

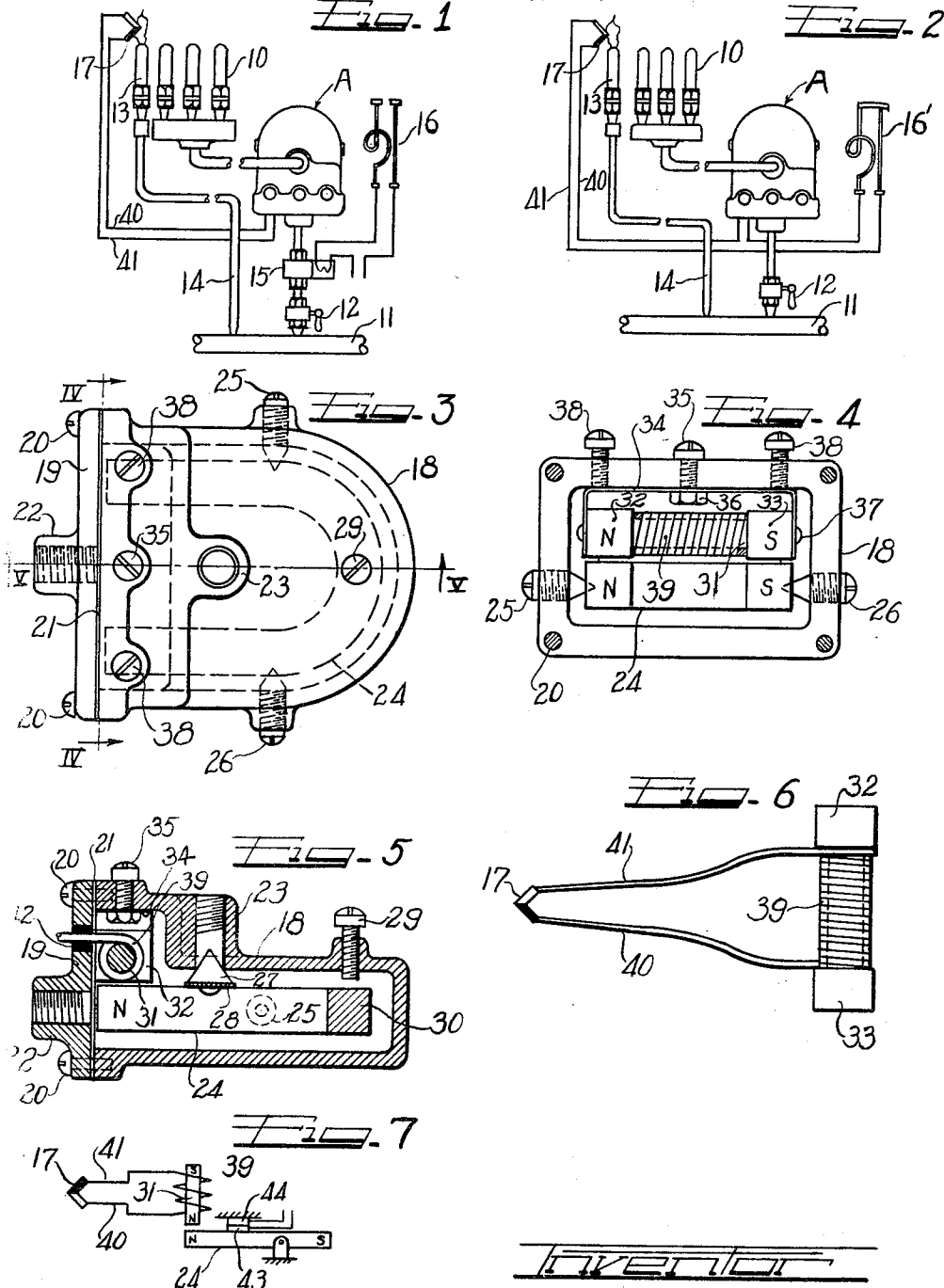
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J. A. WHITTINGTON

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CONTROL DEVICE

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Inventor

James A. Whittington

Charles E. Allen Attys.

