Aug. 14, 1934. J. T. MARVIN 1,970,537

SNAP ACTING THERMOSTATIC VALVE

Filed Oct. 13, 1931

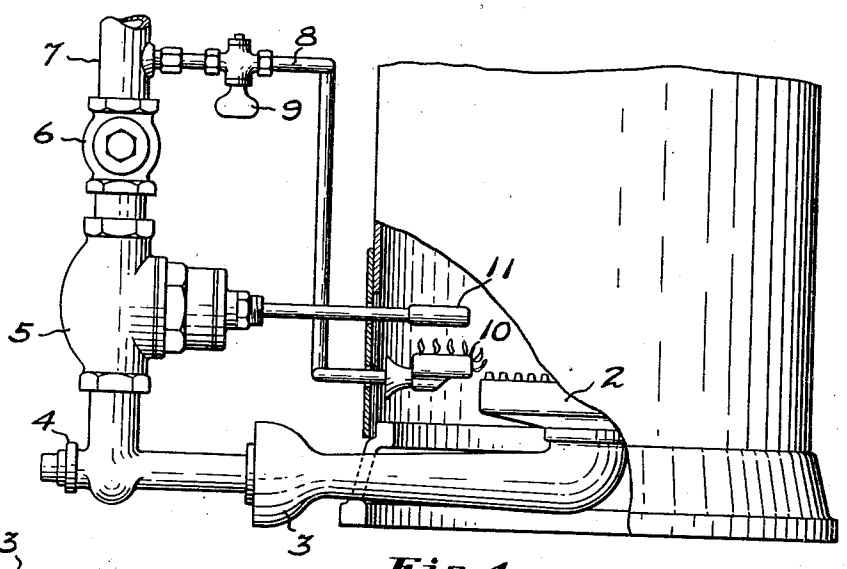


Fig. 1.

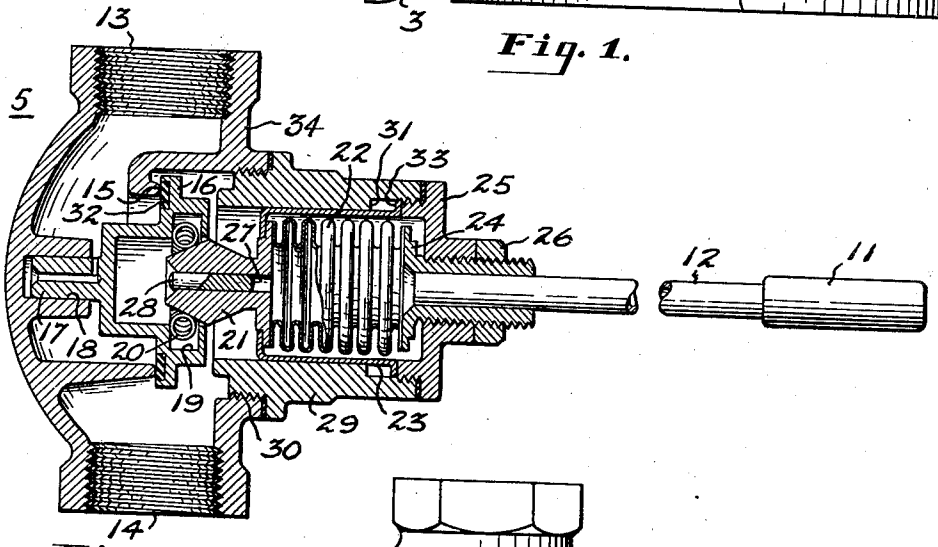


Fig. 2.

