(12) UK Patent Application (19) GB (11) 2 416 823 (13) A

(43) Date of A Publication 08.02.2006

(21) Application No: 0507788.8

(22) Date of Filing: 18.04.2005

(30) Priority Data:
(31) 0416925 (32) 29.07.2004 (33) GB

(71) Applicant(s):
Reliance Water Controls Limited
(Incorporated in the United Kingdom)
Worcester Road, EVESHAM,
Worcestershire, WR11 4RA,
United Kingdom

(72) Inventor(s):
Eric Winter

(74) Agent and/or Address for Service:
Fry Heath & Spence LLP
The Gables, Massetts Road, HORLEY,
Surrey, RH6 7DQ, United Kingdom

(51) INT CL:
G05D 23/13 (2006.01) F16K 11/07 (2006.01)

(52) UK CL (Edition X):
F2V VP30 VS25 VV10

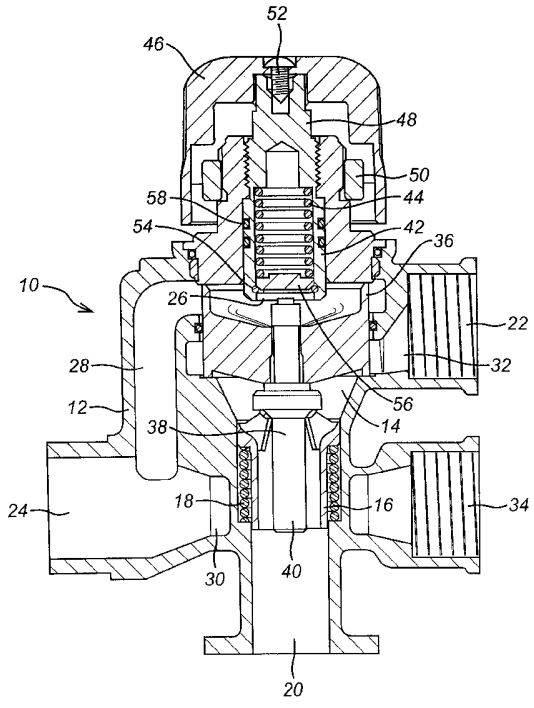
(56) Documents Cited:
US 4669653 A

(58) Field of Search:
UK CL (Edition X) **F2V**
INT CL[7] **F16K, G05D**
Other:

(54) Abstract Title: **Mixing valve**

(57) A mixing valve 10 includes hot and cold fluid inlets 22, 24 to a mixing chamber 14 leading from which there is a mixed fluid outlet 20, the valve further including a cold fluid outlet 34 though which fluid from the cold inlet may pass without entering the mixing chamber. The cold fluid inlet and outlet may be liked by a bypass conduit 30 extending either side of the mixing chamber. The flow of hot and cold fluid into the mixing chamber may be controlled by piston assembly 36 and thermostat 38 responsive to changes in fluid temperature by means of the expansion of a wax/copper mixture lining the piston. A control knob 46 may provide manual control of the valve. The valve may be sued in domestic underfloor heating. The cold fluid outlet may return fluid to a boiler to be reheated.

FIG. 1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

Original Printed on Recycled Paper

GB 2 416 823 A

A MIXING VALVE

The present invention relates to a mixing valve and in particular to a mixing valve for use with water in an underfloor heating system.

Underfloor heating systems are generally constructed of a complex multi-layer network of pipes connected to a heat source (normally a boiler) of a building. Conventionally, in such a system the entire pipework network throughout the building is linked to a central distribution point, commonly known as a manifold. Heating fluid flows through this manifold to and from the heat source of the building.

All manifolds include a mixing valve which receives hot water from a boiler and mixes this hot water with cooler water from the returning loop of the pipe network. The hot and cool water mix within an internal chamber of the valve and then flows from the valve to a pump connected to the flow side of the system. A conventional heating system also requires pre-fabricated pipework to act as a bypass to allow a proportion of the cooler water to return to the boiler to be re-heated. This pre-fabricated pipework is connected to the mixing valve. The pipework and valve assembly are conveniently mounted on to a bracket which is then bolted or otherwise connected to a wall.

The present invention seeks to alleviate the aforementioned problems associated with conventional systems by providing an improved mixing valve that incorporates an in situ bypass. As such, a pre-fabricated bypass pipework is not required allowing the valve to be connected directly to a pump without the need for a separate bracket.

In one aspect, the invention provides a mixing valve comprising a main housing having an inner mixing chamber, the housing including a hot fluid inlet, a cold fluid inlet and an outlet linked to the inner chamber thereby to allow hot and cold fluid to flow into the mixing chamber to be

mixed therein, and to flow from the mixing chamber via the outlet, the housing further including a cold fluid outlet linked directly to the cold fluid inlet to allow a proportion of cold fluid entering the valve housing through the cold fluid inlet to flow across the valve housing without entering the mixing chamber.

The invention will now be described by way of example with reference to the accompanying diagrammatic drawing, in which :-

Figure 1 is a side cross-section view of a mixing valve constructed in accordance with the present invention.

The figure shows a mixing valve 10 according to the present invention. The valve 10 comprises a main housing 12 having mixing chamber 14 which includes a mixing tube 16 retained within the mixing chamber 14 by a return spring 18. The bottom of the mixing chamber 14 communicates with a main fluid outlet 20.

The mixing valve 10 has hot and cold fluid inlets 22, 24 respectively. The hot inlet 22 extends into the mixing chamber 14 within the mixing valve 10. In use, when desired, hot fluid (for example water) flowing along the hot inlet pipe 22 is able to flow into the mixing chamber 14 via inlet opening 26.

