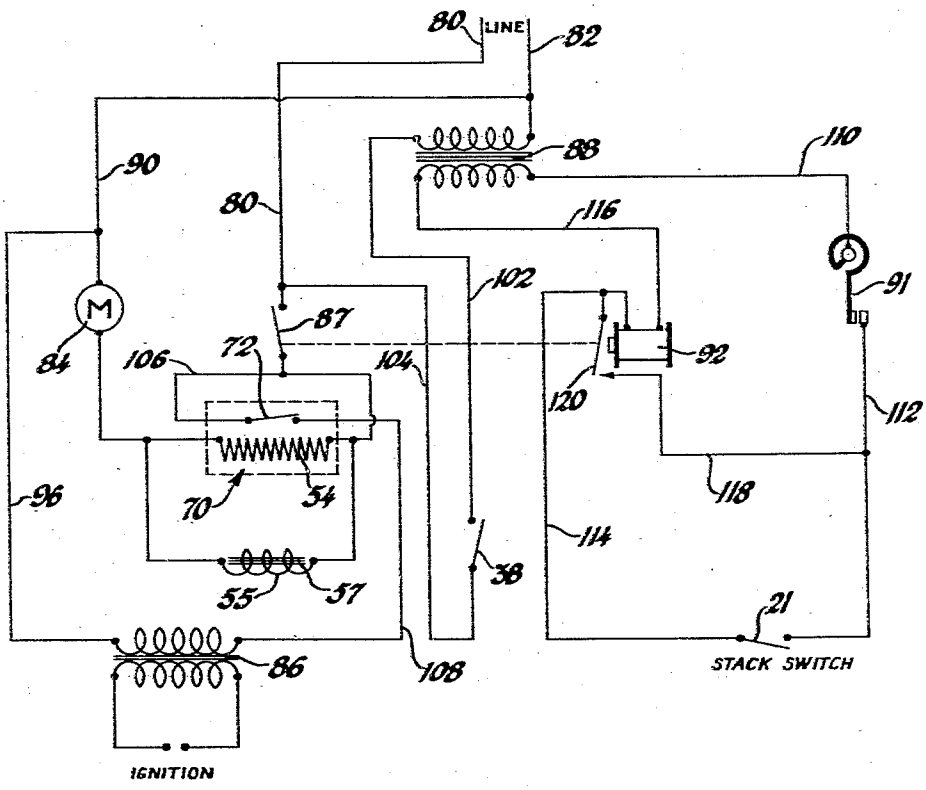
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OIL BURNER CONTROL

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OIL BURNER CONTROL

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2 Claims. (Cl. 158—28)

This invention relates to control apparatus and more specifically to apparatus for controlling fluid fuel burners for heating purposes.

In utilizing various control systems of the present day for operating fluid fuel burners for domestic purposes, it is of course necessary to have in circuit therewith certain safety means and has become rather common practice to use what is termed a "safety switch" for this purpose. These safety switches are usually in the form of an electric heating coil, the heat generated thereby being applied to a bimetal warp switch which upon the application of a certain amount of heat causes a switch to open, said switch requiring manual reset and this assembly has become known as the safety switch.

Since it is actuated by the heat generated by the heating coil and is usually designed to operate its switch after a certain predetermined set interval, it will be apparent that the amount of current flowing through the heating coil will very materially affect the operation with respect to the time required which may be critical.

In the disclosure of our pending application Serial No. 138,688 filed April 24, 1937, of which this application is a continuation in part, the warp switch heating coil is placed in series with the burner motor and as such is subject to the various current fluctuations due to motor operation.

It is therefore an object of this invention to provide regulating means so that the current flowing through the heating coil will remain substantially constant and the time interval will not be altered regardless of line current variation.

With this and other objects in view, which will become evident as the specification proceeds, our invention resides in the construction as outlined in the following specification and claims and illustrated in the accompanying drawing, in which:

The figure is a schematic wiring diagram of a burner control system embodying our invention.

Referring now more specifically to the figure, there is shown a suitable pair of incoming lines 80 and 82 for supplying the necessary current to which a motor 84 is connected which supplies a combustible mixture to the furnace. An ignition transformer 86 and a main transformer 88 are also provided and are connected to the source. A room thermostat 91 and a relay 92 complete the conventional control circuit when taken in combination with the safety switch 70 which is composed of a switch member 38 and a heating coil 54 as well as an auxiliary ignition switch 72 which is also operated by the heating effect. Added to this portion of the usual apparatus is a reactor or choke coil 55 whose operation will later be obvious.

