

April 8, 1941.

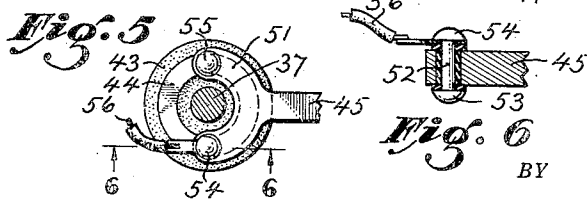
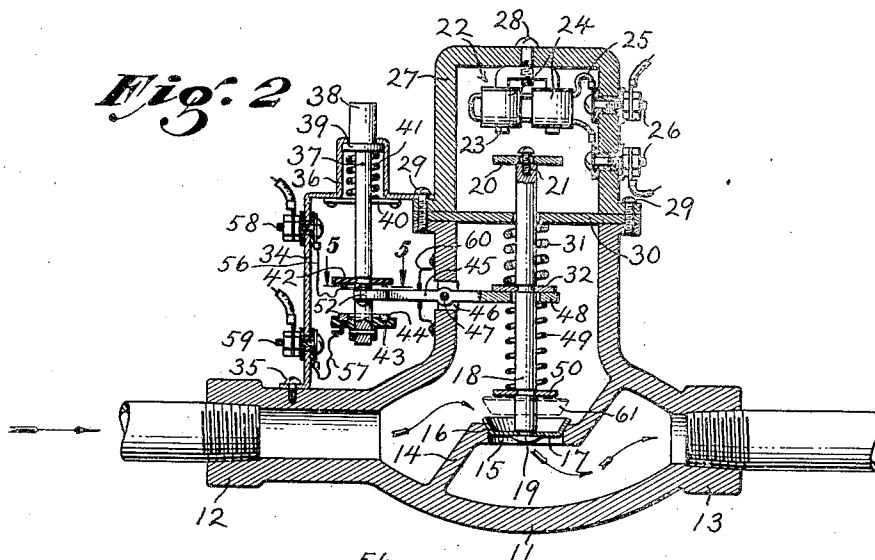
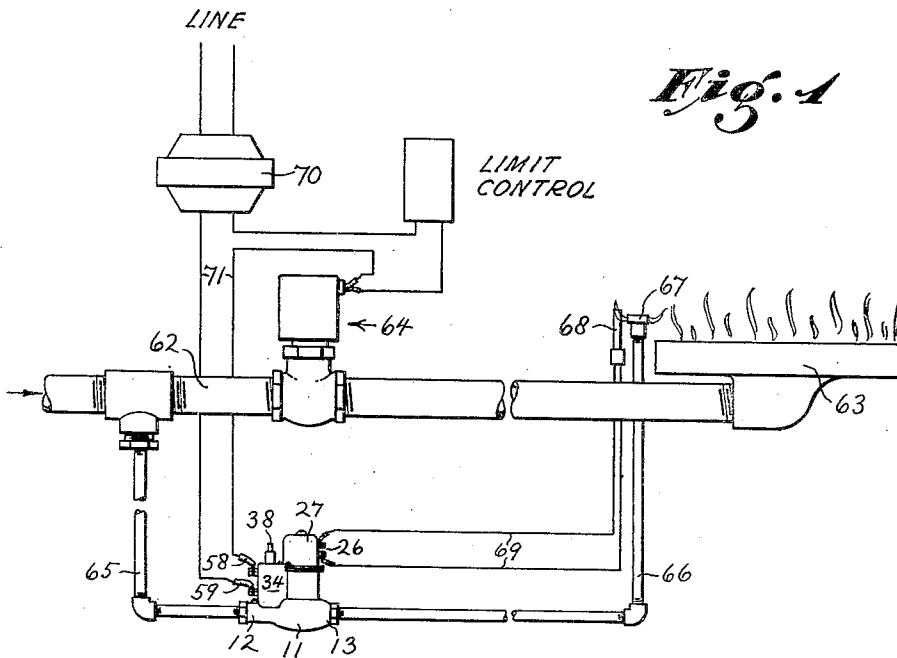
W. A. RAY

