Feb. 7, 1950 W. A. RAY 2,496,638

FLUID CONTROL VALVE

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Fig. 1

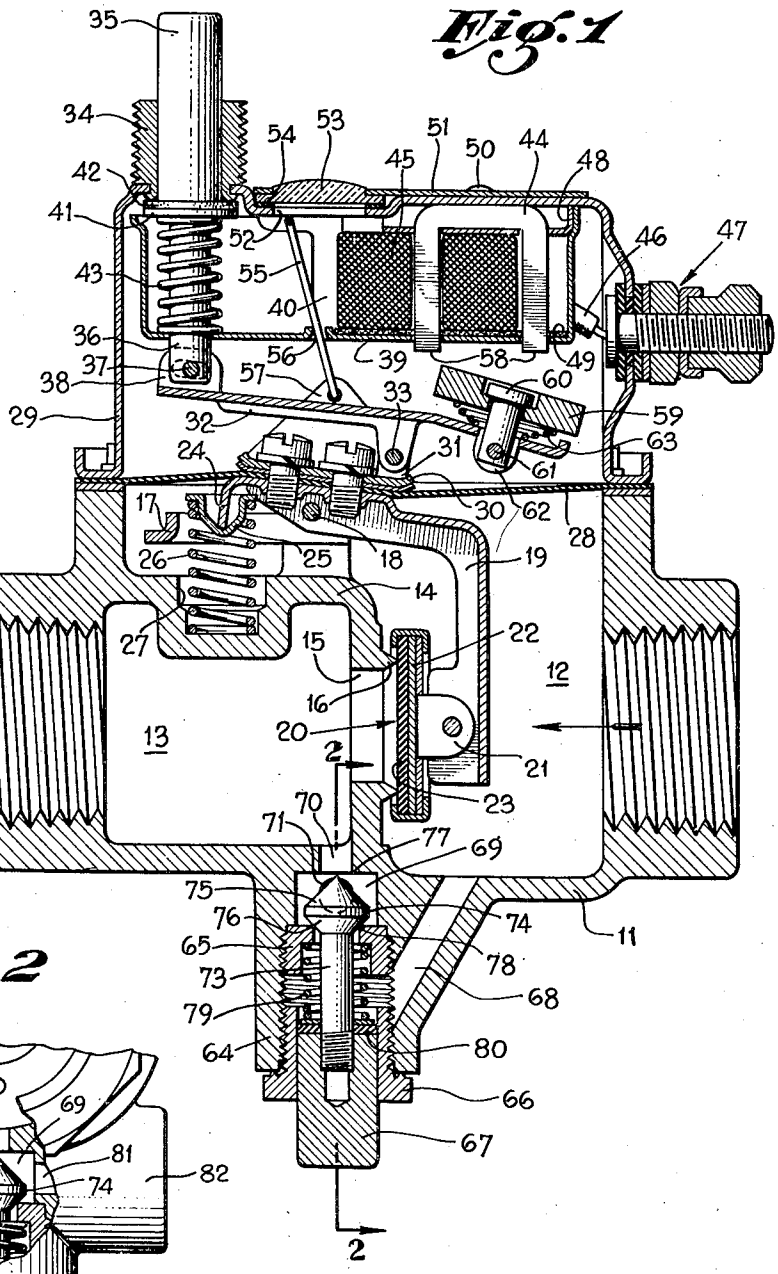
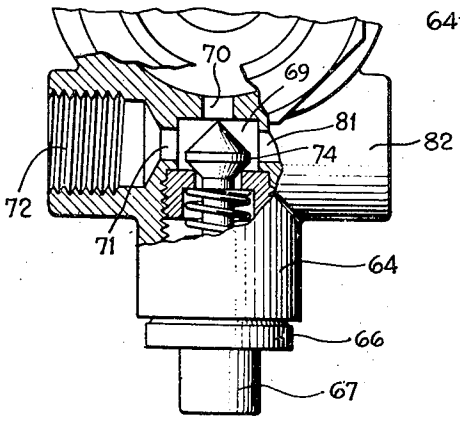


Fig. 2



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FLUID CONTROL VALVE

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7 Claims. (Cl. 137—139)

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This invention relates to fluid-control valves, and more particularly to those of the so-called "manual-reset" type wherein the valve closure is retained in open position by means responsive to the existence of a condition under which it is safe or desirable that the valve be open; the closure being released to closed position upon cessation of the condition, so that it must then be manually-reset after the cause of the trouble has been corrected.

