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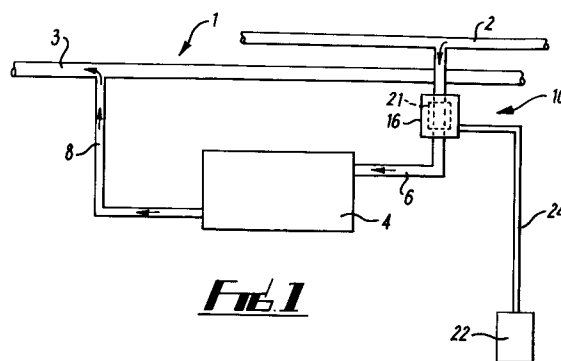
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(54) **Control and operating system.**

(57) A control and operating system for a central heating installation comprises a plurality of valve mechanisms (21) for mounting in or on the central heating installation. A plurality of electromechanical devices are provided for connection to respective valve mechanism. A control device (22) is thereby capable of independently controlling each valve mechanism (21) by means of such electromechanical devices.



The present invention relates to a control and operating system and, in particular, to the control and operation of central heating installations or the like. The invention will find particular application in domestic, industrial and commercial locations.

Conventional central heating installations generally include a main flow pipe carrying newly heated fluid from the heating appliance and a main return pipe carrying cooler fluid back to the heating appliance for re-heating. Each individual heating panel is connected at its inlet via a branch connection to the main flow pipe and at its outlet via another branch connection to the main return pipe. A heating panel is defined as any fluid filled unit where the primary purpose of which is to radiate heat such as a radiator, towel rail, underfloor heater etc. Two gate valves are normally provided on each panel, one at the inlet side generally used to turn the heating panel on or off, and one on the outlet side which could equally be used to turn the heating panel on or off but is more generally used to adjust the flow rate and thus balance the system. Turning the individual heating panels on or off requires manual operation of each inlet valve so that selecting various heating panels at various locations throughout a building to be on or off at various times can be tedious, inconvenient and time consuming. Consequently, heating panels are often left on in a room even though that room is not in use. This leads to unnecessarily high energy consumption.

The present invention has been made in order to overcome the abovementioned disadvantages.

The principal objective of the invention is to reduce energy consumption by providing, at an economic cost, a control and operating system for central heating installations which allows individual heating panels to be quickly and conveniently turned on or off from a single or multiple remote locations. Thus heating only those rooms which are in use or about to be used will be less tedious, less time consuming and more convenient.

Energy consumption in a wet central heating installation is directly proportional to the volume of water heated by the heating appliance. Thus by limiting the volume of fluid to be heated to a minimum, i.e. to that required to heat only the rooms being used or about to be used, substantial savings will be made.

The water circulating in the flow and return pipework in an average central heating installation is at most only 20% of that circulating in the installation as a whole. The economic benefit of being able to close down even a small number of heating panels is therefore self-evident. Closing down half of the heating panels will result in a 40% saving of energy.

According to the invention there is provided a control and operating system for a central heating installation comprising a plurality of valve mechanisms for mounting in or on the central heating installation, a plurality of electromechanical devices each adapt-

ed to be connected to a respective valve mechanism and a control device capable of independently controlling each valve mechanism by means of the electromechanical devices.

Preferably, the control device is capable of independently controlling the on/off status of a plurality of heating panels in a central heating installation. The on/off status of such heating panels may be discretely or continuously controllable between the on and off position.

The valve mechanism may include a ball type valve, a solenoid operated valve or any other suitable valve.

The valve mechanism will preferably be capable of changing from fully open to fully closed with only short rotation and/or longitudinal or lateral movement and will preferably be capable of manual override movement as a fail-safe against power failure or electromechanical malfunction.

The valve mechanism will preferably be located on the flow inlet pipe to the heating panel but could satisfactorily be located on the outlet pipe from the heating panel. Equally the valve mechanism could be incorporated within the heating panel itself immediately adjacent to the inlet or outlet.

In the case of a central heating installation designed on a manifold principle, e.g. microbore systems, the valve mechanisms could be located adjacent to the manifold itself on either the flow or return pipes from each individual heating panel or at any convenient location on either the flow or return pipes between the manifold and the heating panel.