2,237,577

MANUAL RESET VALVE

Filed June 28, 1933

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3

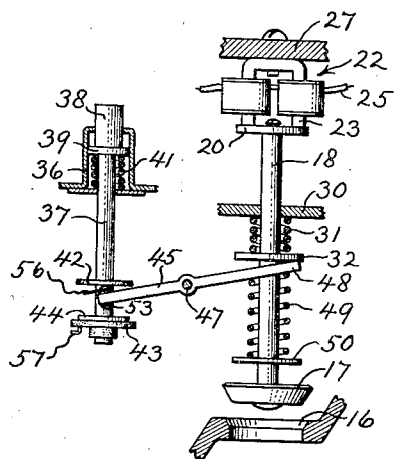
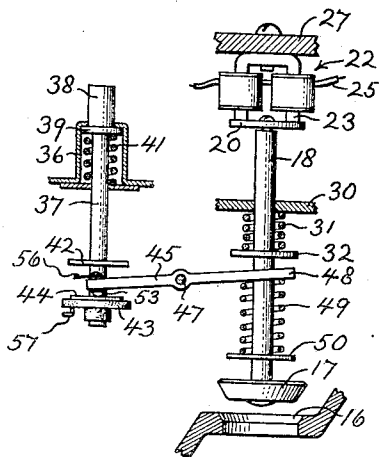


Fig. 4



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MANUAL RESET VALVE

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Application June 28, 1938, Serial No. 216,256

4 Claims. (Cl. 158—117.1)

My invention relates to valves for fluid control and more particularly to those of the "manual reset" type which employ means for interrupting fuel supply to a burner in the event that it becomes extinguished, and it is a chief object of my invention to provide in such a valve means for completing an electric circuit only when said burner is lighted and maintaining said circuit until the burner becomes extinguished.

Manual reset valves of the type to which my invention relates employ a valve member normally biased to closed position and electromagnetic means, including an armature movable with said valve member, for maintaining the valve in open position on actuation of the reset means. Said electromagnetic means may be supplied with current generated by a thermocouple arranged to be heated by the pilot burner, or else by a source of current controlled by a thermal responsive device, such as a contact actuating bimetallic member, subjected to the heat of the pilot burner flame. On extinguishment of the pilot burner, the current ceases to be generated by the thermocouple, or is interrupted by the thermal responsive device, with the result that the valve closes. The electromagnetic means is so arranged that the current supplied to it, when the pilot burner is alight, is sufficient to hold the valve armature in contact with the core, against the force exerted by the biasing means, when it is brought to that position manually, but is not sufficient to influence the armature to move from the position it is in when the valve is open.

Manual reset valves of the type described above are generally employed to supply fuel to a main burner directly. On actuation of the reset mechanism of such a valve, fuel is allowed to pass to the main burner regardless of whether the pilot burner is alight or not. If the pilot burner is not alight, the unburnt gas presents the danger of explosion when a flame is applied to light the pilot burner.

It is an object of my present invention to prevent the possibility of such conditions arising in a fuel burner control system by the provision of a novel manual reset valve for controlling fuel supplied to a pilot burner and including means for controlling a main burner valve by completing an electric circuit thereto, which means are maintained in operative until said pilot burner is lighted. On extinguishment of the pilot burner flame, the valve operates both to close the fuel supply to the pilot burner and

also simultaneously to open the electric circuit to said main valve to close same.

Other objects and advantages of my invention will be apparent during the course of the following description.

Referring to the drawings:

Figure 1 is a schematic view of a fuel burner control system employing a valve embodying my invention;

Figure 2 is a sectional view of a valve according to my invention;

Figure 3 is a fragmentary sectional view of the operating members of the valve shown in Fig. 2, showing said members in the position they assume when the reset mechanism is actuated;

Figure 4 is a similar view of the members in the position maintained by them, after resetting, under energized condition of the electromagnetic means;

Figure 5 is an enlarged section taken on the line 5—5 of Fig. 2; and

Figure 6 is an enlarged section taken on the line 6—6 of Fig. 5.

Referring more particularly to the drawings, the numeral 11 denotes a valve body provided with an inlet 12 and an outlet 13. The partition 14 is provided with a port 15 and a valve seat 16 with which the valve member 17 cooperates to control fluid flow through the valve. The valve stem 18 is secured to the valve member 17 as by the rivet 19 and carries on its upper end the armature 20 of magnetic material which is rockably held thereon as by the screw 21. Cooperating with said armature 20 is the electromagnet generally designated by the numeral 22 and having a core 23 and coils 24 which are connected by the wire 25 to the terminals 26 insulatively mounted in a wall of the upper valve casing 27 which also supports the core 23 as by the screw 28. The upper valve casing 27 is secured to the valve body 11 as by the screws 29 with the valve guide member 30 therebetween. A spring 31 surrounding the valve stem 18 is compressed between the valve guide 30 and a collar 32 rigidly secured to the valve stem 18 and urges the valve member 17 against the valve seat 16. A housing 34 is secured to the valve body 11 as by the screw 35 and to the flange of the upper valve casing 27 by the screw 29. Slidably mounted in a cylindrical extension 36 of housing 34 is a rod 37 provided with a button portion 38 having a flange 39. The rod 37 is guided by the plate 40, suitably secured to the housing 34. A spring 41, compressed between plate 40 and flange 39, urges the rod 37 upward. Rigidly secured to the lower