An object of this invention is to provide, in a valve of the character described, means whereby the valve closure is positively maintained in closed position during the attempted resetting operation unless the safe condition has first been established; a feature of the invention residing in the provision of a reset lever pivoted to the closure operating member and freely rockable thereon, while maintaining the closure seated, unless an end of the lever is held (by means responsive to the controlling condition), in which event the closure member can be moved to closure-opening position.

For full understanding of the invention, and further appreciation of its objects and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a sectional view of a valve structure embodying the invention; and

Figure 2 is a fragmentary end view showing a section taken along the line 2—2 of Fig. 1.

Referring more particularly to the drawing, the numeral 11 indicates a valve casing having inlet and outlet chambers 12 and 13, respectively, separated by a right-angled partition 14, the vertical portion of which is provided with a valve port 15 having around its inlet end an annular valve seat 16. Above the top wall of partition 14, and joined integrally thereto, is a U-shaped bracket 17 between the side arms of which is pivoted, on a pin 18, a channelled right-angled closure operating member 19, to the dependent vertical portion of which is connected a closure 20 cooperable with the seat 16; the closure being rockably mounted on the member by means of an ear 21 turned-up from a metal plate 22 which forms a backing for a resilient seat-engaging disk 23. The left-hand extremity of the horizontal portion of closure operating member 19 is formed to provide a dependent finger 24 which bears in a cup 25 provided in the upper end of a helical compression spring 26 which serves to bias the closure operating member in a clockwise direction toward closure-seating position; the lower end of the spring being received in a recess 27 formed in a thickened portion of the top wall of the partition 14. The structure so-far described is substantially the same as is disclosed in Fig. 3 of the drawing of my copending application Serial No. 611,597, filed August 20, 1945.

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Covering the open top of casing 11 is a diaphragm 28, of flexible material such as leather or thin metal, which is clamped at its margin between the casing and the flanged mouth of a cup-shaped housing 29 secured to the casing. Secured to the closure operating member 19 above its pivot 18, with diaphragm 28 therebetween and forming a fluid-tight connection, is a plate 30 having upstanding ears 31 to which a lever 32 is pivotally connected intermediate its ends by a pin 33. Reciprocable in a bushing 34, sealingly secured in an opening through the top wall of housing 29, is a push-button 35 having a stem 36 which is connected at its lower end to the lever 32; the connection being made by a pin 37 secured to the stem and cooperating with elongated openings in turned-up side portions 38 of the lever. The bushing 34 is preferably externally threaded, as shown, for the attachment of a protective cap or for the connection of means for remotely operating the push-button. The stem 36 extends freely through an opening in the bottom wall of a relatively-narrow rectangular receptacle 39 which is secured in position by a sheet-metal member 40 spot-welded to the top wall of housing 29 and having ears (not shown) which cooperate with slots in the side walls of the receptacle. When the push-button 35 is in its retracted position, as shown, the clearance-opening around it is sealed by cooperation of its enlargement 41 and soft washer 42 with the undersurface of bushing 34; the push-button being biased to this position by a compression spring 43 encircling the stem 36, so that the lever 32 is normaly held in its clockwise-tilted position as shown.

Within the right-hand end of receptacle 39 is an electromagnet comprising a U-shaped core 44 around one side arm of which is an energizing coil 45 having leads 46 which are connected, as by solder, to the inner ends of terminal-posts 47 sealingly and insulatingly mounted in openings through an end wall of housing 29. The electromagnet is held in place by the receptacle 39 and by a cooperating cupped member 48 which fits within the expanded mouth of the receptacle; the side arms of the core 44 extending freely through openings in the member 48 and corresponding openings in the bottom wall of the receptacle.

A piece of fibrous material or fish-paper 49, having openings closely conforming to the core sidearms, is inserted below the coil 45 so as to prevent the possibility of dirt, or flakes of the insulating compound with which the coil is customarily impregnated, from falling through the core-openings in the receptacle.

Secured by a rivet 50 to the top wall of the housing is a name-plate 51 having an opening in register with an opening 52 through a portion of the top wall of the housing which is dished to receive a glass or plastic window 53 and sealing gasket 54; the shouldered margin of the window being engaged by the name-plate. The window is preferably in the form of a magnifying lens, as shown, and permits observation of an indicator 55 which conveniently consists of a U-shaped wire extending through a slot 56 in the bottom of the receptacle 39, the lower extremities of the wire being bent for reception in openings through turned-up side portions 57 of the plate 30. When the closure operating member 19 is rocked, in a manner hereinafter to be described, the cross-arm of the indicator 55 is moved to opposite ends of the window so that the condition of the closure can readily be ascertained.