UNITED STATES PATENT OFFICE

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CONTROL DEVICE

James A. Whittington, Evanston, Ill.

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The present invention relates in general to control devices and is more particularly concerned with improved means for actuating the controlling elements of devices such as contacts, valves and the like.

While the invention has in the main been herein described in connection with a safety valve for a gas burner, it will be readily appreciated by those skilled in the art that the invention is susceptible of general application, and I therefore do not contemplate limiting the invention to a specific use.

It is a primary object of the invention to provide novel means for the actuation of contact members, valve members and the like, such as may be used in control devices and wherein means including a magnetic element may be utilized to move the contacts or valve members to one position, and means including a second magnetic element in polar opposition to the first magnetic element may be controlled in such a manner as to cause movement of the contacts or valve members to another position.

A further object of the invention is to provide an improved control device arranged to operate on the thermoelectric repulsion principle, which may be utilized as a safety device for controlling electric circuits, flow of fluids and the like upon the occurrence of certain conditions.

A still further object of the invention is to provide, as an article of manufacture, an improved safety valve device that is so arranged as to operate in response to the energization and non-energization of an auxiliary circuit which is preferably connected with thermoelectric generating means.

Another object is to provide, as an article of manufacture, an improved contact device having novel means for actuating the contacts to open and closed positions.

Still another object of the herein described invention is to provide improved automatic control means for gas burners and the like, which are so arranged that supply of gas or fuel to the burner will be automatically shut off in the event that the pilot burner associated with the main burner should have its flame extinguished for any reason, but which will continue to automatically start and stop the burner in response to variations of heat demand so long as the pilot burner flame exists.

Other objects and features of the invention will more fully appear from the following detailed description taken in connection with the accom-

panying drawing, which illustrates several embodiments thereof, and in which:

Figure 1 is a view schematically illustrating one manner in which the present invention may be practiced by utilizing a valve constructed according to the present invention to provide safe operation of a gas burner;

Figure 2 is a similar view, schematically illustrating another arrangement;

Figure 3 is a plan view of a safety valve constructed according to the present invention;

Figure 4 is a transverse section through the valve, taken substantially on line IV-IV of Figure 3;

Figure 5 is a longitudinal sectional view taken substantially on line V-V of Figure 3;

Figure 6 is a detailed plan view of the repulsion magnetic element and its energizing means; and

Figure 7 is a view schematically illustrating a contact control device embodying the present invention.

As shown on the drawing:

As illustrative of the present invention, there is disclosed in Figures 1 and 2 heating mechanism such as utilized in connection with water heaters, furnaces and the like which in general comprises a main burner 10 which is generally connected with a fuel supply conduit as represented at 11 through a suitable manually operable control valve 12. Associated with the main burner is a pilot light, as represented at 13, the pilot light likewise being connected with the fuel supply through suitable conduit connection 14.

Automatic starting and stopping of the main burner may be accomplished in a number of different ways. One manner of making the heating mechanism automatic so as to turn on and shut off the main burner in accordance with heat demand, is to provide an electrically actuated control valve 15 in the fuel supply connection to the main burner. This valve is of the normally open type and may be arranged for control by a thermostatic device 16 having normally open contacts. As usually arranged, this thermostatic device may be adjusted to close its contacts at a predetermined temperature, whereupon the valve 15 will operate to close the fuel supply and shut off the main burner. As soon as the thermostatic contacts open the valve 15 will open and thus start up the main burner.

Satisfactory operation of such an arrangement is dependent upon the maintenance of a flame at the pilot light 13. It will be appreciated that if this flame should become extinguished there arises a possibility of turning on the fuel supply

to the main burner, and that this burner might not be lighted due to the absence of flame at the pilot light. Under certain conditions, and particularly where the burner is operating upon gas, a dangerous and hazardous condition ensues, wherein gas is being supplied to the burner and is not being burned. This gas may be disseminated into the surrounding atmosphere and, if it becomes lighted, cause a dangerous explosion which may endanger human life, and, even if the gas is not ignited, human life might be endangered by breathing the gas.

