June 16, 1953 R. E. MOORE 2,642,260

FLOW CONTROL VALVE

Filed April 13, 1951

Fig. 1.

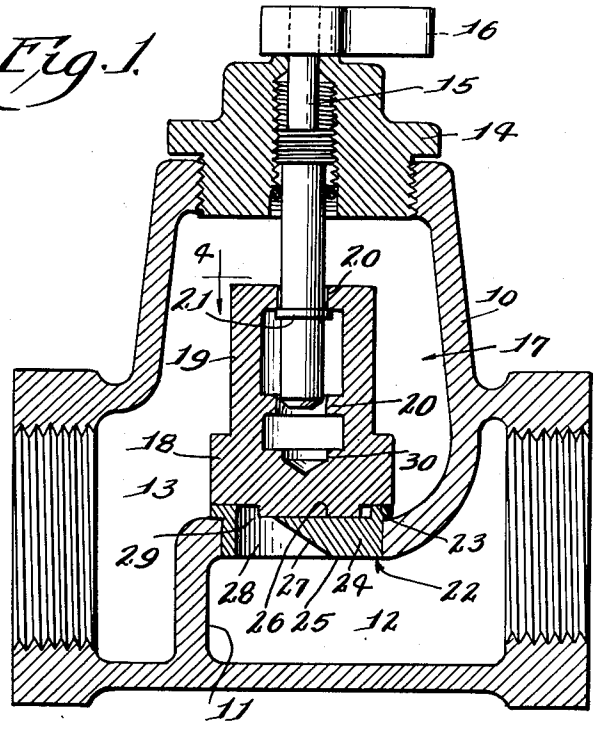


Fig. 2.

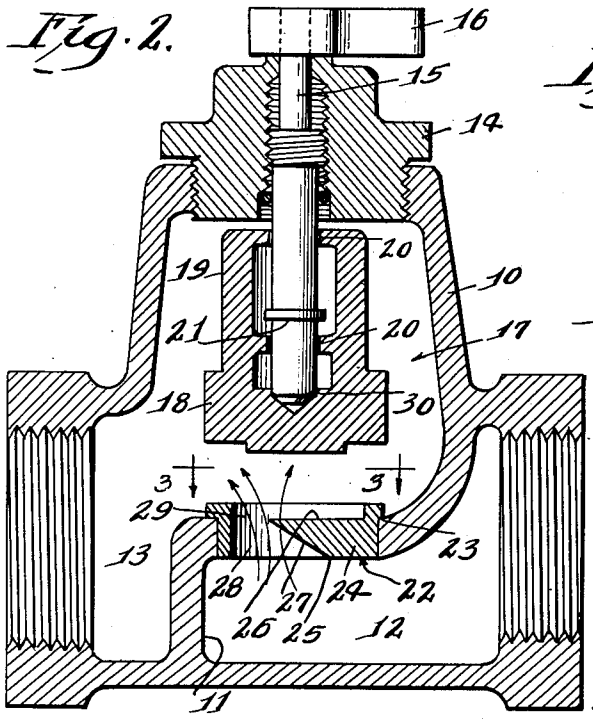


Fig. 3.

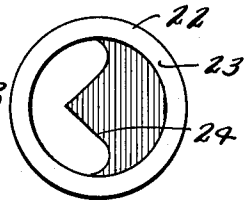
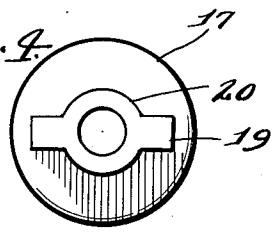


Fig. 4.



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FLOW CONTROL VALVE

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4 Claims. (Cl. 251—127)

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My invention relates to flow control valves which are pressure operated in an opening direction and is concerned more particularly with that type which is vertically reciprocable between opened and closed positions.