Cooperable with the ends or pole-faces 58 of the core 44 is an armature 59 which is mounted on the right-hand end of the lever 32 by a headed rod 60 freely extending through a central opening in the armature and pivoted at its lower end on a pin 61 secured to downwardly-turned side portions 62 of the lever; the armature being urged by a light compression spring 63 against the head of the rod, for which head a shallow recess is provided.

On the bottom wall of the valve casing is a T-shaped boss 64 which is bored vertically and threaded to receive, toward its upper end, a hollow valve-seat member 65 and, at its outer end, a bushing 66 within which a push-button 67 is reciprocable. The space between the seat member and the bushing is connected by a passage 68 to the inlet chamber 12; the space 69 above the seat member being connected by a vertical passage 70 to the outlet chamber 13 and also, by a lateral passage 71, to a threaded outlet connection 72 (Fig. 2). Carried by the push-button 67 is a stem 73 having within the space 69 a valve head 74, the conical upper and lower surfaces 75 and 76 of which cooperate respectively with a seat 77 at the bottom end of passage 70 and with a seat 78 at the upper end of the seat member 65. The valve head 74 is biased downwardly into engagement with seat 78 by a compression spring 79; this spring also serving to compress a resilient washer 80 provided at the inner end of the push button and thereby prevent leakage past it. As is seen in Fig. 2, a second lateral passage 81 leads from the space 69 to an additional outlet connection 82 which is provided merely for sake of convenience; one of the outlet connections 72 or 82 being plugged in normal use of the valve.

In describing the operation of the valve it will be assumed, as typical of its application, that the valve is arranged to control supply of gaseous fuel to a burner system; the main outlet 13 being connected to the main burner and the outlet connection 72 or 82 to a pilot burner for the main burner, energization of the electromagnet coil 45 being controlled by means responsive to the flame of the pilot burner, such as a thermoelectric generating device or a thermal cut-out controlling a convenient source of electrical energy.

To initiate operation of the burner system, the push-button 67 is fully depressed to effect closure of passage 70 and permit gas to flow from the inlet 12 through passage 68, and past the valve seat 78, into the space 69, and thence through passage 71 or 81 to the pilot burner. While maintaining push-button 67 in its depressed position the pilot burner is lighted and, after an interval, the other push-button 35 is also depressed to rock lever 32 and thereby bring the armature into engagement with the pole-faces 58. Push-button 35 (only) is then released and if the electromagnet is at that time still insufficiently energized to effect attractive holding of the armature, the push-button 35 and the lever return to their original positions under the force of spring 43. It will be observed that in this operation of push-button 35 the force applied to the closure operating member 19 is in a direction tending to maintain the closure 20 seated. However, when the thermoelectric generating device or thermal cut-out is sufficiently heated to effect proper energization of the electromagnet so that the armature, when brought into engagement with the pole-faces, is magnetically held in that position, upon release of the push-button 35 the lever 32 rocks about the armature-rod pivot-pin 61 and, under the force of spring 43, the closure operating member 19 is rocked in a counterclockwise direction to effect unseating of the closure 20; gas then flowing to the main burner where it is ignited by the pilot-burner flame. The push-button 67 is then released, flow of gas to the pilot burner continuing by way of passage 70. It is to be understood that the lifting force applied to the closure operating member by spring 43 through lever 32 (when the armature is held) is considerably greater than the counter force of the closure operating member bias 26, and that the push-button 35 therefore returns to its fully-retracted position when released. While the pilot burner is alight the parts are retained in their "reset" positions, but in the event of extinguishment of the pilot burner, and resultant deenergization of the electromagnet, the armature is released and the closure operating member moves to its closed position under the force of its bias spring, thereby obstructing supply of fuel to the main burner and also to the pilot burner.

The specific embodiment of my invention herein shown and described is obviously susceptible of modification without departing from the spirit of the invention, and I intend therefore to be limited only by the scope of the appended claims.

I claim as my invention:

1. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a member pivotally mounted on said structure and carrying a closure cooperable with said seat; a first spring biasing said member to closure-seating position; a lever pivotally connected to said member; means for applying a force to said lever to rock it on the member in one direction and thereby move one end of the lever, said force being arranged to act on the member in a direction to maintain said closure seated; a second spring biasing the lever, with respect to the structure, in the opposite direction; and means for temporarily holding said one end of the lever in its moved position so that when said force is removed the lever, under the force of said second spring, is rocked in said opposite direction about said one end while the same is held, and the member is rocked, against the force of said first spring, in a direction to unseat the closure.

2. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a member pivotally mounted on said structure and carrying a closure cooperable with said seat; a first spring biasing said member to closure-seating position; a lever pivotally connected to said member; a push-button slidable in an opening through a wall of said structure and operatively connected to an end portion of said lever, said push-button serving as means for manually applying a force, to the lever to rock it on the member in one direction and thereby move one end of the lever, said force being arranged to act on the member in a direction to maintain said closure seated; a second spring biasing the push-button toward retracted position, and thereby the lever in its opposite direction; and means for temporarily holding said one end of the lever in its moved position and providing a pivot about which, while said one end is held, the lever can rock in said opposite direction under the force of said second spring when said manual force is removed, to move the member in a direction to effect unseating of the closure against the force of said first spring.

3. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a member having a pivotal mounting on said structure and carrying a closure cooperable with said seat; a first spring biasing said member to closure-seating position; a lever pivotally connected, intermediate its ends, to said member at a point thereon between said mounting and said closure; means for manually applying a force to one end of said lever to rock it on the member in one direction and thereby move the other end of the lever, said force being arranged to act on said member in a direction tending to maintain the closure seated; a second spring biasing the lever, with respect to the structure, in the opposite direction; and means for temporarily holding said other end of the lever in its moved position and providing a pivot about which, while said other end is held, the lever can rock in said opposite direction under the force of said second spring, when said manual force is removed, to move the member in a direction to effect closure-unseating movement of said member against the force of said first spring.

4. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a member having a pivotal mounting on said structure and carrying a closure cooperable with said seat; a first spring biasing said member to closure-seating position; a lever pivotally connected to said member at a point thereon between said mounting and said closure; means for manually applying a force to said lever to rock it on the member in one direction and thereby move one end of the lever, said force being arranged to act on said member in a direction tending to maintain the closure seated; a second spring biasing the lever, with respect to the structure, in the opposite direction; an electromagnet mounted on the structure; and an armature carried by said one end of the lever and cooperable with said electromagnet when that end of the lever is in its manually-moved position; said electromagnet being adapted, when energized, to hold said armature and thereby said one end of the lever; said armature having a pivotal connection with the lever about which, while said one end is held, the lever can rock in said opposite direction under the force of said second spring when said manual force is removed, to move the member in a direction to effect closure-unseating movement of said member against the force of said first spring.

5. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a member having a pivotal mounting on said structure and carrying a closure cooperable with said seat; a first spring biasing said member to closure-seating position; a lever pivotally connected, intermediate its ends, to said member at a point thereon between said mounting and said closure; a push-button slidable in an opening through a wall of said structure and operatively connected to one end of said lever, said push-button serving as means for manually applying a force to the lever to rock it on the member in one direction and thereby move the other end of the lever, said force being arranged to act on said member in a direction tending to maintain the closure seated; a second spring biasing the push-button toward retracted position, and thereby the lever in its opposite direction; an electromagnet mounted on the structure; and an armature carried by said other end of the lever and cooperable with said electromagnet when that end of the lever is in its manually-moved position; said electromagnet being adapted, when energized, to hold said armature and thereby said other end of the lever; said armature having a pivotal connection with the lever about which, while said other end is held, the lever can rock in said opposite direction under the force of said second spring when said manual force is removed, to move the member in a direction to effect closure-unseating movement of said member against the force of said first spring.

6. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a closure; a closure operating member arranged to move said closure in opposite directions into and out-of engagement with said seat; a lever pivotally connected to said member; manually operable means for rocking said lever in one direction on the member to move said one end of the lever while, through the lever, applying to the member a force in a direction to maintain said closure seated; means for temporarily holding said one end of the lever in its moved position; and means for rocking the lever in the opposite direction about said one end while the same is held, to effect movement of the closure in a direction away from its seat.

7. In a manual-reset valve: a valve structure having a passage therethrough provided with a valve seat; a closure; a closure operating member arranged to move said closure in opposite directions into and out-of engagement with said seat and biased to closure-seating position; a lever pivotally connected to said member; means for manually applying to said lever a force, acting on the member in a direction to maintain the closure seated, to rock the lever on the member in one direction and thereby move one end of the lever; means biasing the lever in the opposite direction; and means for temporarily holding said one end of the lever in its moved position so that when said force is removed the lever, under the influence of its bias, is rocked in said opposite direction about said one end while the same is held, and the member is moved,

against the force of its bias, in a direction to effect unseating of the closure.

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