The electromechanical device may include gears and may be connected to the valve mechanism by a gear-type arrangement.

Any suitable electromechanical device may be used to achieve the desired rotary and/or longitudinal or lateral movement of the valve mechanism.

The electromechanical device used may incorporate suitable and appropriate gearing.

The desired rotary and/or longitudinal or lateral movement of the valve mechanism may be achieved by modifying existing geared servos.

A receiver device may be incorporated within the electromechanical device to enable the electromechanical device to be activated, and hence operate the valve mechanism, by a corresponding transmitter. It will be appreciated that any suitable transmission means may be used such as radio infrared or sonar.

Preferably each electromechanical device will have a powered override facility.

The control device preferably includes a control panel which may be operated manually, by remote control or otherwise. The control device may be programmable. Preferably, a valve mechanism and electromechanical device is provided for each heating panel in the central heating installation.

Preferably the control device includes a transmitter and the electromechanical device includes a receiver and control of the valve mechanism is achieved by means of electromagnetic transmission between the transmitter and the receiver.

The control panel for the hard-wired system may take the form of a fixed panel mounted at any location within the building convenient for the user. Repeater panels may be mounted at other locations within the building.

The control panel for the transmitter and receiver systems may be mounted in a fixed position or be completely mobile for use at any location in the building. Thus, the control panel may be adapted for remote operation of the control device. Any suitable transmitter and receiver system may be used such as radio, infrared or sonar.

Control may also be achieved by a combination of a fixed panel and a mobile infrared hand set.

Push button, rotary or the like switches may be provided on the control panel to permit a variety of valve operations, from fully open through a sequence of stages using limit switches or the like to fully closed.

The control system preferably includes thermostatic controls preferably at one or each of the valve mechanism locations so that the temperature required at one or each heating panel site may be selected at the control panel.

The thermostatic controls will preferably include a frost and/or a predetermined minimum temperature setting which, when reached, overrides all other signals and activates the valve mechanism passing a complementary and concurrent signal, via the control panel, to activate the heating appliance.

The control panel may include display means such as a digital clock and L.E.D.'s or the like indicating the current status of each valve mechanism.

The control panel may preferably include a programming facility so that the user can program each individual heating panel to operate for a given period at a predetermined time and, if required, at a predetermined temperature.

The simplest form of the invention provides for a mechanised rotating ball valve to be installed on the flow inlet to each individual heating panel. The ball valve is operated via a simple hard-wired low voltage circuit to a master control panel. The user will then be able to control each individual heating panel at the touch of a button rather than having to visit each heating panel site to operate conventional gate valves manually.

Installation of the control and operating system in its simplest form can easily be achieved using a pipe slicer, two rubber bungs and a few common household tools.

Installation of the valve assembly is easily carried out without draining down the central heating in-

stallation. BY using rubber bungs or the like inserted in the outlet of the header tank and the expansion pipe; air and water are effectively prevented from entering the system thus allowing a pipe to be severed without loss of water.

Taking each heating panel in turn a short length of the inlet pipe to the heating panel is cut out and the valve mechanism installed in its place, after the nuts at either end of the valve mechanism have been tightened the rubber bungs in the header tank and expansion pipe can be removed.

The control gear is then simply clipped onto the adjacent pipework and located over a square or splined head connected directly to the rotating valve.

The control system is preferably operated on a 6 to 9 volt DC supply. Thus for the hard-wired system a very small cable may be used such as bell wire or telephone wire size. This type of wire can easily be hidden around carpet edges thus obviating the need for floor boards and carpets to be taken up during installation of the wiring.

The electrical circuitry may be connected to the control mechanism by a simple spiggot connector or the like into a socket or the like provided within the control mechanism. At the control panel numbered socket ports or the like may be provided to connect each individual heating panel on the system via a spiggot connector or the like to the appropriate port.

According to the invention there is further provided a central heating installation including a control and operating system of the invention.

In order to reduce the cost and complexity of installation, a light weight four core cable may be used to transmit power and control signals to all the valve actuators in the building. Typically this cable would be of similar type to that used for internal telephone wiring. The four cores could be used as follows:

2 cores for low voltage DC power (maximum 48 volts).

