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C. A. COBB
ELECTROMAGNETIC VALVE
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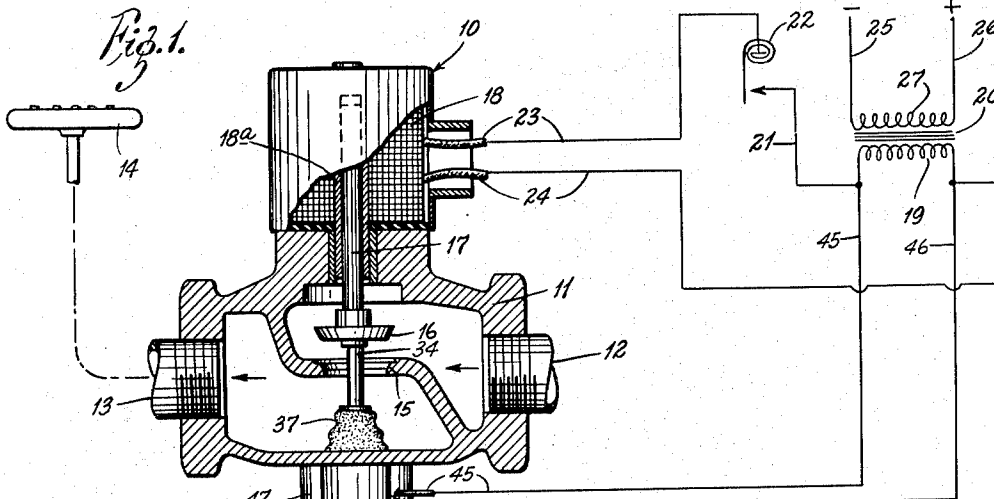
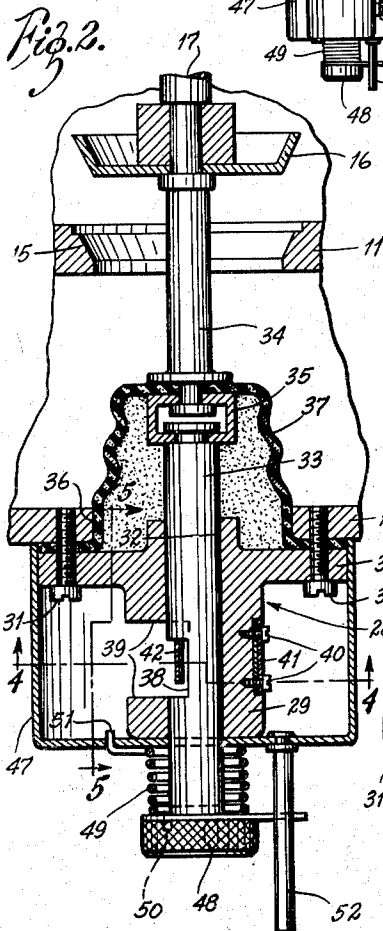
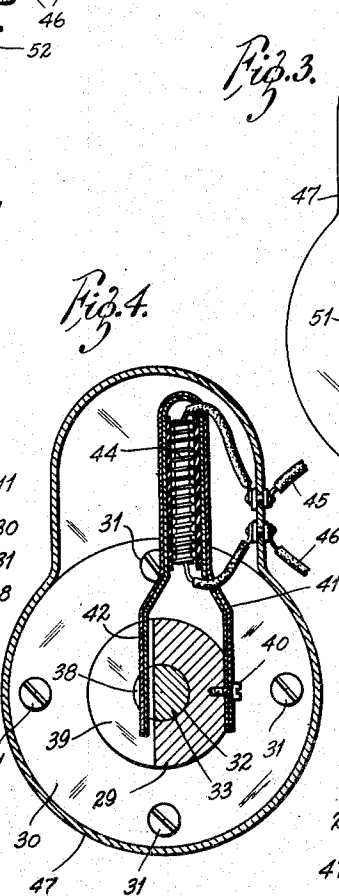
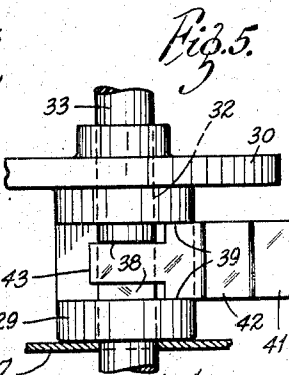


Fig. 5.

