

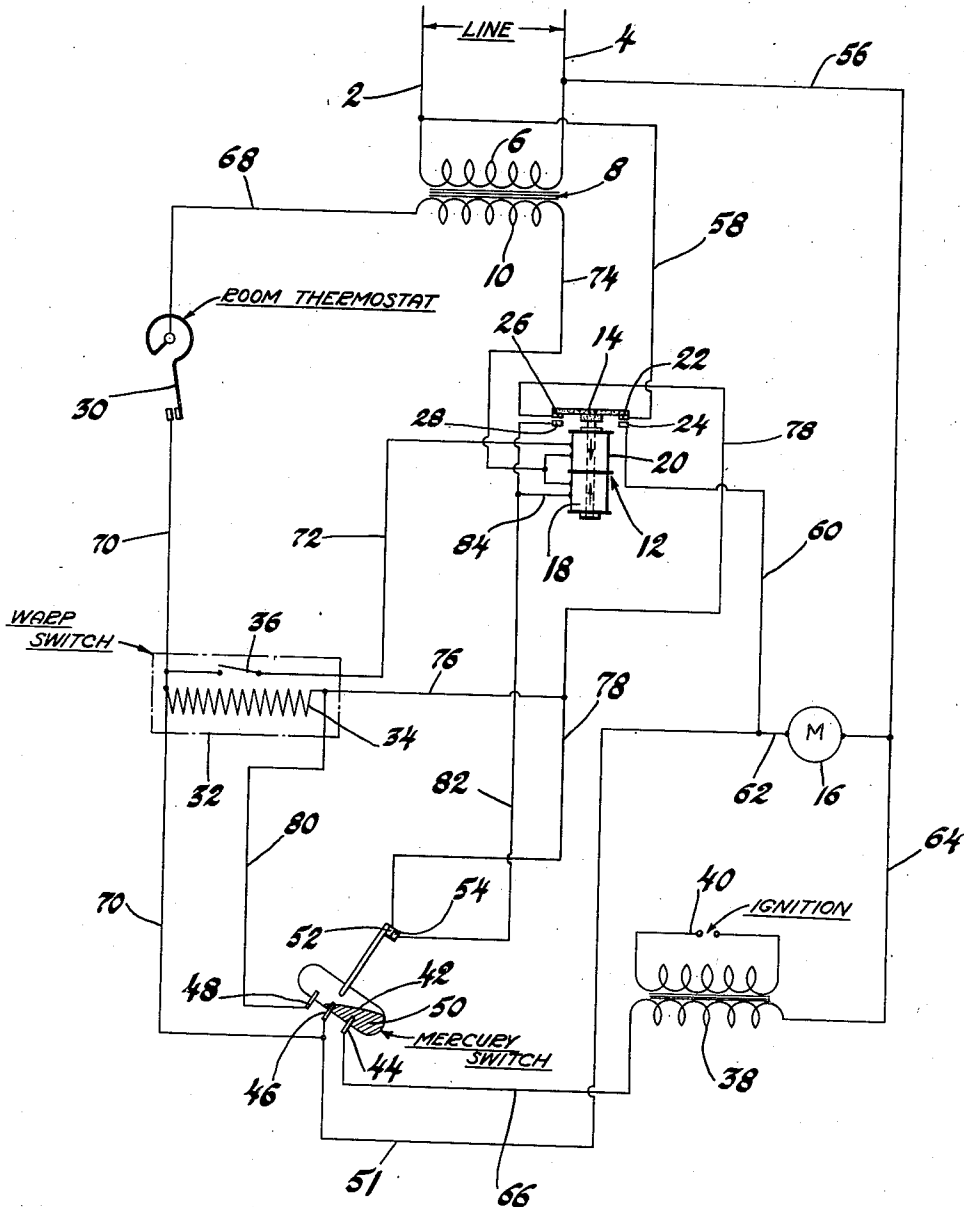
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OIL BURNER CONTROL

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OIL BURNER CONTROL

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1 Claim. (Cl. 158—28)

This invention relates to control systems and more specifically to control systems that are used for controlling fluid fuel burners such as oil burners.