2 cores for duplex control signals.

A digital communication protocol may be employed which would allow two way communication between any remote actuator and the control unit. Each actuator may have its own unique address, internally preset, so that the control unit could demand the attention of any particular actuator before commencing a dialogue.

The communication protocol may be designed in such a way as to allow all the actuators to be connected in parallel across the four cores of the cable without interference, thus simplifying installation. Insulation displacement connectors in each actuator would further simplify the installation.

Each actuator may contain a temperature measuring device capable of monitoring the ambient temperature and relaying this information back to the control unit upon request. The control unit could implement a continuous polling scheme to monitor the

temperatures of all the rooms in the building and use this information to maintain a precise temperature in each room without the need for an additional thermostatic valve.

The control unit may be programmed so that for example heating unit valves will be operated at least once per day outside the heating season. This would prevent the build up of chemical deposits on the valve mechanism. Such deposits are known to be troublesome to existing valve mechanisms which are traditionally left stationary during the summer months.

The present invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Fig. 1 is a schematic view of a control system of the invention in use;

Figs. 2a and 2b show one type of valve which may be used in the control system of the invention in the open and closed positions respectively;

Fig. 3 is a block diagram showing the components of one arrangement of the control system; and

Fig. 4 is a block diagram showing the components of an alternative arrangement of the control system.

Referring to the drawings, a central heating installation 1 comprises a main flow pipe 2, a main return pipe 3, one or more heating panels 4 and inlet and outlet pipes 6, 8 leading into and out from heating panel 4.

The control system 10 includes a valve body 12 which is inserted at some location along the inlet pipe 6 and secured by means of nuts 14.

An electromechanical device 16 is located adjacent to the valve body 12 and may be secured to the pipes at either end of the valve body 12 or to the pipe body 12 itself.

One type of valve body is shown in Figures 2a and 2b wherein a bored out ball 18 is mounted in the valve body 12. A bore 20 extends through the ball such that when the valve 21 is in the open position the bore 20 extends substantially parallel to the longitudinal length of the valve body 12. To close the valve 21, the ball 18 is rotated within the valve body 12 by about 90 degrees so that the bore 20 extends approximately at right angles to the longitudinal length of the valve body 12. The rotation is achieved by means of a cog, spline, or square head 17 which is fixedly connected via shaft 19 to the ball 18. The cog, spline or square head may be turned using a stepper motor or the like.

The electromechanical device 16 includes appropriate gears and circuitry to allow the valve 21 to be operated as required.

Figures 3 and 4 illustrate possible ways of operating the valve. A low voltage dc supply B such as a 6 volt battery is used to drive a motor M. The motor M may directly operate the ball valve via spindle M' or

the valve may be operated indirectly through gear box G connected to motor N such as by using a stepped motor N such as by using a stepped motor or the like. In this case, spindle or cog G' rotates the ball valve.

Switch S is provided along the positive supply input to enable the supply to be switched on or off as required. Any suitable type of mechanical or detector type switching mechanisms may be used.

As shown in Fig. 4 a receiver device R may be incorporated so that operation of the motor M is achieved by activating the receiver device R, for example using a corresponding transmitter T (not shown).

Rotation of the ball valve may be achieved by modifying existing geared servos. A control panel 22 is mounted at a suitable accessible location remote from the valve 21 and electromechanical device 16. The control panel 22 is hard-wired 24 to the electromechanical device 16. It will be appreciated however that any suitable transmission means may be used such as radio, infrared or sonic control.

It will be appreciated that the present invention is not intended to be restricted to the details of the above described embodiment. In particular, any suitable valve mechanism may be used. Any suitable electromechanical device may be used and preferably the circuitry includes semiconductor chips to facilitate miniaturisation of the device. The control panel may be operated by remote control or manually.

