reducing water wastage, the apparatus comprising:

a plurality of connection points for attachment of the apparatus to a water supply;

means for shutting off water supply after a pre-determined period of water flow;

means for monitoring water flow, wherein the water flow monitoring means comprises an impeller or paddle switch located within a flow pipe, the impeller or paddle switch being operable to generate an electrical signal during the movement of the impeller or paddle switch due to water flow and thereby measure water flow;

a timer for setting the pre-determined period of water flow;

an alarm operable on shutting off the water supply; and

a reset means operable to recommence flow of water.

In an alternative arrangement, the water flow monitoring means comprises a temperature probe to detect changes in temperature due to water flow.

The apparatus according to the invention is a water saving apparatus capable of reducing water wastage and minimising flooding in the event of a leak or burst pipe. In use, water flow through the water saving apparatus occurs via taps, valves or leakage. The apparatus monitors water flow and shuts off water supply in the event that unusual flow is detected. This process is described in more detail herein below.

As a result of using the apparatus according to the invention, the demand on water supplies and reservoirs is reduced. Thus, the apparatus reduces water consumption costs to the water consumer and benefits the water supplier.

By plurality of connection points is meant more than one connection point, preferably two connection points.

Each connection point for attachment of the apparatus to water mains is a suitable fitting to allow existing pipes to be connected to the apparatus according to the invention. Each connection point is preferably made of metal such as copper, plastic or steel.

The means for shutting off water supply preferably comprises one or more water shut-off valves, particularly preferably one or more solenoid-operated or motorised water shut-off valves. The default position for the valve is open. When the valve is in the default (open) position, water is allowed to flow freely through the apparatus. Upon actuation of the means for shutting off water supply, the valve is shut, stopping water flow. The default open status of the valves, e.g. solenoid-operated water shut-off valves, means water supply is not interrupted in the event of an electrical power loss.

Preferably, the means for shutting off water supply comprises a solenoid or motorised valve operating on DC supply such as 24 volts to open and close the valve to water flow.

The means for monitoring water flow comprises a sensor which is set to monitor a predetermined flow rate. The sensor preferably detects water movement from as low as 0.04

l/s up to any larger volume per second capable of travelling through the appropriate sized pipes, for example from approximately 0.025 l/s to approximately 0.40 l/s. This range is not considered to be limiting and any suitable range may be set by the user.

In a preferred embodiment, the sensor comprises a pivotally mounted paddle switch which moves from a first position to a second position when water flows past. Alternatively, the sensor comprises an impeller which moves from a first position to a second position when water flows past.

The sensor sends a signal to the timer when water begins to flow past the sensor.
The sensor also sends a signal to the means for shutting off the water supply when water begins to flow past the sensor.
Specifically, when water flows past the sensor during use of the apparatus, the timer is activated and a countdown period of a predetermined amount begins. Preferably, the countdown period is in the range of from approximately 0 to 60 minutes, particularly preferably from 15 to 45 minutes, e.g. 30 minutes. The countdown period may be adjusted by the user to any required amount of time, including times outside the ranges specified above. The timer is preferably set for the maximum time that water flow is required. The maximum time that water flow is required can vary depending on application and is therefore adjustable by the user. The countdown period of the timer should be set to accommodate the expected usual water usage of the system.

Preferably, the timer comprises a digital display and touch screen so that the user can easily view and adjust the countdown period.

When a building is vacant or not in need of water, for example when the occupants of a house are on holiday, the countdown time is preferably in the range of from approximately 0 to 15 minutes, especially 0 minutes, i.e. set to zero so that no water flow occurs until the user resets the timer. In other words, when the timer is set to zero this induces a lockdown situation where the means for shutting off water allow no water to flow until the timer is returned to the owner's preferred setting. This avoids wastage and flooding.

In other words, when no water is required to flow, the water saving apparatus is preferably manually adjusted to shut off the water supply by turning the timer to zero. The owner/operator can then vacate the premises in peace knowing that in the event of a mishap water wastage or flooding will be minimised in their absence.

Due to the fact that variations in water pressures and volumes may occur, the water saving apparatus according to the invention preferably further comprises a potentiometer to allow for accurate settings of the means for monitoring water flow depending upon water pressures and volumes.