5 With the advent of oil heat used for domestic purposes it has become necessary to supply with the burner a control system therefor which it will be practically unnecessary to adjust except for temperature level and which is sturdy in operation
10 so that the householder will be able to give the whole a minimum of attention. There is, of course, a certain sequence of operations that such a system must proceed to carry on. Mainly, it must, upon a fall in temperature in the space to be heated, supply heat to that area and upon a
15 rise in temperature to a sufficient amount it must cease to operate. Then there must be taken into account the various abnormal conditions of operation and safety means must be included in the circuit to take care of these various
20 abnormalities of operation.

Some of the circumstances which the control system must be able to accommodate are: (1) In case of failure of the burner to start initially
25 the whole system must be cut off. (2) In case of flame failure during normal operation of the burner due to air or water in the oil line or some other similar cause the device must again go to a safety position and (3) Upon failure of
30 current when the burner is operating normally there must be a delay before the ignition is again allowed to go on to prevent an explosion within the furnace.

It is, therefore an object of my invention to
35 provide a simple and efficient control system incorporating the above safety factors which may be readily operated with the smallest amount of attention.

40 With this and other objects in view which will become obvious as the specification proceeds, my invention resides in the construction described in the specification and illustrated in the accompanying drawing in which the figure illustrates a schematic wire diagram of the construction in
45 my invention.

Supply lines 2 and 4 may be connected to any desired source of electricity and are usually the 110 volt power lines operated from the power source. Connected directly across the lines 2
50 and 4 is the primary 6, of a transformer 8, the secondary 10 of which supplies current to an operating relay 12 which operates to close its armature 14 to control the fuel supply motor 16, the latter being used to supply fuel and air for
55 combustion into the furnace. The relay 12 is

composed of two coils 18 and 20, the coil 18 operating normally to attract the armature 14 in which case the switch points 22—24 and 26—28 would be closed and the second coil 20 when energized acting to oppose or buck the first coil 18 and therefore allowing the armature 14 to be released to open the above mentioned switches.

A room thermostat 30 is, of course, placed within the desired area to be heated. A suitable time element warp switch 32 is provided having a heating coil 34 and a switch member 36 operated thereby to give desired safety features. An ignition transformer 38 which provides a high tension current from its secondary to be applied across the spark gap 40 is provided for ignition
15 purposes.

There is also provided a stack switch in the form of a tiltable mercury switch 42 having three contacts therein 44, 46 and 48 which are bridged at different positions of the tube by a globule of mercury 50 depending upon the horizontal position of the tube. Also attached to the tube is a movable contact member 52 which is adapted at certain positions to cooperate with a stationary contact 54 to open or close a desired circuit.

The motor 16 is connected to the main high voltage line by wires 56—58, switch points 22—24 and wires 60 and 62. The ignition transformer 38 is connected in parallel with the motor 16 and directly across the same by the wires 64, primary of the transformer 38, line 66, contact 44, mercury 50, contact 46 and wire 51. In the secondary circuit the transformer secondary 10 is connected by wire 68 to room thermostat 30 which is in turn connected to the warp switch 36 by wire 70 and the latter by wire 72 to the bucking coil 20, the latter being connected back to the secondary 10 by line 74. Line 70 is also connected to the heating coil 34 of the warp switch, the opposite terminal being connected first to the contact 26 on the relay armature by lines 76 and 78 and second to terminal 48 of the tiltable mercury switch by line 80. Line 78 is also connected at its lower extremity on the diagram to movable contact 52 and stationary contact 54 is connected by line 82 to contact 28 of the relay armature and also by line 84 to one terminal of the pull coil 18 of the relay. It may also be mentioned in passing that line 74 is connected directly to one terminal of each of the bucking and pull coils 18 and 20.