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ELECTROMAGNETIC VALVE

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2 Claims. (Cl. 236—75)

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This invention relates generally to electromagnetically operated fuel supply valves, and more particularly to the combination with such valves of means for the manual operation thereof in event of power failure and for the automatic restoration to operation by electromagnetic means upon restoration of power.

It is an object of the present invention to provide in an electromagnetically operated valve novel means for manually moving the valve to an open position and for holding it open in event of power failure.

A further object is to provide novel manual means for opening the valve and means for holding it open, which holding means is manually releasable to permit closing of the valve.

A further object is to provide in an electromagnetically operated valve, manual means for opening the valve and means for holding the valve in an open position when there is no electrical power, which holding means is rendered inoperative upon restoration of power to permit closing of the valve, and in which the operation of the holding means is independent of the operation of the electromagnetic means.

More specifically, it is an object to provide in combination with an electromagnetically operated valve, means for manually opening the valve, means normally operative to hold the valve in an open position once it is opened by said manual means when there is no electrical power, and electrically operated means for causing the holding means to be moved to a position to release and permit the closing of said valve upon restoration of power and in which the electrically operated means and the electromagnetic means have independent circuit connections with the source of electrical power.

Further objects and advantages will become apparent upon reference to the following description and accompanying drawings.

In the drawings,

Fig. 1 is the schematic view showing a preferred form of the present invention together with a burner to which the supply of fuel is controlled by the electromagnetic valve, and a diagram of energizing circuits for the valve.

Fig. 2 is an enlarged fragmentary sectional view of the valve shown in Fig. 1.

Fig. 3 is a bottom view of the manual actuating mechanism.

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

Fig. 5 is a fragmentary view taken on line 5—5 of Fig. 2.

Referring to Fig. 1 of the drawing an electromagnetic valve is generally indicated at 10, hav-

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ing a valve body 11 which has an inlet 12, and an outlet 13 which is connected to a burner 14. The valve body 11 is further provided with a valve seat 15 adapted to be engaged by a vertically reciprocating valve 16. The valve 16 has a stem 17 of magnetic material. Mounted on the body 11 is a solenoid comprising a winding 18, and a central sleeve 18a adapted to receive the valve stem 17 whereby upon energization of the winding 18 the valve is lifted vertically by electromagnetic action to an open position and upon de-energization the valve falls by gravity to a closed position.

A circuit for the control and energization of the solenoid winding 18 is provided and includes the secondary winding 19 of a transformer 20, the lead 21, the thermostatic switch 22 responsive to the temperature of the space heated by the burner 14, a lead 23, the solenoid winding 18, and a lead 24 back to the other side of the secondary winding 19. A source of power is supplied by the leads 25 and 26 connected to the primary winding 27 of the transformer 20.

Mounted on the bottom of the valve body 11 and concentric with valve seat 15 is a guide member generally indicated at 28, having a vertical cylindrical portion 29 and a flange portion 30. Member 28 is attached to the valve body by means of screws 31 passing through the flange 30 thereof. The member 28 is provided with a vertical bore 32 which receives in sliding fit relationship a manual actuating rod 33. The rod 33 has an upper section 34 adapted to engage the under side of valve 16. The upper section 34 is loosely coupled to the lower section 33 by a coupling 35 which permits relative rotation between the sections 33 and 34. An opening 36 in the lower part of the valve body 11 is provided and is sealed by a flexible cup shaped diaphragm member 37 having its rim clamped between the flange 30 of member 28 and the valve body and being attached at its closed end to the lower end of the upper section 34 of the actuating rod thereby to seal the opening 36 and to permit vertical reciprocation of the actuating rods.

The lower section 33 of the actuating rod is provided with a notch 38, and the cylindrical portion 29 of the member 28 is also provided with a somewhat wider notch 39. Mounted on the cylindrical portion 29 of member 28 in a horizontal position and having one leg attached thereto by means of screws 40, is a generally U-shaped bimetal element 41. The free leg 42 of the element 41 is adapted to enter the notch 39 in the member 28. The extreme end of the free leg 42 is reduced in width as indicated at 43 in Fig. 5 and is adapted to engage the notch 38 in

the lower section 33 of the actuating rod. The bimetal element 41 is so constructed that the free leg 42 moves outward from its position in notch 38 upon being heated and inward upon cooling.