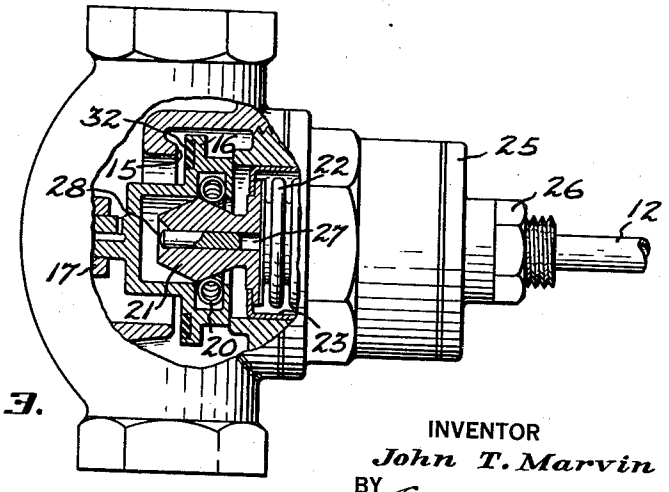


Fig. 3.

INVENTOR
John T. Marvin
BY Edmund J. De Pas
HIS ATTORNEY

Patented Aug. 14, 1934

1,970,537

UNITED STATES PATENT OFFICE

1,970,537

SNAP-ACTING THERMOSTATIC VALVE

John T. Marvin, Cleveland, Ohio, assignor to The Patrol Valve Company, Cleveland, Ohio, a corporation of Ohio

Application October 13, 1931, Serial No. 568,647

2 Claims. (Cl. 236—48)

This invention relates to thermostatic devices and in particular thermostatically operated fuel control valves.

It is the object of this invention to provide a simple compact and inexpensive control device of the type disclosed, wherein the operation of the valve member is effected with a snap movement by means of a generally simplified snap-over mechanism.

With these and other objects in view, the invention consists in the novel construction, arrangement and combination of parts, hereinafter described, illustrated in some of its embodiments in the accompanying drawing and particularly pointed out in the appended claims.

In the drawing, Figure 1 is a side elevational view of a small gas-fired heating appliance with certain of the parts broken away to show the arrangement of my improved control device.

Figure 2 is an enlarged central sectional view of my improved valve in its closed position.

Figure 3 is an enlarged side elevational view, partly in section, showing the valve in its open position.

For purposes of explanation and illustration, I have shown my improved fuel control device in connection with a gas-fired water heater, the heater casing of which is indicated by the numeral 1. Within the casing 1, there is provided a gas burner 2 having a gas and air mixing tube 3 which is arranged for communication with a needle adjusted gas valve 4. The inlet side of the valve is connected to the outlet of my improved cut-off valve 5. A manual or automatic fuel control device 6 is connected in the fuel supply line 7 ahead of the valve 5.

The gas supply conduit 7 communicates at a point ahead of the valve 6 with a conduit 8. The conduit 8 supplies gas under control of the valve 9 to a pilot burner 10 arranged below the thermostatic bulb 11 of my cut-off valve 5.

Referring to the enlarged views of Figure 2 and 3, my improved valve is provided with a globe valve body 34 internally threaded at 13 and 14 for connection with the gas supply line and the valve 4 respectively. Integrally formed with the valve body 34, there is provided a valve seat 15 which cooperates with a valve head 16. The valve head 16 has a seating face 32 of leather or other suitable material and is provided with an extended stem portion 17 which is received in a suitably formed guide 18 formed in the valve body for the purpose of maintaining the valve head in alignment with its seat 15.

An internal annular groove 19 is provided in the valve head 16 for reception of an annular coil or garter spring 20. The garter spring 20 is arranged to cooperate with a conical cam 21 in effecting the operation of the valve 16 with a snap movement. The cam 21 is provided with a base which serves as a closure for the free end of the bellows 22 which is provided for its actuation. A cup-shaped guide member 23 is also secured to the base of the cam member 21 and is movable therewith. The fixed end of the bellows 22 is rigidly secured to a threaded member 24 which is adjustably carried in the valve cap or closure member 25.

A locknut 26 is provided for securing the member 24 and the associated bellows 22 in the desired adjusted position. A thermostatic bulb 11 communicates with the interior of the bellows 22 by way of the conduit 12. The cam 21 has a centrally drilled opening 27 provided for the purpose of charging the bellows with a thermo-sensitive fluid. A plug 28 is provided to seal the unit after such filling. The bellows 22, the bulb 11 and tube 12 constitute a thermostat which is adjustable carried in the valve cap 25 by the member 24. A coupling member 29 is threadably received in an enlarged side opening 30 of the valve body. The outer end of the coupling member 29 is threaded for the reception of the valve cap 25.