It will be obvious from a short study of the drawing that there are two separate portions of the circuit, namely the high and low voltage sides, and in the high voltage side we have a main motor circuit including line 80, motor switch 87, heater coil 54, motor 84, line 90 back to the opposite incoming line 82.

Also connected across the main line is the primary of the transformer 88 which is in series with a safety switch 38, through line 102 which is also connected back to incoming line 80 adjacent the motor switch 87 by line 104.

The motor switch 87 is also connected through line 106 to the ignition switch 72 thence through line 108 to the primary of the ignition transformer 86 which is then connected back through line 96 to line 90.

Referring now to the secondary or low voltage portion of the control circuit we have the secondary of the transformer 88 connected directly to the thermostat 91 by line 110, the latter being connected by line 112 to a stack switch 21 operated by combustion temperatures within the burner and being normally closed when cold and opening upon a given rise in temperature within the furnace. This latter switch is then connected through line 114 to relay 92 and thence back to the secondary of the transformer 88 through a line 116. There is also connected across from line 112 to line 114 a shunt line 118 having therein a holding switch 120 operated by the relay 92.

It is therefore obvious that with the switches 21, 72 and 38 normally closed during inoperative periods, when the room thermostat 91 closes its contacts to call for heat the relay 92 will be energized through an obvious circuit and close switches 87 and 120, the first completing a circuit through the motor and also through the ignition coil and the second closing a holding circuit for the relay itself so that when the temperature within the burner increases and stack switch 21 opens the relay will still remain energized if the room thermostat is closed.

After a certain period of heating of the coil 54 through which the motor current flows, the switch 72 is designed to open thereby cutting off the ignition but switch 38 is prevented from opening after a further period by a certain interlock (not shown herein) operated in conjunction with the stack switch. It is therefore obvious that normally the total motor current in this construction would pass through the heating coil 54 for the

warp member and therefore the heating effect thereof is subject to the fluctuations in the amount of current drawn therethrough by the motor. As an example of this fluctuation, one of the present commercial type of burner motors has been found to have an input variation of from 175 to 190 watts when the motor is new, or approximately 8%. Of course if the motor is old and other losses increase, the variation may be higher. It has also been noted that the line voltage on power supply systems may vary ±15%, depending upon the load and feeder size. There is thus a possible variation of 38% in current input to the motor. The normal motor current is 2.5 amperes. A plus or minus 19% variation would mean a variation of from 2.03 to 2.97 amperes. As the current through the motor circuit varies, the heat produced by coil **54** will also vary and therefore the time of operation of the bimetal arm will vary. As an example of this, one of the resistors used had a value of 1.6 ohms and therefore with the above current variation the variation in dissipation in watts in the resistor would be 6.6 to 14.1 watts. This might cause the ignition to be deenergized too soon or might cause the warp switch **38** to open before the stack interlock has had sufficient opportunity to mechanically prevent this.

In order therefore to overcome this and to provide for a definite set time interval under any current variation a reactor coil **55** is placed in parallel with the heating coil **54** to act as a regulator therefor. This reactor coil since it is placed directly in parallel with the resistance element **54** is subject to the same voltage and the reactor therefore functions as an automatic voltage regulator. The value of the reactor, a. an example, has a voltage drop across it of 4 volts at 110 line voltage. The core **57** of the reactor is so designed that when the motor current flowing in the circuit is normal the core is nearly saturated and hence the impedance is substantially constant.

Therefore since the voltage drop across the reactor is a function of the impedance in circuit, the proper amount and grade of iron for the core may be selected to insure a substantially constant voltage for a specified current variation. Therefore since the voltage across the reactor coil is maintained substantially constant, that across the resistor coil is the same and the heat produced by the heating coil and the time of operation of the bimetal arm will always remain the same.

We claim:

1. In a control mechanism for fluid fuel burners, electrically operated means for discharging a combustible mixture into a zone of combustion, a thermal time switch controlling the means and an electric heating coil supplying heat thereto and in series with said first-named means, and means regulating the current through the heating means to maintain the same substantially constant.

2. In a control mechanism for fluid fuel burners, an electric motor for discharging fuel, a thermal time switch controlling motor operation, a heating coil for the time switch in series with the motor and a reactor coil in a parallel circuit to the heating coil for maintaining the current through the heating coil substantially constant irrespective of fluctuations in the motor current.

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