As noted above, the apparatus according to the invention monitors the flow of water as the water passes through the apparatus. When water flows past the means for monitoring water flow, the timer is activated and the predetermined countdown period begins. If flow ceases before the timer reaches zero, i.e. before the end of the countdown period, the timer resets to a default position and the predetermined countdown period only begins again when more water flows past the means for monitoring water flow. If flow does not cease before the timer reaches zero, i.e. if unusual flow occurs, the means for shutting off water supply are actuated and the water supply is shut off.

When the means for shutting off water supply are actuated, the alarm is activated alerting the owner/operator to the fact that the water saving apparatus has detected unusual water flow. The cause of excess water flow can then be identified and the appropriate action taken, for example, tap, pipe, valve and/or ball cock repair. Once the necessary action has been taken, the reset button can be actuated, resetting the timer to the default position.

Preferably, the alarm comprises a visual alarm, such as a flashing light. Alternatively, or additionally, the alarm preferably comprises an audible alarm, such as a buzzer.

In a preferred embodiment, the alarm and/or reset button is fitted remotely from the remaining components of the water saving apparatus, for example, in a room frequently used, such as a kitchen.

Alternatively, or additionally, the water saving apparatus further comprises a text message SMS unit (SIM card) for sending a warning message to building maintenance or to a home owner's mobile phone, as appropriate.

In a preferred embodiment, the water saving apparatus further comprises a battery pack as back up in the event of power failure.

In a preferred embodiment, the water saving apparatus further comprises a solar powered 24 Volt programmable logic computer (PLC), particularly preferably with the screen of the PLC visible to the user.

The means for shutting off water supply and means for monitoring water flow are installed in a water line supplying water to a building such as a residence, and are typically disposed between a main, manually operated valve and a first point of water demand of the water plumbing system in the building.

Preferably, the water saving apparatus further comprises further means for shutting off water supply, e.g. a second water shut off valve, preferably located on an overload tank.

The means for shutting off water supply is preferably interposed a water conduit from a water main to the living quarters portion of a residential building, such that activation of the means for shutting off water supply operates to prevent flow of water from the water main to the living quarters. In this manner, damage to the living quarters from failure of water pipes running through the living quarters is prevented during times that the means for shutting off water supply is activated.

The water saving apparatus is easily adjusted to suit individual needs and is operator friendly. The water saving apparatus can be manually adjusted to shut off water supplies to prevent wastage or flooding when homes, schools, farmyards or businesses are vacant or not in need of water.

Preferably, the water saving apparatus is provided in kit form for self-assembly.

It will be appreciated that while copious references are made herein to "water," the water saving apparatus is applicable to any type of liquid or fluid.

According to a further aspect, the invention provides a method for reducing water wastage, comprising monitoring water flow using the water saving apparatus as described herein.

The invention will now be described with reference to the accompanying drawings which show one embodiment of the apparatus in accordance with the invention in which:-

Figure 1 shows a front view of a preferred water saving apparatus according to the invention;

Figure 2 shows a plan view of the water saving apparatus of Figure 1;

Figure 3 shows a left hand side view of the water saving apparatus of Figure 1; and

Figure 4 shows further components of the water saving apparatus of Figure 1.

Referring to the drawings and initially to Figures 1 and 2, there is shown a preferred water saving apparatus 100 comprising enclosure (A) fitted with timer (B), alarm (C), reset button (D), two lockdown valves (E), water flow monitoring sensor (G) and two water connection points (F).

Water saving apparatus 100 also comprises a solar powered 24 Volt programmable logic computer (PLC) (not shown), with the screen of the PLC visible to the user through the enclosure (A).

Water saving apparatus 100 can detect water movement within a pipe and allow the water to flow for the set period of time, thereafter water saving apparatus 100 will shut off the water supply valves (lockdown valves (E)) and minimise wastage. If water flow occurs from leakage or burst pipes lockdown valves (E) will automatically operate after the set time has elapsed, therefore minimising damage to the surrounding areas, even when no one is present. When timer (B) is set to zero this induces a lockdown situation where lockdown

valves (E) close and no water is allowed flow until timer (B) is returned to the owner's preferred setting. This minimises wastage and flooding.

Enclosure (A) is a control box of approximately 200 mm in length and 200 mm in width.

Enclosure (A) is connected to water flow monitoring sensor (G) and lockdown valves (E) by means of electric cable thus allowing for remote mounting of the water flow monitoring sensor (G) and the lockdown valves (E) to suit the required application.

Enclosure (A) is of steel or plastic construction and is compliant with IP66 rating. This allows the unit to be fitted in an environment where dust or water may be present such as garages, farm sheds or pump houses.

