May 23, 1933. W. B. BASTIAN 1,910,230

SNAP ACTION VALVE

Filed Aug. 4, 1930

Fig. 4.

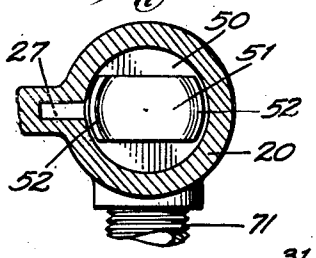


Fig. 2.

Fig. 5.

Fig. 1.

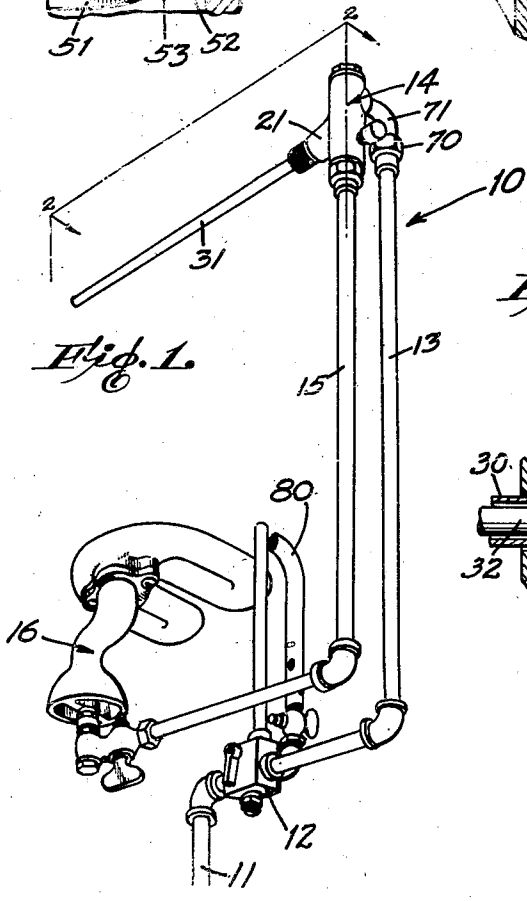
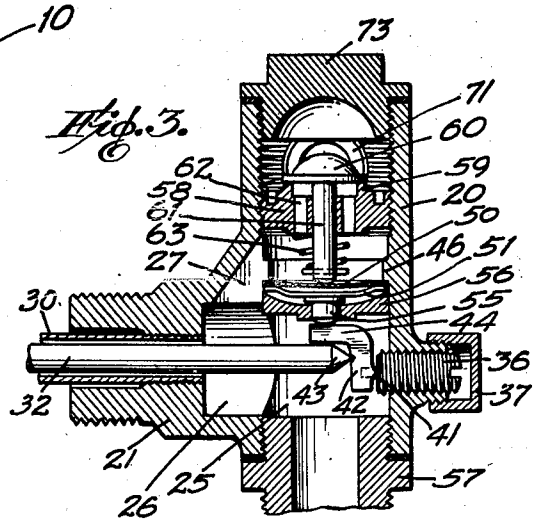


Fig. 3.



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UNITED STATES PATENT OFFICE

WILLIAM B. BASTIAN, OF GLENDALE, CALIFORNIA

SNAP ACTION VALVE

Application filed August 4, 1930. Serial No. 473,002.

My invention relates to valves, and more particularly to snap action valves.

It is an object of my invention to provide an improved snap action valve which is especially adapted for use in connection with a thermostat. It is common practise to regulate the temperature of domestic gas water heaters by controlling the burner with a thermostatically actuated snap action valve. Frequently it is desirable to adjust the control valve to provide for supplying hotter or colder water from the tank. These valves are usually adjustable, but because of the size and conformation of these valves it is generally difficult to place them in any other than a relatively inaccessible position beneath the heater tank.

It is a further object of my invention to provide a relatively compact thermostatically controlled snap action valve which can be mounted on the side of a domestic water heater tank.