portion of rod 37 is the insulating disk 42 and the insulating collar 43, in which is recessed the contact ring 44. A lever member 45 is pivotally secured in an aperture 46 in an upper wall of the valve body 11 as by the pin 47 and is provided with an end portion 48 having an aperture loosely surrounding the valve stem 18. A relatively weak spring 49, surrounding the stem 18, is compressed between the collar 50, rigidly secured to said stem, and the end portion 48 of lever 45, normally holding said end portion against the collar 32. The other end of lever 45 is provided with a forked portion 51 (Fig. 5) which carries in one end portion the contact rivet 52, insulatingly mounted thereon (Fig. 6) and having a contact head 53 cooperable with the contact ring 44. The upper end portion of the rivet 52 is formed with a head 54 which normally bears against the insulating disk 42. A rivet 55 (Fig. 5) carried in the other end portion of fork 51 is provided with heads to balance the effect of the heads of the contact rivet 52 on the disk 42 and contact ring 44. The contact rivet 52 and the contact ring 44 are connected respectively by wires 56 and 57 to terminals 58 and 59, insulatingly mounted in a side wall of the housing 34. A flexible diaphragm like member 60 is secured to lever 45 and valve body 11 to seal the aperture 56 through which lever 45 extends.

In Fig. 2, the valve is shown in its closed position with the valve member 17 seated. The position taken by the valve member 17 when it is in open position is shown in broken lines at 61.

In Fig. 1, I have shown the valve of my invention applied to a fuel burner control system. Supply of fuel through the main conduit 62 to the main burner 63 is controlled by the electrically operated valve 64. Fuel from the main conduit is also supplied to the inlet 12 of my valve through the conduit 65 and passes by way of the outlet 13 and conduit 66 to the pilot burner 67, which serves both to ignite the main burner and also to heat the thermocouple 68, which is electrically connected to the terminals 26 of the valve by the wires 69. From the terminals 26 the thermoelectric current may flow to the electromagnet 22. A transformer 70 provides power for operation of valve 64 and is connected thereto through the limit control, wires 71, terminals 58 and 59, and contact members 44 and 53.

The operation of the valve of my present invention, when it is connected in a fuel burner system as is shown in Fig. 1, is as follows:

With the pilot burner extinguished, the valve elements assume the positions shown in Fig. 2. To light the pilot burner, the reset button 38 is pushed downwardly, causing the consequent pivotal movement of lever 45 to raise the valve stem 18, thus opening the valve and permitting fuel to pass to the pilot burner 67 where it may be ignited by any suitable means. This same movement causes the armature 20 to come in contact with the core 23 of the electromagnet. Fig. 3 shows the positions assumed by the valve elements under these conditions.

If the reset button is released immediately, the valve will return to its previous position, stopping the supply of fuel to the pilot burner. However, if the button is held in the depressed position for a short time, the thermocouple 38, which is being heated by the pilot flame, will generate sufficient current to energize the electromagnet 22 to a point at which the armature

20 will be held to the core 23 against the force of the spring 31. To ensure proper seating of the armature on the core face in spite of minor structural misalignment, the armature is preferably loosely mounted on the valve stem as shown. The reset button may now be released, when the elements will assume the positions shown in Fig. 4.

Should the pilot burner be extinguished, the thermocouple will quickly cool to a point at which the thermoelectric current generated by it will be insufficient to hold the armature against the force of the spring 31 and the valve will close.

The operation of the means controlling the main valve will now be considered. As has previously been described, the contact members 44 and 53 are adapted to complete an electric circuit through the main valve, the limit control, and the secondary of the transformer 70. In Fig. 2, the contact members 44 and 53 are shown in spaced relation, opening the power circuit to the main valve. On actuation of the reset button, the contacts remain open, as is shown in Fig. 2.

If the reset button is prematurely released, before sufficient power is generated by the thermocouple to cause the electromagnet to hold the armature, the lever 45 is returned to normal position by the spring 31 as rapidly as the reset rod moves upwardly, thus holding the contact members open throughout the movement. The button 38 and the flange 39 are preferably arranged to cooperate with the walls of the cylindrical housing 36 to produce a dash-pot effect, retarding a too rapid return of the reset rod which might momentarily cause closing of the contacts when the reset button is released.