Claims

1. A control and operating system for a central heating installation characterised in that a plurality of valve mechanisms for mounting in or on the central heating installation, a plurality of electromechanical devices each adapted to be connected to a respective valve mechanism and a control device capable of independently controlling each valve mechanism by means of the respective electromechanical devices.
2. A control and operating system according to claim 1 further characterised in that the control device is capable of independently controlling the on/off status of a plurality of heating panels in a central heating installation.
3. A control and operating system according to claim 2 further characterised in that the on/off status of said heating panels is discretely or continuously controllable between said respective on and off status.
4. A control and operating system according to any preceding claim further characterised in that one or more of the valve mechanisms includes a ball type valve or solenoid operated valve.

5. A control and operating system according to any preceding claim further characterised in that the or each valve mechanism is capable of changing from fully open to fully closed with only short rotation and/or longitudinal or lateral movement. 5
6. A control and operating system according to any preceding claim further characterised in that the or each valve mechanism is located on respective flow inlet or outlet pipes to heating panels of the central heating installation. 10
7. A control and operating system according to any preceding claim further characterised in that a receiver device is incorporated within the or each electromechanical device. 15
8. A control and operating system according to any preceding claim further characterised in that the control device is programmable. 20
9. A control and operating system according to any preceding claim further characterised in that a valve mechanism and an electromechanical device is provided for all but one heating panel in a central heating installation. 25
10. A control and operating system according to any preceding claim further characterised in that the control system includes one or more thermostatic controls. 30

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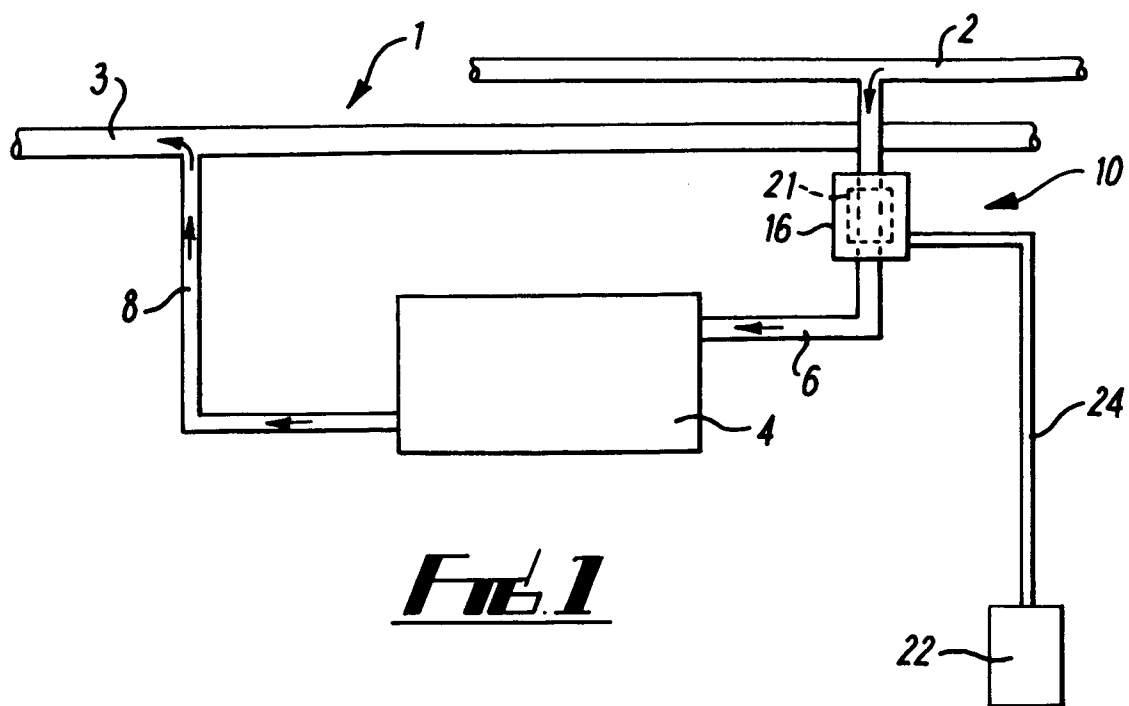


