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Water flow arrester

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Invention Title: WATER FLOW ARRESTER

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

This invention relates to improvement(s) to devices that undertake to control water flow, observe or monitor water flow, and devices that undertake to arrest water flow pursuant to purpose specifically programmed time intervals, for various objectives including the primary objective to ameliorate conservation of common water usage and to limit accidental damage due to spillage.

Existing devices specify limited or specific function, e.g. water temperature control, controlling shower use through gradual reduction of temperature, isolating faulty sections of plumbing and protecting damage to hot water services, each is designed to react to a single specific event or failure and are, as such narrow in their control scope. Such devices involve considerable complication of design and installation.

This invention undertakes to empower the user with additional, comprehensive and effective ability to control water consumption and waste, occurring accidentally or otherwise, beyond the normal controls afforded, while allowing a continuous and transparent-to-the-user operation. The unique approach, involving limited complication of arrangement of components and installation, provides comprehensive, [non-exclusive] application and opportunity for control. The functional scope of this

invention encompasses all issues, reasonably relevant and likely necessary to provide total control over water flow, together with necessary low cost design constraint and simplified installation to increase the potential for greater percentage of use in the community.

Common water usage, especially among domestic, accommodation industry and institutional use, includes high levels of water wastage. Examples of water wastage would typically include, long showers, taps left running unnoticed or for convenience sake and as well due to plumbing faults and leakage at stopcocks, valves and appliances. The need for water conservation is and will continue to be increasingly important to communities, both water supply providers and the general recipient. The costs associated with unnecessary water wastage are significant and will only increase. It is therefore important to gain greater control over water use and hence water waste.

To date, average water consumers do not have the benefit of such a [singular] device, designed specially to aid almost total control over 'their consumption of water' in a reasonably convenient and low cost manner.

As an adjunct to water wastage, related wastage arising from water leaks, burst pipe or appliance hose for example, often causes considerable associated damage to the immediate surroundings. This damage can often be very disproportionate in cost with respect to the repair of the failed item, in that the subsequent water damage costs can run into thousands of dollars.

The above problems are substantially overcome by the present invention which forms an active arrester of water flow which is uniquely designed to allow water to flow as required but also to interrupt the flow of water temporarily in accordance with preset conditions. The ongoing availability of the supply of water is transparent to the user except in the case of the water supply having been arrested by the device whereupon a Reset Intervention operation is required, specifically intended to aid and encourage shorter water consumption intervals. The requirement for the Reset Intervention is an essential aspect of the device, being an inconvenient and undesirable event for the user, i.e. while showering,

The Reset Intervention will [therefore] be avoided whenever possible. The awareness of and subsequent desire to avoid this event will aid the objective, which is to ameliorate conservation of water. The preset conditions governing the device will be varied with respect to installation type or location circumstances, however the objective - to conserve water through limiting the availability of flow to short intervals only and thereby also limit the amount of water related damage - remains constant.

This invention includes a unique method of communication involving utilisation of water pressure trapped between a strategically placed Solenoid valve, which is inserted between the main isolation stopcock of a water supply facility and any other stopcocks of that same water supply facility, e.g. as found in any single occupancy. Such water pressure, by virtue of being trapped, provides an Initial Water Pressure State (IWPS). The IWPS provides the necessary reference to communicate to the Water Flow Arrester Device any demand for water and other control issues.

This unique method also avoids any encumbrance of dynamic fluctuations prevailing in a water supply, potentially being of hindrance to the operation of such a device. Such fluctuation in water pressure not only varies between suburbs or buildings but also within suburbs, streets, building levels and even different times of the day. The IWPS requires only such pressure as is normally required to constitute a potential for water to flow within the plumbing system of a water supply facility.

In addition and unique to this invention the Solenoid valve operates 'closed by default'. The closed by default mode of operation, which permits both the IWPS facilitating communication, and also prevents any possibility of water flowing without an electromotive force being applied.

The demand for water is communicated by a reduction in water pressure with respect to the IWPS. A Pressure Sensor senses pressure change and detects this event. The Pressure Sensor supplies a control signal to activate a Timer Control unit circuit operating to govern supply of electromotive force to operate the Solenoid valve for the duration of a preset time interval.

