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AUTOMATICALLY CONTROLLED VALVE

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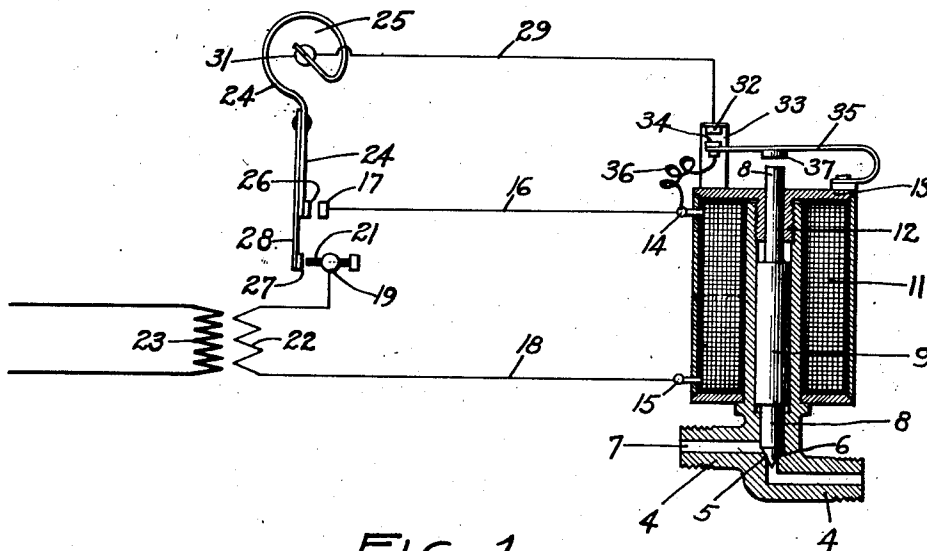


FIG. 1

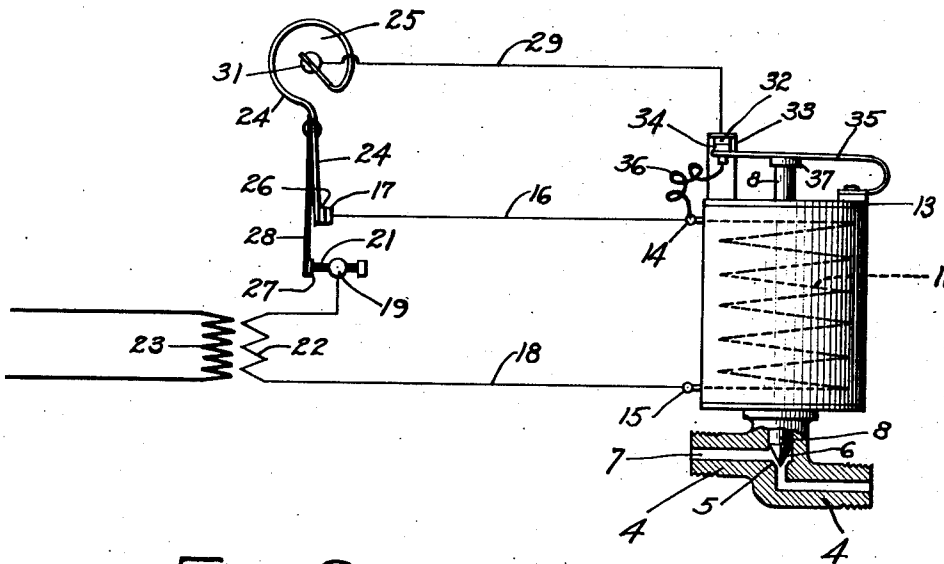


FIG. 2

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AUTOMATICALLY-CONTROLLED VALVE.

Application filed October 23, 1924. Serial No. 745,406.

This invention relates to an improved automatically controlled valve and more particularly to valves whose opened and closed positions are automatically controlled by means or mechanisms having elements automatically actuatable in response to external conditions such for example, as changes in pressure or temperature. In the use of such responsive elements, disadvantages frequently arise in that a single positive initial actuation is not always attained but a plurality of partial actuations in opposite directions frequently occur when the element reaches its critical condition with the result that the valve tends to chatter or effect only partial opening or closing movements in succession.

In the structure here disclosed for purpose of clear explanation of the invention, there is shown such an element of the type which is responsive to thermal changes. This element is adapted to control a circuit to energize an electromagnetic device which in turn regulates the opened or closed position of the valve. In this disclosed form there is provided a means which will maintain the circuit in a device-energizing condition when such circuit is once energized and will so hold the circuit until the circuit is again opened upon subsequent opening movement of the element.