In the normal inoperative condition of the circuit the motor is deenergized due to the fact that contacts 22—24 are open which also of course deenergizes the ignition. The stack control

switch 42 is in the position shown with the mercury bridging the two lower contacts 44-46. The warp switch 36 is in its open position. Contacts 52 and 54 are closed as shown and the room thermostat is open. With this as a normal condition, the following constitutes the series of operation.

When the room thermostat 30 calls for heat, current is supplied by the secondary 10 of the transformer and flows through the following circuit: line 68, room thermostat 30, line 70, heating coil 34, lines 76, 78, contacts 52 and 54, lines 82-84, relay coil 18 and line 74 back to the secondary 10. This causes the relay coil 18 to attract its armature and closes both sets of contacts 22-24 and 26-28. The closure of the first set of contacts 22-24 starts the motor 16 in operation through the following circuit: lines 2 and 58, contacts 22-24, lines 60, 62, motor 16 and line 56 back to line 4. The motor therefore commences at this time to project fuel and air into the combustion chamber. At the same time the ignition is energized in parallel with the motor through the following circuit across the latter: line 51, contact 46, mercury 50, contact 44, primary 38 and line 64. This causes sparks to jump across the ignition gap which ignites the oil within the burner and starts combustion.

If the various portions of the apparatus are operating normally the stack switch will heat up, the bimetallic coil tending to rotate the mercury switch in a counterclockwise direction as shown which will open contacts 52 and 54 and the initial circuit to the relay coil 18. However, the closure of the armature contacts 26-28 has provided a by-pass for maintaining current through the relay coil 18 as follows: line 78, contacts 26 and 28 and line 82, stack relay coil 18 will thus be maintained energized after the contacts 52-54 open. At the same time as the mercury switch is rotated the circuit between contacts 44 and 46 will be broken and the ignition transformer deenergized therefore shutting off the ignition. Also contacts 46 and 48 will be bridged by the mercury providing a shunt path directly around heat element 34 which removes the heavy flow of current therethrough and prevents any operation of the warp switch. Therefore, the burner will continue in normal operation until the room thermostat is satisfied at which time it will open its contacts and the system will be deenergized.

If, however, upon energizing of the system for some reason or other the combustion does not take place, the mercury switch 42 will not be

rotated, but the heat coil 34 will remain fully in circuit and receive a fairly high current. After a predetermined time this will cause switch 36, which is responsive to the heat of the coil to close, and this will place in circuit the bucking coil 20 by an obvious circuit which will act to oppose and overcome the attraction of coil 18 and the armature 14 thereof will be allowed to move upwardly and break both the shunting switch 26 and 28 and motor switch 22-24 and return the motor to its off position. In order to deenergize the heating coil 34 after the system has gone to safety position, it is only necessary to manually open the room thermostat contacts for a short period to allow the coil to cool and open switch 36.

Assuming as a second possibility that the furnace is operating normally and flame in the burner ceases for some particular reason as pointed out thereinbefore, the mercury switch 42 will commence to rotate in a clockwise position as the temperature in the furnace falls and at some point the mercury will be caused to move to the right-hand portion thereby opening the shunt around the warp switch coil 34 placing it fully in the circuit and the operation will be the same as that previously described whereby the bucking coil is placed in the circuit to overcome the relay coil.

I claim:

In a control system for fluid fuel burners, a power circuit, a motor therein to provide fuel for burning, a motor switch in said power circuit controlling the operative periods of the motor, a pair of parallel control circuits, a switch responsive to heat demand for controlling the energization of both control circuits, one control circuit comprising a relay coil for closing said motor switch when energized, a heating coil in series with said relay coil, and a switch constructed to close in response to combustion and bridging said heating coil, the other control circuit comprising a second relay coil constructed to counteract, when energized, the magnetic field of the first relay coil, and a switch in series with the second relay coil, said last switch being constructed to close or open following periods of energization or deenergization of said heating coil, whereby during heat demand a failure of the combustion responsive switch to close permits the heating coil to remain energized and the second relay coil to be energized until the heat demand switch is manually opened.

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