If the preset time interval expires, the Timer Control unit will discontinue any electromotive force to the Solenoid valve and thereby prevents the continued flow of water through the Solenoid valve and the Timer Control unit will latch on to a condition requiring a Reset Intervention switch operation. The Reset Intervention switch operates to re-initialise the Timer Control unit, which again provides electromotive force to the Solenoid valve, subject to the IWPS and the preset time interval - and thereby flow of water.

Subsequent to the Reset Intervention switch operation and in the event that the IWPS can not be achieved, for example if a stopcock remains open, the Timer Control unit continues supply of electromotive force to the solenoid value for the duration of a preset time interval - only. Such circumstances will continue to prevail and repeatedly require the Reset Intervention switch operation until the stopcocks are fully closed or leaks or other faults are repaired or rectified and thereby reduce accidental or unnecessary water wastage.

Subject to the Delay Interval timing event, if demand for water ceases for example, a stopcock is closed before the preset time interval has expired, the Pressure Sensor sensing an appropriate change in water pressure will signal an IWPS to the Timer Control unit. The IWPS is achieved by the action of the prevailing water supply pressure rebuilding within plumbing system and is detected by the Pressure Sensor.

The Timer Control unit operation includes a Delay Interval timing event occurring immediately after receiving any Pressure Sensor signal and operates to provide stabilisation of signal processing while pressure is rebuilding within the plumbing system. The Delay Interval timing event of the Timer Control unit prevents the Solenoid valve closing prematurely to ensure flow of water for a minimum period equal to this interval length (accept if power is isolated or discontinued).

The Timer Control unit also includes a Long Interval timer function, designed to be operated only by a suitable switch located adjacent to the Solenoid valve position, which when activated allows flow of water for a minimum period equal to this interval length. The Long Interval timer is provided for

special purposes, such as filling a swimming pool, or in the case of an emergency involving the need of continuous water supply.

The Water Flow Arrester Device includes power control switching that operates to isolate the Pressure Sensor signal from the Timer Control unit and thereby functions to prevent any flow of water, via the Solenoid valve. The said Power Control switching, which may be lock operated, does not effect the Long Interval timer function.

In one form of the invention, electromotive force is provided by a suitable mains powered supply and comprising a normally closed Solenoid valve installed between a main isolation stopcock of a water supply facility and any other stopcocks within the same water supply facility. Included as part of this installation is a Pressure Sensor positioned between the Solenoid valve and any stopcock within the water supply facility.

External components are encased within a suitable non-deteriorating insulated case with a removable cover to allow access and maintenance. An interconnecting lead of suitable insulated electrical cable terminates between external and internal components of the Water Flow Arrester Device. The internal components are positioned somewhat convenient to the facilities, such as near a shower. The Reset Intervention switch is included with the internal components.

The Timer Control unit of the Water Flow Arrester Device comprises suitable [multiple] electronic timer circuits and includes visible, audible or other suitable condition indicating devices. It also includes inputs for outputs of the Reset Intervention, Long Duration Control and Power Control switches, the Pressure Sensor and the Mains Powered Supply, together with outputs to the Solenoid valve.

In another form of the invention described above, operation may be provided via a suitable remote-control function including a transmitter and receiver. The Power Control switch function occurs with a remote control transmission to the remote control receiver which subsequently signals the Timer Control unit operating to isolate the Pressure Sensor signal from the Timer Control unit and thereby functions to prevent any flow of water, via the Solenoid valve. The Power Control switching operation

does not effect the Long Interval timer function. The Power Control switching operation may be integrated as part of a new or existing alarm system and operated by remote control operation.

In yet another form of the invention described above, a suitable remote control transmitter provides the Reset Intervention switch function. The remote Reset Intervention switch signals transmission to a suitable receiver terminated to the Timer Control unit and operates to re-initialise the Timer Control unit to allow the flow of water, via the Solenoid valve. The Reset Intervention switch may be integrated as part of a new or existing alarm system and operated by remote control operation.

In the drawings:

FIG 1 shows a control process diagram for the Water Flow Arrester device.

FIG 2 shows a schematic layout and relationship of components of the Water Flow Arresting Device.

Referring to FIG 2; It can be seen that the Water Flow Arrester device is located between a main isolation stopcock at (A) and other water supply facility stopcocks (I), so that water must pass through a Solenoid valve (B) and a Pressure Sensor (C) which are connected to a Timer Control Unit circuit (J) and a Power Supply (D) via suitable electrical wiring terminating at the Solenoid valve and the Pressure Sensor via the Timer Control Unit circuit network (G), (F) and (E) and to a remotely located Reset Intervention Switch (H). The flow of water from points (A) to points (I) is controlled by signals provided by (C) and also by (H) to programmed time delay switching items of (J) operating solenoid (B).