It is therefore required, in such installations, that some form of safety device be installed to prevent the occurrence of this condition. In the present arrangement, safe operation is accomplished by providing a safety valve as generally indicated at A, this valve being disposed, in the arrangement shown in Figures 1 and 2, in the fuel supply of the main burner. This valve, as will hereinafter be described in detail, is so constructed as to be controllable through a suitable connection with a thermocouple 17 disposed in the flame path of the pilot burner. In general, the operation is such that so long as the flame exists at the pilot light, the safety valve will remain in open position and enable automatic control by means of valve 15, but, should the pilot flame become extinguished, the safety valve will operate to close the supply of fuel to the main burner.

More specifically, the safety valve A comprises a hollow housing or casing 18 of brass or other suitable non-magnetic material. This housing is open at one end, which is adapted to be closed by a removable cover or end plate 19, which may be removably secured to the housing as by screws 20, a gasket 21 being preferably provided to prevent leakage. The end plate 19 is formed with a projecting boss 22 having suitable internal threads to facilitate a pipe connection thereto and form communication with the interior of the housing. The top of the housing is also provided with a boss portion 23 having a passage therethrough forming another communication with the interior of the housing, this passage being internally threaded in a similar manner for pipe connection.

A horseshoe magnet 24 is disposed within the housing 18 with its pole ends adjacent the end plate 19. This magnet is pivotally supported by laterally disposed pivot pins 25 and 26, threadedly supported in the housing for longitudinal adjustment and having their innermost ends pointed for introduction into appropriate recesses in the spaced legs of the magnet. These pivot pins support the magnet for swinging movement and are so disposed that the magnet is overbalanced on the side of the pivot pins containing the polar ends of the magnet. That is, the pole ends of the magnet normally tend to swing downwardly and pivot the magnet in a counterclockwise direction as viewed in Fig. 5.

For controlling flow to the housing, there is provided a conical shaped valve member 27 which is supported intermediate the legs of the magnet upon a bridging member 28. The apex end of the valve member 27 is adapted to move into and out of the passage defined by the boss 23 to thus effect a valving action upon swinging movement of the magnet in opposite directions.

In order to limit counterclockwise movement of the magnet, there is provided in the housing a screw 29 having its innermost end disposed in the path of movement of the leg bridging portion 30 of the magnet. It is thus possible, through the

adjustment of the screw 29, to limit the drop out or opening movement of the magnet and consequently the valve member 27. With the construction just described, it will be appreciated that the valve will be normally biased to open position.

Within the housing 18 adjacent the plate 19, there is disposed above the lower end of the magnet an armature 31 constructed of a high permeability iron or special alloy. This armature is provided at its end with pole pieces 32 and 33 which are disposed directly over the pole ends of the permanent magnet. This armature is supported from the top of the housing by an inverted U-shaped spring 34 secured at its center as by a bolt 35 and associated nut 36 adapted to engage the under side of the spring and hold the spring against the inner surface of the housing top. The legs of this spring are respectively secured as by rivets 37 or otherwise to the armature pole pieces.

Laterally spaced on either side of the bolt 35, a pair of adjusting screws 38—38 are threadedly mounted for longitudinal movement in the housing, the innermost ends of these screws respectively engaging the spring 34 adjacent the ends of its bridging portion. With this arrangement, it will be evident that by adjusting the screws 38—38 inwardly and outwardly, the spring 34 may be flexed and caused to raise and lower the armature 31, whereby the air gap between its pole pieces 32 and 33 and the polar portions of the permanent magnet may be adjusted to desirable values.

The armature 31, thus being normally fixed as to position, will complete the magnetic circuit of the permanent magnet, and due to the magneto motive force set up, the pole ends of the permanent magnet will be attracted towards the armature with the result that the permanent magnet will assume a position as shown in Figure 5, wherein the valve member 27 closes its associated passage and thus interrupts flow through the housing 18.