Between the legs of the element 41 is mounted a resistance heater 44. An energizing circuit for the heater 44 is provided comprising a lead 45, the secondary winding 19 of the transformer 20, and a lead 46. A casing 47 is provided which encloses the member 28 and associated parts. The lower end of the actuating rod section 33 extends downwardly and exteriorly of the casing 47 through an aperture therein and is provided at its lower end with a knurled head 43. There is provided a helically wound spring 49, biased between the case 47 and the head 43 which urges the actuating rod downward. The spring 49 also acts as a torsion spring urging the actuating rod rotationally in a counterclockwise direction as viewed in Fig. 3 by reason of its having one of its ends connected to the head 43 at 50 and its other end connected to the case 47 at 51. A stop 52 attached to the case 47 is provided which limits the rotation of shaft 33 so as to cause the notch 38 therein to be aligned with the reduced free end 43 of the bimetal element 41.

In operation

In normal operation when there is a supply of electrical power, the valve 16 is opened and closed intermittently to supply fuel to the burner 14 in accordance with the requirements of the space heated thereby. Under these normal conditions the space thermostat 22 controls the operation of the valve.

In the event there is a failure of electrical power at the source 25-26, the valve 16 will fall by gravity to a closed position. Under these conditions if it is desired to open the valve manually in order to continue the supply of heat, the actuating rod 33 is pushed upward, moving the valve to an open position. As the rod 33 is moved upward the free leg 42 of element 41 being cool because heater 44 is inoperative due to lack of electrical energy, will move inward and engage the slot 38, thus preventing the downward return of the actuating rod and preventing the return of the valve to a closed position. If it is desired subsequently to close the valve manually, the knurled head 43 of the actuating rod is rotated clockwise thereby moving the notch 38 out of register with the free end 43 of the bimetal element, which permits the spring 49 to move the actuator downward and permit closing of the valve.

When the knurled head 43 is released after this operation it will automatically be returned rotationally to a position against the stop 52 wherein the notch 38 is again aligned for registration with the free end of the element 41 for subsequent resetting in the open position.

If electrical power is resumed when the valve is set in an open position, the heater 44 will be energized independently of energization of the solenoid winding 18 and will cause the free leg of element 41 to move outward and release the valve and permit it to close, whereafter normal operation of the valve under control of the space thermostat 22 is resumed. This is an important feature of the invention because it often occurs that the space thermostat 22 which necessarily must be included in the solenoid circuit, for the intermittent control of fuel to the burner in accordance with requirements of the space, may be

open at the time power is resumed due to heat being supplied to the space through manual operation of the valve. It will be seen that if the room thermostat is satisfied and in an open position at the time power is resumed and if under these conditions the valve is in an open position the thermostat would continue to stay open and the reset mechanism would not be tripped if it were dependent upon energization of the solenoid winding as in arrangements of this character now in use.

The foregoing description and drawing are intended to be illustrative and not limiting the scope of the invention being defined in the appended claims.

I claim:

1. In combination with a normally closed fuel control valve for a space heating system, an electromagnetic actuator for opening said valve, a source of electrical energy, a circuit for said actuator having connections with said source of energy and including a temperature responsive switch responsive to the temperature of a space to be heated, manual means for moving said valve to an open position, temperature responsive detent means having a position at normal ambient temperatures for holding said valve open once it is opened, and being responsive to heat to move in a position in which it is inoperative to hold said valve open, and a resistance heater for heating said detent means, said heater having circuit connections with said energy source independent of said temperature responsive switch, and being capable of rendering said detent means inoperative when there is a supply of electrical energy at said source.

2. In combination with a normally closed fuel valve for a space heating system, a solenoid actuator for opening said valve, a source of electrical energy, a circuit for said actuator having connections with said source of energy and including a temperature responsive control switch, manual means for moving said valve to an open position, a bi-metal detent having a position at normal ambient temperatures for holding said valve open once it is opened and being responsive to heat to move to a position for releasing said valve, and a resistance heater for heating said detent, said heater having circuit connections with said energy source which are independent of said control switch and said solenoid actuator, whereby said detent is maintained in an inoperative position at all times when there is a supply of electrical energy at said source.

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