If the reset button is held long enough after the pilot burner is lighted to permit generation of sufficient current to hold the armature in contact with the core, on releasing the button the elements will assume the positions shown in Fig. 4 with the contacts held together by the force of the spring 49 on the lever 45. It is obvious that this spring 49 should be weak in respect to both the reset button spring 41 and also the valve spring 31 so as not to hinder the operation of either of those springs. Spring 49 is preferably arranged to have just sufficient force to hold the contact members firmly together when the elements are in the positions shown in Fig. 4. If the limit control is now in "heat demand" condition, the circuit to the main valve will be complete and consequently it will open to supply fuel to the main burner where it will be ignited by the pilot burner.

Should the pilot burner become extinguished, the armature is released and the supply of fuel to the pilot burner shut off. Simultaneously, the circuit to the main valve is opened, closing the valve and the fuel supply to the main burner.

It will be apparent from the foregoing description that I have provided a novel valve according to the stated objects of my invention.

My invention is not limited to the use of the thermo-couple described in connection with the particular embodiment which I have chosen by way of illustration, as it is within the scope of my invention to employ instead an external source of current controlled by a thermal responsive device actuated by the pilot burner flame.

Also, while I have described the valve of my invention as having contact means for closing a

circuit to an electrically operated main valve, my invention is not so limited as other electric devices, such as, for example, a blower, might be substituted without departing from the spirit and scope of my invention.

And, while I have described my invention in its preferred embodiment, I wish it to be understood that modifications may be made and that no limitations on the invention are intended other than are imposed by the scope of the appended claims.

I claim as my invention:

1. A fluid control valve comprising, in combination, a valve port, a valve member cooperable with said port to control fluid flow therethrough, an armature connected to said valve member, electromagnetic means cooperable with said armature by contact therewith for holding said valve member in open position, a source of current for said electromagnetic means, means for resetting said valve member to open position and said armature into contact with said electromagnetic means, means for returning said resetting means to normal position after resetting, means associated with said resetting means for completing an electric circuit on return of said resetting means to normal position, and means for returning said valve member to closed position and for holding said circuit completing means inoperable, said last-named holding means being ineffective when said valve member is held in open position by said electromagnetic means.

2. In combination, a fuel supply conduit, an electrically operated main valve in said conduit, a main burner connected to said main valve, a pilot valve connected to said main conduit ahead of said main valve, a pilot burner connected to said pilot valve, electromagnetic means for holding said pilot valve in open position when said electromagnetic means are energized, means actuated by said pilot burner for supplying current to said electromagnetic means when the pilot burner is lighted, means for closing said pilot valve on extinction of the pilot flame, resetting means for opening said pilot valve, and contact means operable by said resetting means for completing an electric circuit to said main valve, said contact means being operable only on release of said resetting means while said pilot valve is held in open position by said electromagnetic means.

3. In combination, a fuel supply conduit, an electrically operated main valve in said conduit, a main burner connected to said main valve, a pilot valve connected to said main conduit ahead of said main valve, a pilot burner connected to said pilot valve, a thermocouple subject to the heat of said pilot burner, resetting means for opening said pilot valve, electromagnetic means in said pilot valve and energized by said thermocouple for holding said pilot valve in open position as long as the thermocouple is heated by the pilot burner, means for closing said pilot valve on extinction of the pilot flame, and contact means operable by said resetting means for completing an electric circuit to said main valve, said contact means being operable only on release of said resetting means while said pilot valve is held in open position by said electromagnetic means.

4. In a fluid fuel burner control system, in combination, a fuel supply conduit, an electrically operated main valve in said conduit, a main burner connected to said main valve, a pilot valve connected to said main conduit ahead of said main valve and comprising a valve port and a valve member cooperable with said port to control fluid flow therethrough, an armature connected to said valve member, electromagnetic means cooperable with said armature by contact therewith for holding said valve member in open position, a pilot burner connected to said pilot valve, means actuated by said pilot burner for supplying current to said electromagnetic means when the pilot burner is lighted, means for resetting said pilot valve member to open position and said armature into contact with said electromagnetic means, means for returning said resetting means to normal position after resetting, means associated with said resetting means for completing an electric circuit to said main valve on return of said resetting means to normal position, and means for closing said pilot valve member on extinction of the pilot flame and for holding said circuit completing means inoperable, said last-named holding means being ineffective when said pilot valve member is held in open position by said electromagnetic means.

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