The claims defining the invention are as follows:

1. A Water Flow Arrester device designed to process water flow, normally comprising a Solenoid Valve, a Pressure Sensor and Power Supply, each electronically connected to a Timer Control Unit circuit providing a Delay Interval and programmable Short and Long interval timers and a remotely located Reset Intervention Switch, is installed between a main isolation stopcock of a water supply facility and all other stopcocks of that facility and wherein each component of the Water Flow Arrester device is electrically terminated from the Timer Control unit outputs to inputs of each other component, thereby electrically communicating with each other via suitable electrical cable or cables and wherein the Timer Control unit circuit operates to control electronic timing intervals invariably acting to switch On or Off, electromotive force (EMF) provision to the solenoid emanating from the Power Supply and wherein utilisation of resultant water pressure trapped within the water supply facility reticulation, due to the closing operation of the Solenoid valve, may be sensed by the Pressure Sensor to establish an Initial Water Pressure State (IWPS), which is the basis of communication between the Water Flow Arrester device and the said water supply facility wherein the IWPS is uniquely utilised by the components of the Water Flow Arrester device to provide a communication medium to support ongoing demand communication between any stopcock within a water supply facility and the Pressure Sensor and in which communication to the Timer Control unit circuit aims to verify (a) establishment of IWPS, or (b) continuation of IWPS and or (c) a lack of IWPS establishment, and wherein such communication is stabilised by a Delay Interval timing event of the Timer Control unit circuit, which acts to defeat spurious signals of the Pressure sensor, beyond which the Timer Control unit circuit continues to respond to the Pressure sensor communication signals and to react to the prevailing IWPS, and wherein the said Timer Control unit circuit will return to a stand-by status in the event that IWPS is achieved - within the duration of the programmed Short Interval timer of the Timer Control unit circuit, or wherein, if in the event that IWPS is not achieved, the said Timer Control unit circuit will discontinue EMF to the Solenoid valve to close it until a [hence forth] required Reset Intervention Switch operation occurs and at which time the said Timer Control unit circuit will again duly respond to the demand from any stopcock operating within a water supply facility by the Pressure Sensor sensing a drop in pressure, and by instantaneously providing water supply via operation of the Solenoid valve.

2. The Water Flow Arrester device of claim 1 wherein water flow is prevented by default and that water flow may continue only until expiration a preset Short Interval timer period and wherein at which time the Timer Control unit circuit provides visual or audible indications and water flow is operationally discontinued by the Timer Control unit acting to discontinue EMF to the Solenoid valve permanently, requiring operation of the Reset Intervention Switch and wherein operation of the Reset Intervention Switch will subsequently act to reset the Short Interval timer status to begin a new interval timing cycle, thus allowing flow of water, and will continue to cycle in such manner until IWPS is achieved, thus alerting the user of actual duration of water flow, or otherwise, of a fault condition within the water supply facility by alerting the user of the prevailing inability to establish IWPS, which may be due to other open stopcocks or leaks or other faults within the plumbing of the said water supply facility.

3. The Water Flow Arrester device of claims 1 and 2 wherein the Water Flow Arrester device provides for the water supply to be prohibited completely, along with any possibility of damage related to unintended water flow, by user action, switching off the Power Supply to isolate EMF from the Solenoid Valve, thus acting to lock off water supply within a water supply facility altogether (anticipating absence from the said water supply facility for example).

4. The Water Flow Arrester device of claims 1 to 3 wherein a Long Interval timer switch of the Timer Control unit functions to override the normal control functions of the Water Flow Arrester device in an event where an unusually long water supply interval is required (During an emergency or to fill a swimming pool for example) which can be operated externally and upon which the Power Supply – On Off - state has no effect.

5. The Arrester Device of claims 1 to 4 wherein the Reset Intervention switch may be operated remotely by the switching by wireless remote control operation or by integration with a switch component part of a new or existing alarm system.

6. The Water Flow Arrester device of claims 1 to 5 wherein the operation to isolate the Power Supply may be operated remotely by the switching by wireless remote control operation or by integration with a switch component part of a new or existing alarm system.