The object therefore of the invention is to provide an improved automatically controlled valve.

Other objects of the invention will more fully appear from the following detailed description and the accompanying drawings and will be pointed out in the annexed claims:

In the drawings, there has been disclosed a structure designed to carry out the objects of the invention but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a view in vertical section of a valve, electromagnetic coil and wiring diagram including a thermostat with the parts shown with the valve closed.

Figure 2 is a view similar to that of Figure 1 but showing the parts with the valve in open position.

In this selected embodiment of the inven-

tion there is shown a pipe section 4 providing a substantially conical valve seat 5 upon which the conical valve 6 may be seated to close the passage 7, through the pipe section. It may be noted that this particular valved pipe section is adapted to be inserted in a supply line of fluid fuel, either gaseous or liquid, such for example, as a pipe line leading from a source of gas to a gas-heated appliance or leading from a source of oil to an oil burner.

The valve 6 is preferably integral with a metallic stem 8 having an annularly enlarged portion 9 which may function as a weight yieldably to maintain the valve in one position. As here shown the valve is gravitationally held in closed position.

The preferred means here disclosed for moving the valve to another position comprises a solenoid 11 whose plunger is provided by the stem 8 with its enlarged portion 9. Obviously, upon energization of the solenoid, its plunger is raised from the position shown in Figure 1 to that shown in Figure 2 whereby the valve is moved from its normal closed position to an open position permitting fluid flow through the passage in the pipe sections. Preferably, the plunger is provided with a stop 12 formed by a boss integrally depending from the plate 13 within the axial recess of the solenoid so that this device is of the form commonly known as a plunger electromagnet. As a further detail of construction it may be noted that the pipe section is integrally formed with a tubular right-angled portion which forms a lining for the axial recess of the solenoid within which lining the plunger is borne for longitudinal movement.

The winding of the solenoid is provided with two terminals 14 and 15 and the wire 16 leads from the upper terminal 14 to the thermostat post 17 while the wire 18 leads from the lower terminal 15 to the second thermostat post 19. This post 19 is preferably provided with a contact screw 21 whose position may be outwardly and inwardly adjusted to regulate a lag action between the opening and closing engagements of the means for closing the circuit across these posts 17 and 19. The wire 18 may lead through the secondary side 22 of a transformer having its primary side 23 energized from a suitable source of elec-

tric energy not necessary to be shown. Hence, when this energizing circuit is closed across the posts 17 and 19 the solenoid is energized and the valve position is changed.

The means for closing this energizing circuit across these posts is carried by the thermo-bar 24 of the thermostat 25 which bar is automatically actuable in response to surrounding conditions of temperature in accordance with common practice. However, this thermo-bar 24 carries two electrically connected contacts 26 and 27 adapted respectively to engage the post 17 and the post-screw 21. It will be noted that these contacts 26 and 27 are preferably offset from the same straight line, the contact 26 being carried directly by the adjacent face of the thermo-bar while the contact 27 is carried by the similar face of a relatively flexible metallic strip 28 secured to the rear face of the thermo-bar. Hence, in a closing movement of the thermo-bar, the contact 27 will engage the projecting screw 21 and, upon such continued movement, will flex to permit the engagement of the contact 26 with the post 17 and, what is equally important, in any opening movement of the thermo-bar, the contact 26 will first become disengaged while the flexed strip 28 still maintains the contact 27 in electrical engagement with the screw 21. This construction and operation permits the use of a supplemental connection from the solenoid around the disengaged post 17 to the thermo-bar so that relatively slight opening movement of the thermo-bar followed by an immediate closing movement will not de-energize and re-energize the solenoid in rapid succession but, on the other hand, will cause the solenoid to maintain its energized condition until the contact 27 is moved from the screw 21. Thus, the disadvantages of a succession of alternate movements of the thermo-bar at its critical temperature will not be induced in the valve but the valve will remain in position until a full opening movement of the thermo-bar is completed.

Such a supplemental holding connection is afforded by the wire 29 which is secured to the thermostat post 31 which is in electrical engagement with the thermo-bar 24 and therefore with the metallic strip 28 and contact 27. The other end of this wire 29 is connected to a contact 32 mounted upon an insulated bracket 33 carried by the solenoid 11. A complementary contact 34 is carried by a resilient arm 35 mounted in insulated relation upon the solenoid. This contact 34 is normally held adjacent to, but away from, the overhanging contact 32. The contact 34 is electrically connected by the wire 36 with the upper solenoid terminal 14.