Timer (B) is a timer, preferably with a flashing light and fingertip control. The fingertip control is preferably a rotating dial on the front face. The fingertip control allows for easy setting of the timer by a user. The flashing light confirms when the unit is in countdown mode. Timer (B) provides for easy setting of the unit, depending how long the owner requires a continuous flow of water.

Alarm (C) is an alert system and can be of audible or visual type, e.g. an audible buzzer or a light. As shown in the embodiment of Figure 1, alarm (C) is fitted on enclosure (A). Alternatively, if required, alarm (C) may be fitted remotely.

Reset button (D) is a push button. When an operator presses reset button (D) after the water supply has been shut off by lockdown valves (E), water saving apparatus 100 returns to the standby position. As shown in the embodiment of Figure 1, reset button (D) is fitted on enclosure (A). Alternatively, if required, reset button (D) may be fitted remotely.

Lockdown Valves (E) of brass or non-ferrite construction are fitted directly to the mains water supply and sub-supplies where appropriate. Lockdown Valves (E) are connected to enclosure (A) by means of suitable electric cable. The default open status of the lockdown Valves (E) means water supply is not interrupted in the event of an electrical power loss.

Water connection points (F) are suitable fittings to allow existing pipes be connected to water saving apparatus 100. Water connection points (F) are preferably made of copper, plastic or steel construction.

Water flow monitoring sensor (G) detects water movement per second from volumes as low as 0.04 l to any larger volume capable of travelling through the appropriate sized pipes. Water flow monitoring sensor (G) is equipped with its own potentiometer to allow for accurate settings depending upon water pressures and volumes as variations may occur from place to place. Water flow monitoring sensor (G) can be an impeller device, a paddle switch or a temperature probe.

From Figures 2 and 3, it can be seen that several lockdown valves (E) can be fitted and controlled by water saving apparatus 100, depending on the customer's needs. Multiple water saving apparatuses are thus not usually required.

Figure 4 illustrates the AC power supply (H), AC relay (J), DC power supply (K) and DC relay (L) within enclosure (A) of water saving apparatus 100.

Power Supply (H) is a standard 220 volt AC power supply fed through a 6 amp miniature circuit breaker that offers protection in the event of a short circuit or power surge.

AC relay (J) is a 220 Volt, 10 amp 'hold on' relay which energises when timer (B) provides a signal that a lockdown situation is required. AC Relay (J), when energised, provides voltage to lockdown Valves (E) and the lockdown function is achieved.

DC power supply (K) converts the power supply from AC to DC to operate water flow monitoring sensor (G). DC relay (L) is a 24 volt, 10 amp unit which is energised when water flow monitoring sensor (G) sends a signal to say that water flow has commenced. DC relay (L), when energised, supplies power to timer (B), which then begins the countdown sequence.

It will of course be understood that the invention is not limited to the specific details as herein described, which are given by way of example only, and that various alterations and modifications are possible without departing from the scope of the invention.

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CLAIMS:

1. An apparatus for monitoring water usage and reducing water wastage in a commercial or residential water supply system, the apparatus comprising:
a plurality of connection points for attachment of the apparatus to a water supply;
means for shutting off the water supply after a predetermined period or volume of water flow;
means for monitoring water flow, wherein the water flow monitoring means comprises a sensor adapted for location within a flow pipe, the sensor selected from a temperature probe, an impellier or a paddle switch;
a timer;
means for recording total water usage;
means for displaying total water usage and instantaneous flow rate;
a first reset means operable to zero and restart recording of total water usage;
an alert system comprising an SMS unit and/or an alarm, said alert system operable when one of a plurality of predetermined total water usage volumes is reached and on shutting off the water supply; and
a second reset means operable to recommence flow of water, and
wherein the means for shutting off water supply comprises one or more water shut-off valves, preferably one or more solenoid-operated or motorised water shut-off valves.

2. An apparatus for reducing water wastage as claimed in Claim 1, wherein the means for monitoring water flow comprises a pivotally mounted paddle switch, the timer comprises a digital display and touch screen; the apparatus further comprises a potentiometer to allow for more accurate settings of the means for monitoring water flow depending upon water pressures and volumes, the alert system comprises a visual alarm and/or an audible alarm and the alarm and/or reset means are fitted remotely from the remaining components of the apparatus.