7. The Water Flow Arrester device of claims 1 to 6 wherein the Water Flow Arrester device may be powered by batteries, including a back-up battery facility supporting a Long Interval timing interval, and wherein batteries supply power to the Timer Control Unit circuit operating to provide suitable electrical pulses to operate a suitable low voltage Solenoid valve, and wherein the said back-up battery will also ensure water supply in the event of a Long Duration timing interval being required, circumventing otherwise isolated or failed batteries to provide the required electrical pulse to activate the said low voltage Solenoid valve.

8. The Water Flow Arrester device of claims 1 to 7 wherein each component of the Water Flow Arrester device may be located remotely in respect to each other or partly are integrated within a new or existing alarm system control circuit board.

9. The Water Flow Arrester device of claims 1 to 8 wherein a diagrammatic indication of operational control processes, relevant to the Water Flow Arrester device, are indicated Fig 1.

10. The Water Flow Arrester device of claims 1 to 9 wherein the operation of the Water Flow Arrester device may be fully powered by batteries and operate without wire connections.

RODNEY FRANCIS ARMSTRONG — Friday, 24 February 2000

(Name of Applicant) (BLOCK LETTERS) — *(Date)*

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FIG 1
WATER FLOW ARESTER CONTROL PROCESS

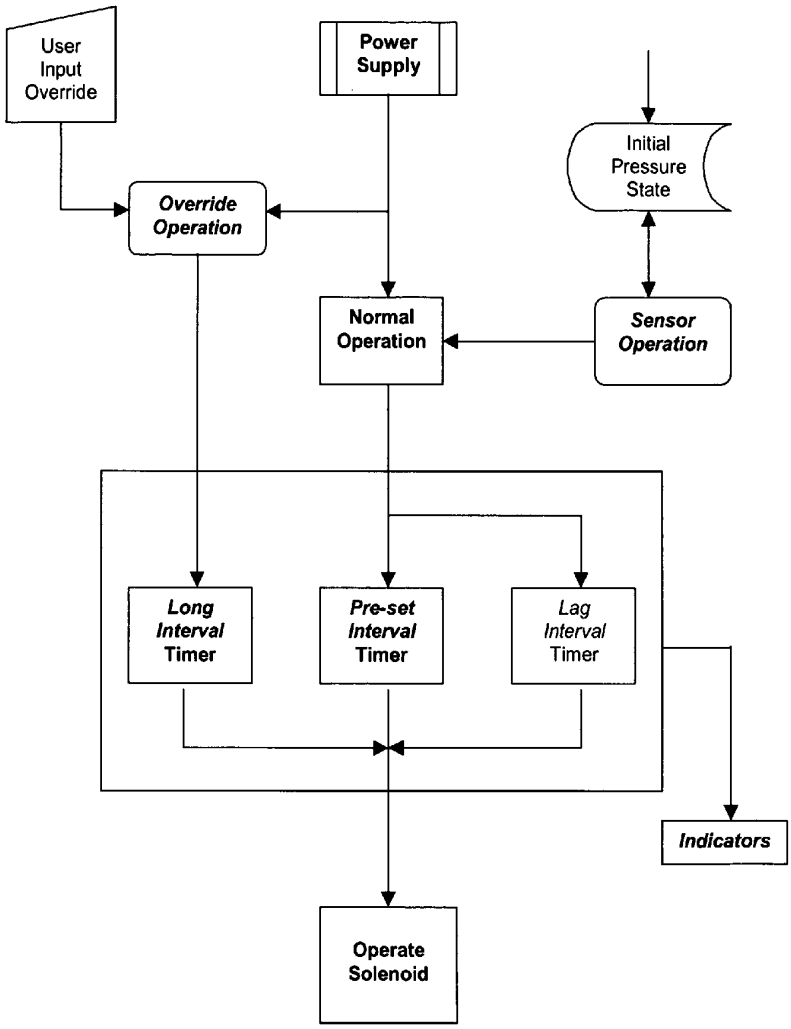

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FIG 2 WATER FLOW ARRESTER DEVICE – CONFIGURATION

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Ⓐ Main Supply Isolation Stopcock
Ⓑ Solenoid Valve
Ⓒ Pressure Sensor
Ⓓ Power Supply
Ⓔ Long Interval Timer
Ⓕ Short Interval Timer
Ⓖ Delay Interval Timer
Ⓗ Reset Intervention Switch
Ⓘ User Water Supply Stopcocks
Ⓙ Timer Control Unit