Operation: When the thermal condition of

the thermostat is such that the thermo-bar 24 initiates its circuit-closing movement, the contact 27 on the relatively flexible strip first engages the adjustably offset screw 21, but the circuit remains open until further movement of the thermo-bar flexes the strip until the contact 26 is carried into electrical engagement with the post 17 when an energizing circuit is closed from the secondary side 22 of the transformer through the post 19, screw 21, contact 27, strip 28, thermo-bar 24, contact 26, post 17, wire 16, terminal 14, solenoid 11, terminal 15 and wire 18 back to the transformer. The resultant energization of the solenoid raises the plunger and opens the valve.

When the thermo-bar subsequently initiates its circuit-opening movement, the contact 26 is first disengaged while the flexed strip still retains the contact 27 in electrical engagement with the offset screw 21. Under such conditions, the supplemental holding wire functions. That is, the circuit has been opened along the post 17 and wire 16 to the terminal 14 so that this opened side of the circuit is closed by the wire 36 from the upper terminal 14 to the contact 34 which is held in electrical engagement with the overhanging contact 32 by the raising of the resilient arm 35 through a lifting engagement of the upper projecting end of the valve stem 8 against the button 37. Such connection therefore continues across the engaged contacts 34 and 32, to wire 29, thermostat post 31, thermo-bar 24, strip 28, contact 27, and screw 21, transformer side 22, wire 18, terminal 15, solenoid 11, and back to the terminal 14. The solenoid is thus maintained in its energized condition during the period of the relatively small movements of the thermo-bar which often take place around its critical temperature. Hence, these substantially successive changes do not affect valve-position and valve-chattering and the other disadvantages are overcome. After the thermo-bar has completed its opening movement sufficiently to disengage the contact 27 of the flexed strip, the solenoid circuit is completely opened and the valve closed while the resilient arm 35 resumes its normal state wherein the contacts 32 and 34 of the supplementary wire 29 are disengaged.

Having thus described my invention what I claim as new and desire to secure by Letters-Patent, is:

1. An automatically controlled valve including means yieldably to maintain the valve in one position, a device electrically energizable to maintain the valve in another position, a circuit for the device, a pair of spaced terminals in the circuit, automatically actuable contacting means movable to open and close the circuit across the terminals, said contacting means being arranged

upon opening movement initially to move from engagement with one terminal and upon further opening movement to move from engagement with the other terminal
5 whereby the circuit is opened, means adapted to maintain the circuit in closed condition after disengagement of the first terminal and until disengagement of the other terminal, and means to prevent re-closure of
10 the circuit until after both terminals are again engaged by the contacting means upon closing movement thereof.

2. A thermostatically controlled valve including means yieldably to maintain the
15 valve in one position, a device electrically energizable to maintain the valve in another position, a circuit for the device, a pair of spaced terminals in the circuit, a thermostatic element, means movable by the ele-
20 ment to co-operate with said terminals to open and close the circuit thereacross, said means being arranged to be disengaged from the terminals in successive relation, means to maintain the circuit in closed condition
25 after one of said terminals has been disengaged and until disengagement of the second terminal, and means to prevent re-closure of the circuit until after both terminals are again engaged upon closing movement
30 of said co-operable means whereby chattering of the valve is eliminated.

3. An automatically controlled valve including means yieldably to maintain the valve in one position, a device electrically

energizable to maintain the valve in another 35 position, a circuit for the device, a pair of spaced terminals in the circuit, an automatically operable element, means movable by the element to co-operate with said terminals to open and close the circuit there-
40 across, said means being arranged to be disengaged from the terminals in successive relation, and means operable by the energized device to maintain the circuit in device-energizing position after one of said
45 terminals has been disengaged and until disengagement of the second terminal.

4. A thermostatically controlled valve including means yieldably to maintain the valve in one position, an electromagnetic 50 device energizable to maintain the valve in another position, a circuit for the device, a pair of spaced terminals in the circuit, a thermostatic element, contacts movable by the element to open and close the circuit
55 across the terminals, said contacts being arranged to be disengaged from the terminals in successive relation, a supplemental electrical connection leading from the terminal
60 first disengaged to said device, and means operable by the device to open and close said connection whereby the device may be maintained in energized condition after said first
terminal is disengaged and until disengagement of the second terminal. 65

In witness whereof, I have hereunto set my hand this 14th day of October, 1924.

FREDERICK S. DENISON.