

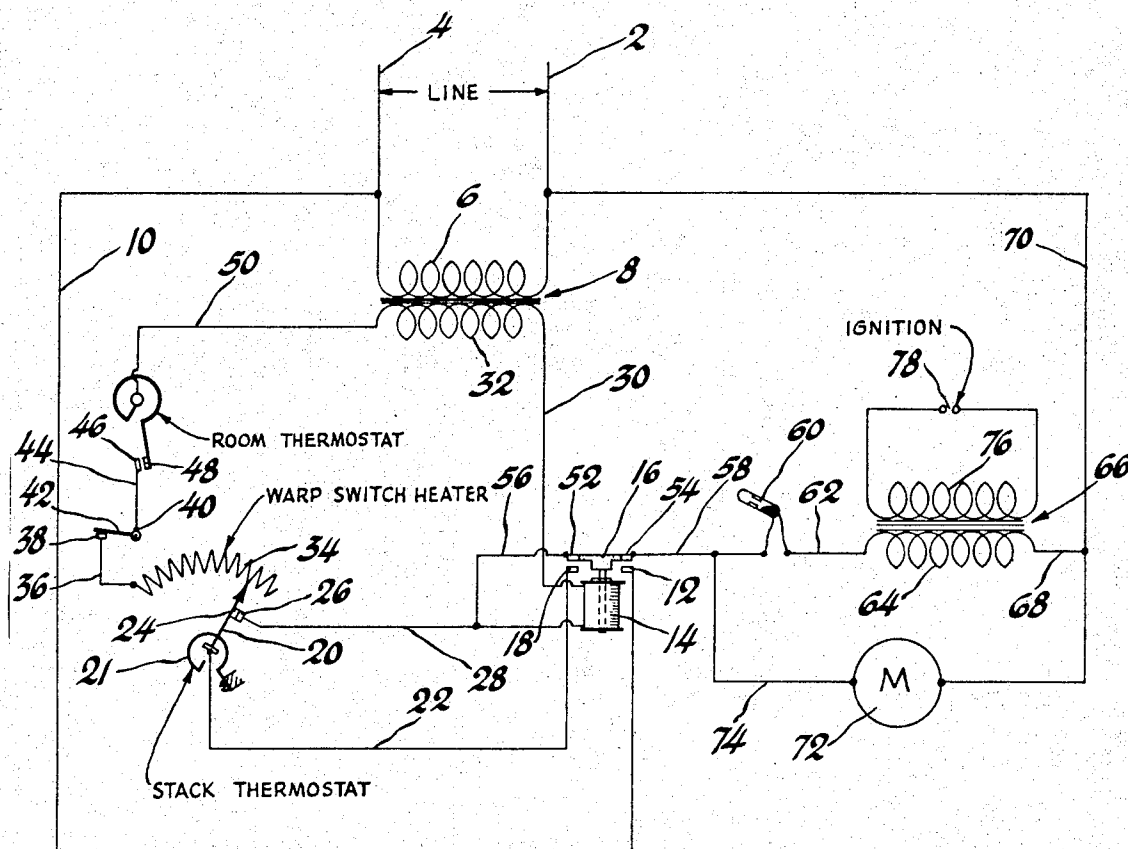
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OIL BURNER CONTROL VARIABLE RESISTANCE OPERATED STACK SWITCH

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OIL BURNER CONTROL VARIABLE RESISTANCE OPERATED STACK SWITCH

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1 Claim. (Cl. 158—28)

This invention relates to electric control circuits generally and more specifically to control circuits that are primarily adapted to be used for controlling various heating systems such as oil burners.

In designing a control circuit for oil burner operation there are certain fundamental operations which it is necessary to fulfill from a standpoint of safety of operation and these may be stated briefly as follows:

The apparatus must be completely turned off if, First: The oil burner does not ignite upon an initiation of operation through thermostatic actuation upon a call for heat from some control station.

Second: There must also be a provision for shutting down the whole system if at any time the flame is extinguished for any reason and,

Third: There must be a provision to throw the system into safety if the current is discontinued for even a short period of time.

With these primary factors in mind, it is the purpose of my invention to provide a circuit fulfilling these requirements and at the same time being comparatively simple in construction.

For a better understanding of the nature and objects of my invention reference is made to the following specification wherein there are described the embodiments of my invention which are illustrated in the accompanying drawing, in which:

The figure shows a diagrammatic wiring system of the circuit of my invention.

Referring specifically thereto, the source of current is applied across lines 2, 4 and is applied to the primary 6 of the transformer generally designated at 8. To the line 4 is connected line 10 whose opposite end is connected to one contact 12 of a relay switch 14. The contact 18 opposite contact 12 is connected by the line 22 to a rotatable needle 20 adapted to be rotated by the bimetallic stack element 21. This needle 20 carries adjacent its outer end a contact 24 which cooperates with a stationary contact 26 connected to line 28 and thereby to one side of the actuating coil for the relay 14, the opposite side of the relay coil being connected by line 30 to one side of the secondary 32 of the transformer 8. The end of the needle 20 moves along an arcuate path and is designed to traverse a resistance heating coil 34 and to act with rheostatic action thereover to cut in or out of the circuit varying amounts of resistance.

One end of the heater coil is connected by line 36 to contact 38 which with its cooperating con-

tact 40 is bridged by a switch member 42 which switch member may be termed the "warp switch" and is actuated by a bimetallic element whose position is controlled by the amount of heat supplied thereto by the heating coil. The term "switches" in this application is used in a broad, generic sense and they may either be mercury switches, contact switches, or any other type which it is deemed desirable to use. Contact 40 is connected by line 44 to one contact 46 of the room thermostat, the opposite contact 48 of which is connected through the thermostat and through a line 50 to the opposite side of the secondary 32.