A characteristic form of this valve includes a valve member slidably mounted for vertical movements on a stem, the member being raised in an opening direction by fluid pressure and gravity moved to closure when the pressure is removed. A typical application of the valve occurs in forcibly circulated, hot water heating systems wherein the valve opens in response to the operation of a thermostatically controlled pump to permit circulation through the radiating part of the system and closes when the pump stops, i. e., when the demand of the space being heated is satisfied. Sufficient clearance must be provided between the valve member and its stem to insure its free gravity movement to closure, but this condition sets up a chattering action when the pump starts running and the noise thus created is transmitted through the associated piping and is objectionable, particularly in domestic installations.

It is therefore one object of the invention to provide a flow control valve in which the opening pressure is directed against the valve member in such a way that the member is tilted or rocked into non-chattering contact with the valve stem and maintained in this position as long as the pressure is effective.

A further object is to provide a valve of the character indicated in which the valve seat is conditioned to achieve the required direction of pressure against the valve member.

These and further objects of the invention will be set forth in the following specification, reference being had to the accompanying drawing, and the novel means by which said objects are effectuated will be definitely pointed out in the claims:

In the drawing:

Fig. 1 is a sectional elevation of the valve with the valve member in closed position.

Fig. 2 is a view similar to Fig. 1, but showing the valve member in open position.

Fig. 3 is a plan view of the valve seat looking in the direction of the arrow 3 in Fig. 2.

Fig. 4 is a plan view of the valve member looking in the direction of the arrow 4 in Fig. 1.

Referring to the drawing, the numeral 10 designates a hollow valve body which is divided interiorally by a wall 11 into inlet and outlet chambers 12 and 13, respectively. A closure cap 14 is threaded in the upper part of the body 10 in facing relation to the wall 11 and threaded through the cap 14 is a vertical stem 15. Exteriorly of the cap 14, the valve stem 15 carries a handle 16 for manually shifting the stem into and out of the body 10.

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Within the body 10, there is slidably mounted on the stem 15 a valve member 17 comprising a valve disk 18 and spaced, parallel legs 19—19 which extend upwardly from the disk and are respectively positioned on opposite sides of the stem 15. The legs 19 are connected by vertically spaced, annular ribs 20—20 that are apertured for free sliding engagement with the stem 15 below the cap 14, the legs and ribs accordingly constituting a skeleton structure for guidably mounting the disk 18 on the stem 15. Between the ribs 20, the stem 15 is provided with an annular shoulder 21 for a purpose presently explained.

For coaction with the valve disk 18, the wall 11 is apertured to receive a bushing 22 which is axially aligned with the stem 15 and valve member 17 and in effect constitutes a part of the wall 11. Specifically, the bushing 22 includes an annular valve seat 23 for sealably contacting the under side of the valve disk 18 in the usual manner and a generally segmental web 24 which partially closes what would otherwise be a passage determined by the inside diameter of the bushing. The top and bottom surfaces 26 and 25, respectively, of the web 24 are parallel, the top surface 26 being preferably depressed below the seat 23 and with its free edge shaped as a fanciful "W" as shown in plan view in Fig. 3, this shape being suggestive only. The exposed edge face 27 of the web 24 is beveled so that the area of the surface 26 is greater than that of the surface 25. Hence, the passage 28 through the bushing 22 decreases in size from the inlet chamber 12 towards the outlet chamber 13 and reaches a minimum in the throat 29 which is about coplanar with the surface 26. Further, the throat 29 is positioned so that fluid passing therethrough strikes the under side of the valve disk 18 in an area generally offset with respect to the axis of the disk 18, the web 24 therefore acting as a baffle.

In the usual flow control valve having a valve member vertically slidable on a stem, the construction is generally identical with that shown in Fig. 1 except that the bushing 22 lacks the deflecting web 24 and the passage therethrough is completely determined by the inside diameter of the bushing. In a valve of this type, when the valve member is subjected to an opening pressure, there is a tendency for the member to chatter

as it rides upwardly along the stem and this chatter sets up a noisy condition which is transmitted through the associated piping. This noise is particularly objectionable in domestic hot water heating systems.