Still further objects of my invention are to provide a thermostatically controlled snap action valve having but few parts; to provide such a valve in which these parts are relatively small and compact and therefore not likely to stretch, break, or get out of adjustment; and to provide such a valve in which the compounding of movement between the thermostatic element and the valve member is accomplished by relatively short moments without sacrificing continued accuracy over a long period.

The manner in which the foregoing objects are accomplished, as well as further objects and advantages, will be made manifest in the following description, taken in connection with the accompanying drawing:

Fig. 1 is a perspective view of a preferred embodiment of my invention connected up in a water heater.

Fig. 2 is an enlarged, vertical, sectional view taken on a line 2—2 of Fig. 1 and illustrating the valve of my invention in open position.

Fig. 3 is a fragmentary view, similar to Fig. 2, and illustrating the valve of my invention in closed position.

Fig. 4 is a horizontal view taken on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary, enlarged, detailed view illustrating the manner of operation of the valve of my invention.

Referring specifically to the drawing, and particularly to Fig. 1, a complete gas line assembly 10 is here shown, including an incoming gas line 11, a burner control device 12 (upon which I have filed co-pending application for U. S. Letters Patent, Serial No. 473,001 filed Aug. 4, 1930), a pipe 13, a thermostatically operated snap action valve 14 embodying the features of my invention, a pipe 15, and a combined cock and air mixer gas burner 16.

The thermostatically controlled snap action valve 14 includes a cylindrical body 20 which is shown as vertically disposed and which is provided with a neck 21 projecting at right angles therefrom. The neck 21 is externally threaded and screwed into a flanged fitting 22 provided on a water heater tank 23.

The body 20 has a vertical chamber 25 formed therein having an enlargement 26 at one end which extends into the neck 21, there being a slot 27 which connects an upper portion of the space 26 with an upper portion of the chamber 25. Screwed into a central aperture formed in the neck 21 is an outer tube 30 of a bimetallic thermostat 31, an inner rod 32 of which extends through space 26 into chamber 25.

Extending outwardly from the body 20 on an axis disposed just below and parallel with the rod 22, is a small neck 35 which threadedly receives an adjusting screw 36 and which is covered by a cap 37. Extending from the inner end of the screw 36 is a short pin 40 which is received in a suitable cavity provided in a knife edge 41 of a rocker 42, the opposite face of which is engaged by a sharpened end 43 of the rod 32. The rocker 42 has an arm 44 which extends up alongside the rod 32.

Formed in the body 20, so as to extend into the chamber 25, is an approximately annular shoulder 46. Positioned in the chamber 25, just below this shoulder, is a

downwardly cupped disc 50. Disposed just beneath the disc 50 is a stiff yoke 51 formed of sheet metal and having feet 52, heels 53 of which engage the convex side of the disc 50 at spaced points just within the points at which the disc is engaged by the shoulder 46. Resting at its upper end against the yoke 51 and at its lower end against the rocker arm 44, is a tappet 55, which is held in place by a guide member 56, which snugly fits into the chamber 25.

The upper and lower ends of chamber 25 are provided with threads. Screwed into the lower end of this chamber is a union 57, which connects this with the pipe 15.

Screwed into the threads in the upper end of the chamber 25 is a valve body 58 provided with a valve seat 59 and a valve member 60 having a stem 61 slidably mounted in the body 58, said member being adapted to engage the seat 59 and shut a plurality of openings 62 which extend vertically through the body 58. The valve member 60 is urged into seated position by an expansion spring 63, compressed between the body 58 and a pin in the lower end of the stem 61.

Connecting the pipe 13 with the upper end of the chamber 25 is a union 70, having a 90 degree nipple 71, which screws into a suitable aperture provided in the body 20.

Screwed into the upper end of the chamber 25 so as to close the same is a cap 73.