The movable armature 16 of the relay 14 is made of insulating material and carries thereon two movable contacts 52, 54. The contact 52 is connected to line 28 by line 56 and the opposite contact 54 is connected by line 58 to one terminal of a mercury switch 60, the opposite terminal of which is connected by line 62 to a primary winding 64 of the ignition transformer, generally designated at 66, the opposite end of the coil 64 being connected by lines 68, 70 to the main line 2. A blower motor 72 is connected across the primary 64 and is connected to line 58 by line 74, the opposite side of the motor being connected directly to line 70.

Adjacent the primary coil 64 of the ignition transformer is a secondary winding 76 across which is connected a spark gap 78 across which the charge is dispelled to cause a spark and thereby ignite the incoming oil. The bimetallic stack element 21 which as before mentioned rotates the needle 20, also has connected on its shaft means for operating or rotating the mercury tube 60, the purpose of which will become evident as the description proceeds.

The operation of the device is as follows:

Considering that all of the apparatus is in a condition of rest or de-energization, the room thermostat contacts 46, 48 are open as a sufficient temperature is present in the area to be heated. Switch 42 is closed across contacts 38, 40 as this element is normally in that position unless abnormal conditions are present to open said switch, after which it then requires a manual reset. The thermostatic element holds the needle 20 in the position shown and in which position contacts 24, 26 are closed. The relay is in its uppermost position which keeps contacts 18, 52 open and 12, 54 open and the mercury switch is in its closed position. At this time therefore, the room thermostat closes contacts 46, 48 as the temperature drops sufficiently to require additional heat. A circuit is now completed from secondary coil 55

32 to line 50, room thermostat contacts 46, 48, line 44, switch 42, line 36, heating resistance coil 34, needle 20, contacts 24, 26, line 23, relay coil 14 and line 30 back to the secondary. This current energizes the relay thereby attracting its armature which closes contacts 18, 52 and also 12, 54. A circuit is completed through the last mentioned contacts to the motor which now begins to rotate through the following circuit: line 4, line 10, contacts 12, 54, line 58, line 74, motor 72 and line 70 back to the opposite incoming line 2. The motor therefore starts up at the time the motor circuit is completed.

A circuit is also completed through mercury switch 60, line 62, primary 64 of the ignition transformer and line 68 in addition to the various lines mentioned in connection with the motor to energize the ignition transformer which current of course is transmitted to the secondary winding 76 and sparks begin to jump across the gap 78 to ignite the oil. Therefore, considering normal operation, the oil is ignited and the temperature in the stack increases which affects the stack bimetallic element which with the application of heat commences to rotate the needle 20 in a counterclockwise direction as shown in the drawing and at the same time turns the ignition switch 60 which after sufficient travel cuts out the ignition transformer. Therefore, as the needle 20 passes over the resistance heating coil 34 it cuts out more and more of the current until there is an insufficient amount left to supply enough heat to throw out the warp switch.

It will also be noted that as soon as the needle 20 moves it breaks contacts 24, 26 but contacts 18, 52 closing provides a shunt around the contacts 24, 26 so that their opening will now cause no change. If for any reason the burner does not start and the oil does not ignite, there will be no increase in the temperature and therefore the needle 20 will remain on the right-hand portion of the heating coil and the passage of the current through the coil 34 will heat up the same and after a predetermined time interval the warp switch 42 will open.

Considering that the burner is operating normally and delivering heat and there is a flame failure for any reason such as a certain amount of water or air in the oil, the following operation will take place:

The burner motor will continue to run but the

stack element will start to cool off thereby turning the needle 20 in a clockwise direction and increasing the amount of the heating element in the circuit which after a short set time will again cause the warp switch to open and shut down the whole circuit. It might also be mentioned in this connection that while the stack switch element in cooling down returns the needle 20 in a clockwise direction, that there is provided a mechanical interlock to prevent the return of the mercury switch at this time so that ignition may not come on under these conditions but that the burner will be shut down.

If there is a momentary failure of current when the burner is operating normally the relay will at once be de-energized and its armature will cause the contacts 18, 52 and 12, 54 to be broken and since the needle 20 is in a position adjacent the left-hand portion of the heating coil due to the forces supplied by the stack element, the contacts 24, 26 will be opened. There will be no circuit by which the relay may again be energized until the stack switch has cooled sufficiently to close contacts 24, 26, which will therefore give a time delay to allow the heated vapors to clear from the furnace before the device again recycles.

It is therefore evident that I have provided a simple circuit which fulfills the various requirements of safety as previously set forth.

I claim:

In a control system for fuel burners, a high and a low voltage circuit, a fuel propelling means and a switch therefor in the high voltage circuit, a room thermostat, switch contacts, electrical heating coil for actuating said contacts and a relay coil all in series in the low voltage circuit, said relay actuating the high voltage switch, a member movable over the heating coil to vary the amount thereof in circuit, a stationary contact, a contact cooperating therewith on the movable member, said member closing the pair of contacts at one extremity of its travel, means for moving the member actuated by combustion temperature, a shunt circuit around the last-named contacts and a pair of contacts in said shunt circuit actuated by the relay coil simultaneously with the high voltage switch whereby a starting and a holding circuit is provided for the relay coil.

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