For opening the valve member 27, an arrangement is provided whereby the magnetic attraction of the poles of the armature 31 may be rendered ineffectual so as to permit the magnet to swing in a counter clockwise direction by virtue of its unbalanced mounting. This is accomplished by providing an energizing coil 39 on the armature between its pole pieces, the direction of this winding being such that it will set up a magnetizing field in a direction to oppose the magnetic field between the poles of the permanent magnet. That is, referring to Figure 4, if the left pole of the permanent magnet is a north and the right pole a south pole, then the armature would be so magnetized as to make the pole piece 32 a north pole and the pole piece 33 a south pole.

With the armature magnetized in the manner just described, the attractive force which exists between the poles of the permanent magnet and the armature when no current is flowing in the coil 39, will be neutralized and a repulsion effect produced by the armature, when current is flowing in the coil 39. The permanent magnet is then moved in a counter-clockwise direction to open the valve.

The ends of the coil 39 are connected to one or more thermo-electric generators, in this case thermo-couples as indicated at 17. These thermo-couples, when disposed in the flame of the pilot light 13 will generate sufficient current to bring about the opposing magnetization of

the armature 31, as described above. The connections 40 and 41 between the coil 39 and the thermo-couples may be brought out through the plate 19 through a suitable sealed opening 42.

It will be appreciated that the arrangement described above for operating the valve may appropriately be utilized in a control device for an electric circuit, contacts being substituted for the valve members. Such an arrangement is schematically illustrated in Figure 7, wherein contacts 43 and 44 are provided. One of these contacts is fixedly supported, whereas the other is mounted on the permanent magnet for movement into and out of engagement with the fixed contact.

It will be appreciated that although I have shown the permanent magnet as being supported on its pivot in a manner to produce unbiased swinging movement thereof in a counterclockwise direction, the magnet might be supported in balanced position on its pivots and the biased movement secured by means of a suitable spring.

Referring again to the control means illustrated in Figure 1, it will be noted that the thermo-couple is directly connected with the coil 39 through conductors 40 and 41, and that the thermostat device 16 is associated with the automatic control valve 15.

As shown in Figure 2, the burner control arrangement may be simplified and be made less expensive by eliminating the valve 15 and connecting a cold-closed thermostat 16' in one of the connections from the thermo-couple to the coil 39. With this arrangement, the thermostat will act to establish and interrupt energization of the coil 39 from the thermo-couple so long as the pilot flame continues, and thus open and close the valve in accordance with heat demands. However, should the pilot flame at any time become extinguished, the source of current to coil 39 is discontinued with the result that the valve immediately closes the fuel supply to the main burner and prevents further control thereof by the thermostat.

It is, of course, to be understood that although I have described in detail several embodiments of my invention, the invention is not to be thus

limited, but only insofar as defined by the scope and spirit of the appended claims.

I claim as my invention:

1. A control device comprising a casing having means defining an inlet at one end of the casing and having means defining a side outlet in a side wall of the casing, a U-shaped permanent magnet in said casing having its free ends adjacent said inlet, a valve member seated on the two limbs of said permanent magnet and in aligned relation to said outlet, spaced opposed pivot pins on said casing engaging said limbs at points intermediate said valve member and the closed end of the magnet for normal swinging movement of said valve member away from said outlet to open said outlet, a second magnet in said casing and disposed facing the free ends of said permanent magnet to normally attract said free ends for holding said valve member in closing position in said outlet, and coil means on said second magnet energizable to effect release of the free ends of the permanent magnet for movement of said valve member to outlet-opening position.

2. A control device comprising a casing having means defining an inlet at one end of the casing and having means defining a side outlet in a side wall of the casing, a U-shaped permanent magnet having its two free ends adjacent said inlet and on opposite sides thereof, a bridging member on the limbs of said magnet, a valve member on said bridging member and in aligned relation to said outlet, spaced opposed pivot pins on said casing engaging said limbs at points intermediate said bridging member and the closed end of said magnet for normal swinging movement of said valve member to open said outlet, a second magnet in said casing disposed to one side of said inlet to normally attract the free ends of said permanent magnet for holding said valve in closing position in said outlet, and coil means on said second magnet energizable to effect release of the free ends of said permanent magnet for movement of said valve member to outlet-opening position.

JAMES A. WHITTINGTON.