The cold fluid inlet 24 extends into the housing 12 of the mixing valve 10 whereupon it divides into two cold fluid pipes 28, 30. The first cold fluid pipe 26 extends through the housing 12 and into the mixing chamber 14. In use, when desired, cold fluid (for example water) flowing along the first cold fluid pipe 28 is able to flow into the mixing chamber 14 via inlet opening 32.

The second pipe 30 extends through and across the housing 12, forming a cold fluid outlet 34 on the other side of mixing valve 10. Although not shown in the Figure, the second pipe 30 crosses the housing 12 either side of the mixing valve 10 allowing, in use, cold fluid travelling along the second pipe 30 to flow either side of the mixing valve 10 and out through the cold fluid outlet 34. The second pipe 30 therefore forms a bypass around the mixing chamber 14 allowing a proportion of cold fluid entering into housing 12 through the cold fluid inlet 24 to bypass the mixing chamber 14 entirely and simply flow out of the mixing pipe housing 12, via the cold fluid outlet 34, and to a boiler (not shown) for re-heating.

The rest of the cold fluid entering the housing 12 through the cold fluid inlet 24 flows along the first pipe 28 and, if required into the mixing chamber 14 whereupon it is mixed with hot fluid flowing into the mixing chamber 14 through the hot fluid inlet 22 and inlet opening 26.

The resultant fluid, now at a pre-determined temperature, is able to then flow out of the housing 10 through the main outlet 20 and around the system to provide the required heating to a floor under which the underfloor heating system is located.

The control mechanism for controlling the flow of hot and cold fluid into the mixing chamber 14 will now be described.

The control mechanism includes a main piston 36 and a thermostat 38. In a preferred embodiment, the piston 36 and thermostat 38 are formed as one-piece. One end 40 of the thermostat 38 extends into the mixing chamber 14 while the other end (the "top end") abuts the bottom of a housing 42 which surrounds an overtravel spring 44. The piston 36 is lined with a wax/copper mixture which expands and contracts in response to temperature.

Figure shows the non-use situation where the piston 26 covers both inlet openings 26, 32 therefore closing the path of fluid travelling from either the hot pipe inlet 22 or the cold pipe inlet 28 to the mixing chamber 14.

In use, when the temperature of the fluid within the mixing chamber 14 is too high, the wax mixture expands causing the thermostat 38 to move upwardly against the overtravel spring housing 42. This, in turn, causes the piston 36 to lower thus opening inlet opening 26 to allow cold fluid from the cold fluid pipe 28 to enter the mixing chamber 14 thereby cooling the temperature within.

If, on the other hand, the fluid within the mixing chamber is too low, the wax mixture contracts causing the thermostat 38 to lower. The return spring 18 then forces the piston 36 upwardly thus opening inlet opening 32 to allow hot fluid from the hot fluid pipe 22 to enter the mixing chamber thereby heating the fluid within.

A control knob 46 is connected to the top of the housing 12 of the mixing valve 10 for manual control of the valve 10. The knob 46 is connected to the main housing 12 through a cap 48 which includes a locking cam 50 and the overtravel spring 44 and its housing 42. The knob 46 is attached to the cap 48 by a screw 52 received within an internal thread formed in the top of the cap 48. Rotation of the knob 46 causes compression of the overtravel spring 44 causing vertical movement of a piston 36 thereby opening one of the inlet openings 24, 32 to allow either hot or cold fluid to enter the mixing chamber 14, depending on the direction of rotation of the knob 46.

The cap 46 is sealed within the housing 12 of the mixing valve 10 through a circlip 54, retainer 56 and a plurality of O-ring seals 58.

The above described embodiment has been given by way of example only, and the skilled reader will naturally appreciate that many variations could be made thereto without departing from the scope of the present invention.

CLAIMS

1. A valve assembly comprising a main housing having an inner mixing chamber, the housing including a hot fluid inlet, a cold fluid inlet and an outlet to allow hot and cold fluid to enter the mixing chamber to be mixed therein and to flow from the mixing chamber via the outlet, the housing further including a cold fluid outlet linked to the cold fluid inlet to allow a proportion of cold fluid entering the valve housing through the cold fluid inlet to flow out of the cold fluid outlet without entering the mixing chamber.

2. A valve assembly according to claim 1, wherein the cold fluid inlet and cold fluid outlet are linked by a bypass conduit that extends across the valve assembly either side of the mixing chamber.

3. A valve assembly according to claim 1 or claim 2, further comprising a control mechanism for controlling the flow of hot and cold fluid into the mixing chamber via the hot and cold fluid inlets respectively.

4. A valve assembly according to claim 3, wherein the control mechanism comprises a piston assembly.

5. A valve assembly according to claim 4, wherein the piston is lined with a wax/copper mixture which expands and contracts in response to a change in temperature.

6. A valve assembly according to claim 4, wherein expansion or contraction of the mixture causes the piston to move between a first position whereby the hot fluid inlet is closed and the cold fluid inlet is open, a second position whereby the hot fluid inlet and cold

fluid inlet are closed and a third position whereby the hot fluid inlet is open and the cold fluid inlet is open.

7. A valve assembly as hereinbefore described and referred to in the accompanying figure.

INVESTOR IN PEOPLE

Application No: GB0507788.8 **Examiner:** Mr Karl Whitfield

Claims searched: 1 to 7 **Date of search:** 7 November 2005

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
A	-	US4669653 A (AVELÖV) see conduit 34

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} :

F2V

Worldwide search of patent documents classified in the following areas of the IPC^{07}

F16K; G05D

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

WPI, EPODOC