The sliding fit of the valve member 17 on the stem 15 is of the order of .020'' to .032'', which is the same as in the older types of valves, it being necessary to insure that the member will move freely in both directions without too loose a fit. It is believed that this sliding clearance, though small, is the cause of the chatter which is eliminated by the specially formed bushing 22.

Assuming that the valve member 17 is in the closed position shown in Fig. 1, then when pressure is established in the inlet chamber 28, fluid moving into the passage 28 is deflected by the web 24 into contact with a limited portion of the exposed area of the under side of the valve disk 18. The pressure against the disk 18 is sufficient to shift the valve member 17 to the open position shown in Fig. 2 in which the lower end of the stem 15 bottoms in a pocket 30 formed in the top side of the disk 18 and, importantly, the same pressure, by reason of its offset direction relation to the axis of the stem 15, tilts or rocks the valve member 17 during its upward movement so that the lower and upper ribs 20 bear oppositely against the stem, respectively. Hence, the valve member 17 is held snugly against the stem 15 to thereby eliminate the chattering action.

When the pressure in the inlet chamber 12 is cut off, the valve member 17 drops by gravity to the closed position shown in Fig. 1. If for any reason, it becomes necessary to open the valve in the absence of pressure in the chamber 12, the same can be manually accomplished by rotating the handle 16 in the proper direction to thereby engage the shoulder 21 with the upper rib 20 and raise the member 17.

I claim:

1. A flow control valve comprising a hollow body having an interior wall including an aperture and defining with the body inlet and outlet chambers, a valve seat surrounding the aperture, a vertical stem mounted within the body coaxial with and above the seat, a valve member freely slidable on the stem for coaction with the seat, the member being moved upwardly in an opening direction by pressure in the inlet chamber and gravity moved to closure when the pressure is cut off, and baffle means partially closing the aperture and forming a throat offset from the axis of the stem whereby pressure operating through the throat rocks the member into snug contact with the stem.

2. A flow control valve comprising a hollow body having an interior wall including an aperture and defining with the body inlet and outlet chambers, a bushing having a valve seat mounted in the aperture, a vertical stem mounted within the body coaxial with and above the seat, a valve member freely slidable on the stem for coaction with the seat, the member being moved upwardly in an opening direction by pressure in the inlet chamber and gravity moved to closure when the pressure is cut off, and web means carried by the bushing below the seat and extending partially across the interior of the bushing to form a throat offset from the axis of the stem whereby pressure operating through the throat rocks the member into snug contact with the stem.

3. A flow control valve comprising a hollow body having an interior wall defining with the body inlet and outlet chambers, a valve seat carried by the wall, a vertical stem mounted within the body coaxial with and above the seat, and a valve member freely slidable on the stem for coaction with the seat, the wall including an opening therethrough lying within the seat and offset from the axis of the stem, the member being moved upwardly in an opening direction by pressure in the inlet chamber acting through the opening against an area portion of the member offset from the axis of the stem to thereby rock the member on and make snug contact with the stem and being gravity moved to closure.

4. A flow control valve comprising a hollow body having an interior wall defining with the body inlet and outlet chambers, a valve seat carried by the wall, a vertical stem mounted within the body coaxial with and above the seat, and a valve disk operably related to the seat and having an upwardly extending skeleton structure including a pair of vertically spaced guide elements slidably freely along the stem, the wall including an opening therethrough lying within the seat and offset from the axis of the stem, the disk being moved upwardly in an opening direction by pressure in the inlet chamber acting through the opening against an area portion of the disk offset from the axis of the stem to thereby rock the skeleton structure to snugly bear the upper and lower guide elements oppositely, respectively, against the stem and being gravity moved to closure.

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