The bulb 11 is formed from a material highly resistant to the corrosive action of the flame of the gas burner 10, such as stainless steel or some of the other ferrous alloys possessing this property. The tube 12 may be formed of copper and the open end of the bulb 11 is welded or brazed to it. The other end of the tube 12 is then soldered in the member 24. The bellows 22 is also soldered at one end to the member 24. The cam 21 is then soldered to the other end of the bellows.

After these operations have been performed, a measured quantity of a thermo-sensitive fluid is introduced under high vacuum into the bellows whereupon the pin 28 is driven in the hole 27 and the operation is completed by soldering over the end of the pin 28.

The cup-shaped slidable member 23 is provided with an outwardly turned flange 33 which moves in the annular groove 31 provided in the coupling member 29. The member 23 serves as a guide for the bellows 22 preventing its buckling and at the same time providing a stop for the bellows in its opening and closing movements.

The valves 4, 6 and 9 are not shown in detail

as their specific construction does not form a part of this invention. In the operation of the device, the pilot burner 10 is first lighted and its gas supply is regulated to the proper degree by means of the valve 9. In a short time the thermo-sensitive fluid within the thermostat comprising the bulb 11, the tube 12 and bellows 22 is expanded by the heat of the pilot flame, whereupon the free end of the bellows 22 moves to the left as viewed in Figure 2. At the same time the cam 21 is likewise moved causing the coil or garter spring 20 to over-ride the ridge or apex of the cam, whereupon the spring 20 contracts and moves downwardly upon the opposite face of the cam carrying with it the valve head 16 and effecting its opening operation with a snap movement.

The appliance is now in condition for the valve 6 to admit or cut off the supply of fuel to the main burner 2 as long as the pilot burner 10 remains lighted. Upon the extinguishment of the pilot burner 10, the fluid within the thermostat cools and causes the contraction of the bellows 22, which shifts the cam member 21 to the right and causes the spring 20 to again over-ride the apex of the cam 21, whereupon it contracts and slides down the opposite face of the cam, carrying with it the valve head 16 which is thereby shifted from the position indicated in Figure 3 to the position indicated in Figure 2 with a snap movement.

The fixed end of the bellows 22 may be shifted with respect to the valve head 16 and valve seat 15 so as to change the operating characteristics of the valve. This adjustment is effected by loosening the lock-nut 26 and then turning the member 24 as desired. By this arrangement, the valve may be adjusted to operate within different temperature ranges and when operated over a given temperature range, it may be adjusted for quick opening or quick closing as desired.

My improved valve as herein shown is of rather simple construction and contains a relatively small number of parts for a snap-acting valve. The valve parts are all designed so as to commend themselves readily to mass production by modern machine tool equipment. The valve is arranged so that it may be readily assembled, thus reducing adjusted manufacturing costs and at the same time facilitating the service and repair of the valve.

Furthermore, it is to be understood that the particular forms of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

Having thus described my invention, what I claim is:

1. In a thermostatically operated device, an expansible-contractible bellows, a housing therefor, thermosensitive means for actuating said bellows, means operated by said bellows, and a sleeve closely fitted about said bellows and slidably fitted in said housing for preventing the lateral distortion of said bellows and for guiding its movement, said sleeve having a portion cooperating with said housing to limit the movement of said bellows.

2. In a thermostatically operated device, an expansible-contractible bellows, a housing therefor, thermosensitive means for actuating said bellows, means operated by said bellows, and a sleeve closely fitted about said bellows and slidably fitted in said housing for preventing the lateral distortion of said bellows and for guiding its movement, said sleeve having an outwardly turned flanged end portion which is received in an annular channel of said housing for limiting the movement of said bellows.

JOHN T. MARVIN.