The operation of my invention is as follows:

As above indicated, the normal position of the cupped disc 50 is with its convex face downwardly. When the disc is thus disposed, the lower end of the stem 61 extends approximately to a point in the plane of the lower face of the shoulder 46, and the valve 60 of course is closed. This condition exists when the thermostat 31 is surrounded by hot water.

When water is drawn from the tank 23 and cool water enters the tank, it surrounds the thermostat, and the pointed end 43 of the rod 42 is forced against the rocker 42 so that the arm 44 urges the tappet 55 and the yoke 51 upwardly. This brings the heels 53 of the yoke feet 52 pressurably against edge portions of the disc 50, as clearly shown in Fig. 5. The pressure thus brought to bear against the disc need only move a very short distance at the outer edge of the disc to effect a considerable throw of the middle of the disc when the latter snaps upwardly, this throw being sufficient to engage stem 61 and lift the valve member 60, causing a flow of gas from the pipe 13, through the aperture 62, through the slot 27, and the lower portion of the chamber 25, and into the pipe 15, which discharges the gas into the burner 16. As a pilot flame is constantly burning from a pilot tube 80 of the burner control device 12, the gas discharged through the burner 16 ignites and heats the water in the tank 23, to the point where the rod 32 is retracted away from the rocker 42, so that ultimately the pressure of the arms 53 of the yoke 51 against the disc 50 is decreased to the point where the disc returns to its natural downwardly cupped position with a sudden snap action. This action, of course, results in the closing of the valve 60, as shown in Fig. 3.

It is to be noted that when the disc 50 is forced into upwardly cupped position, feet 52 of the yoke engage peripheral portions of the disc 50 opposite the shoulder 46, so that further upward pressure of the thermostat 31 against the yoke 51 will be against the shoulder 46, rather than against the yieldable and relatively delicate disc 50.

The guide member 56 further protects the disc 50 in very cold weather where thermostat 31 might force the arm 44 of the rocker 42 upwardly with an undue pressure, as such a pressure would be transmitted to the guide 56, and thence, through the peripheral portions of the disc 50, against the shoulder 46.

The principal reason for placing the valve 14 in the side of the water heater tank 23 at an elevated position is to make the valve 14 accessible for adjustment to determine the temperature of the water maintained in the tank 23. This adjustment is accomplished by removing the cap 37 from the nipple 35 and rotating the screw 36 so as to move its point of contact with the rocker 42 towards or away from the sharpened edge 43 of the rod 32.

Among the principal advantages of my invention are the relatively few parts required in its construction, the small size of these, and the small amount of motion necessary in the valve operating mechanism incidental to the snap action thereof. These features result in the invention being inexpensive to produce; they permit it to be made in a very compact form, so that it may be placed in an accessible position on the heater without being too much in the way; and they result in the entire device being extremely long lived and ensure its continuous performance over long periods with a minimum of expert attention.

While I have shown only one embodiment of my invention, it is to be understood that various changes and modifications may be made in this without departing from the spirit of the invention and the scope of my claims.

What I claim is:

1. In a snap action valve, the combination of: a cupped snap element; supporting means supporting said element on its concave side adjacent the periphery thereof; a pressure element adapted to pressurably engage said snap element on its convex side

near the periphery thereof to cause said snap element to snap to a reverse direction of curvature, said pressure element having a surface normally out of contact with said snap element but which is brought into contact with the snap element after the same has snapped so that further pressure of said pressure element is received by said snap element at points disposed closer to the periphery of said snap element than the points at which pressure is applied to said snap element by said pressure element prior to the snapping of said snap element.

2. A combination as in claim 1 in which said snap element supporting means supports said element after it is snapped at points disposed directly opposite portions of said pressure member which are in contact with said snap element so that further pressure of said pressure element is transmitted through said snap element to said supporting means without further deflection of said snap element.

3. A combination as in claim 1 in which said pressure element is yieldable under higher pressures than necessary to cause said snap element to snap.

In testimony whereof, I have hereunto set my hand at Glendale, California, this 24th day of July, 1930.

WILLIAM B. BASTIAN.