3. An apparatus for reducing water wastage as claimed in any of the preceding claims, wherein the apparatus further comprises a battery pack as back up in the event of power failure, the apparatus further comprises a programmable logic computer (PLC),

preferably a solar powered PLC, the apparatus further comprises additional means for shutting off water supply and the apparatus is provided in kit form for self-assembly.

4. A method for monitoring water usage and reducing water wastage in a commercial or residential water supply system, the method comprising the following steps:

(i) monitoring water flow past a sensor located within a pipe in the system;

(ii) using a timer to determine water flow rate and to time a countdown period;

(iii) recording total water usage;

(iv) shutting off water supply after the countdown period or a predetermined volume of water flow;

(v) alerting a user when one of a plurality of predetermined total water usage volumes are reached and on shutting off the water supply;

(vi) optionally resetting recording of total water usage; and

(vii) optionally resetting the apparatus to recommence flow of water.

5. An apparatus for monitoring water usage and reducing water wastage in a commercial or residential water supply system substantially as herein described with reference to and as shown in the accompanying drawings.

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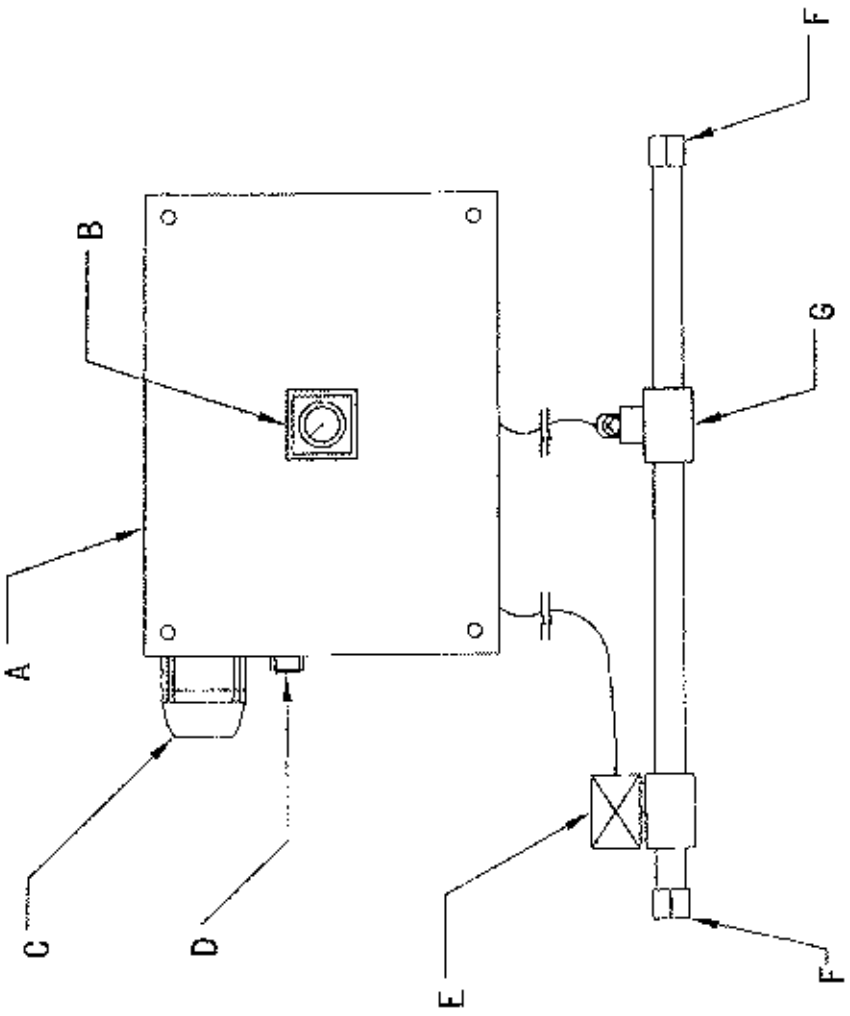