Fig. 1

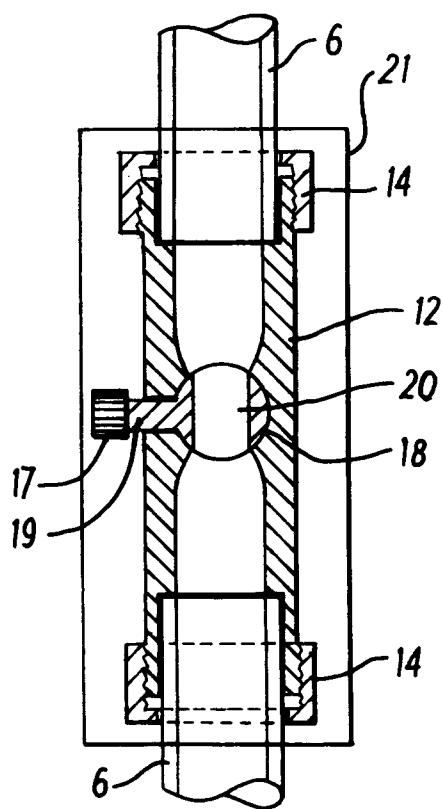


Fig. 2a

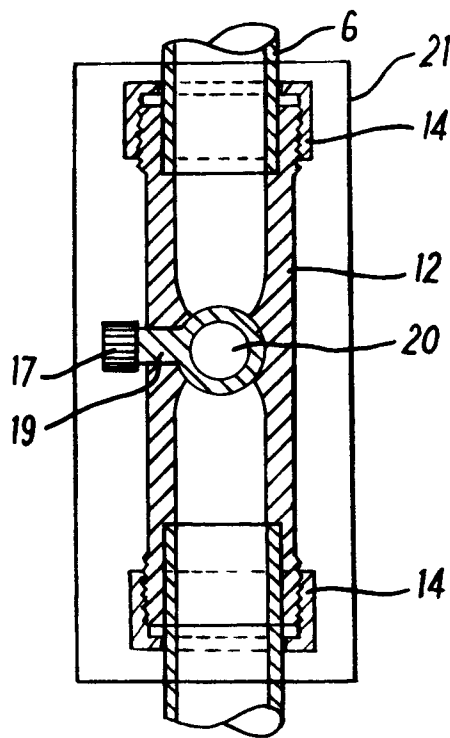


Fig. 2b

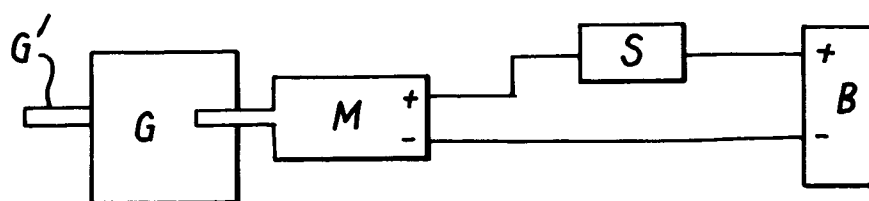


Fig. 3

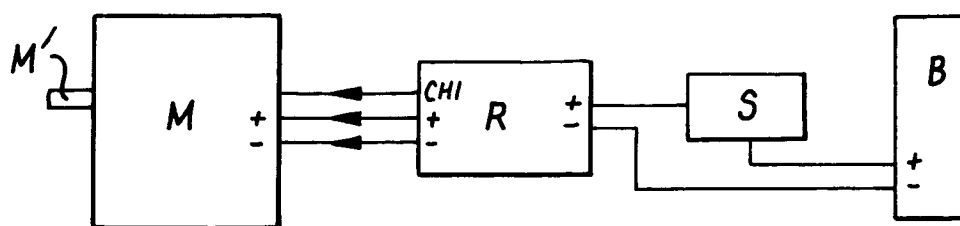


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 0479

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 014 535 (PLYMPTON PATENTS LIMITED) * the whole document * ---	1-10	F24D19/10
X	EP-A-0 029 922 (FREI) * the whole document * ---	1-10	
X	EP-A-0 282 255 (CAMBRIDGE INSTRUMENTS LIMITED) * the whole document * ---	1-10	
A	EP-A-0 375 826 (FIMCIM S.R.L.) * abstract * -----	4,5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			F24D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 April 1994	Examiner Van Gestel, H
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