Fig. 1

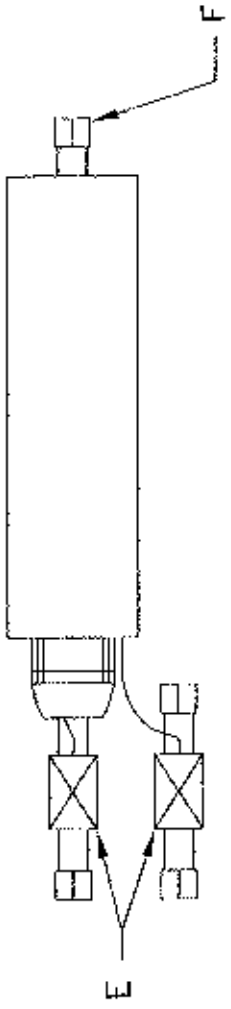

Fig. 2

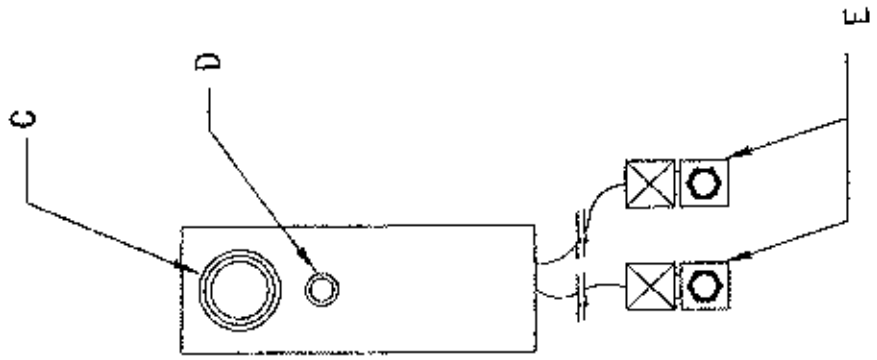

Fig. 3

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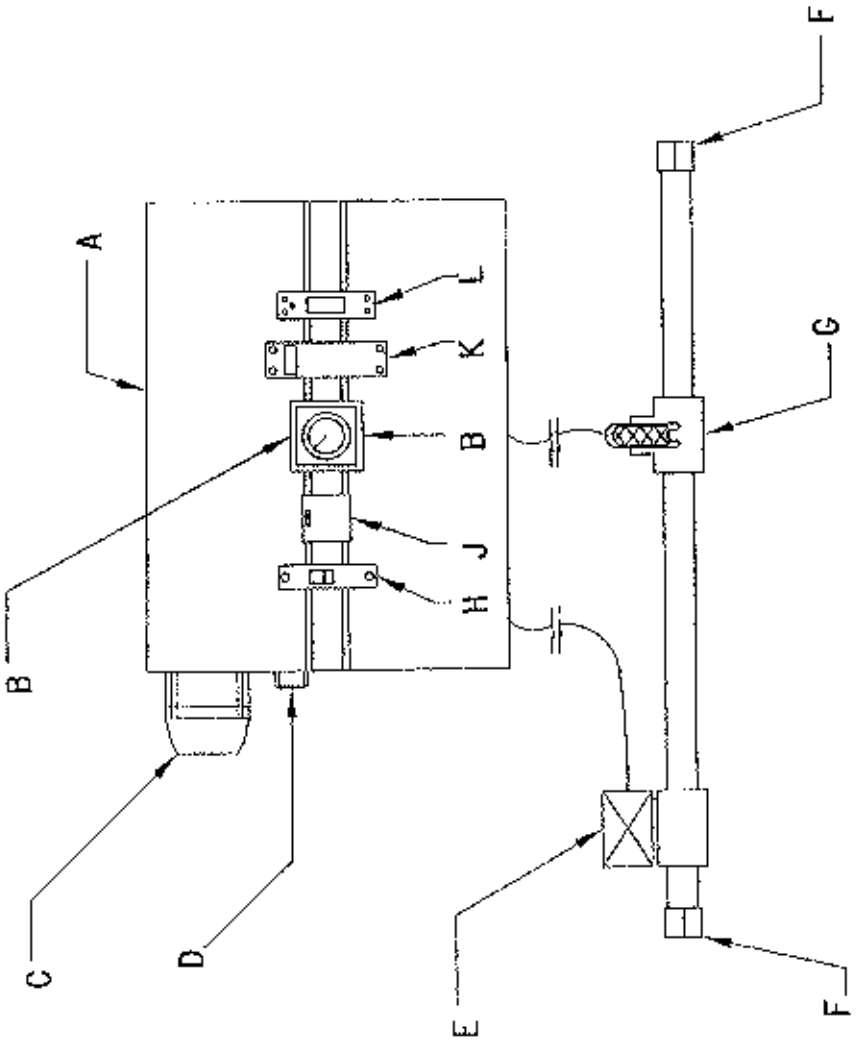

Fig. 4