

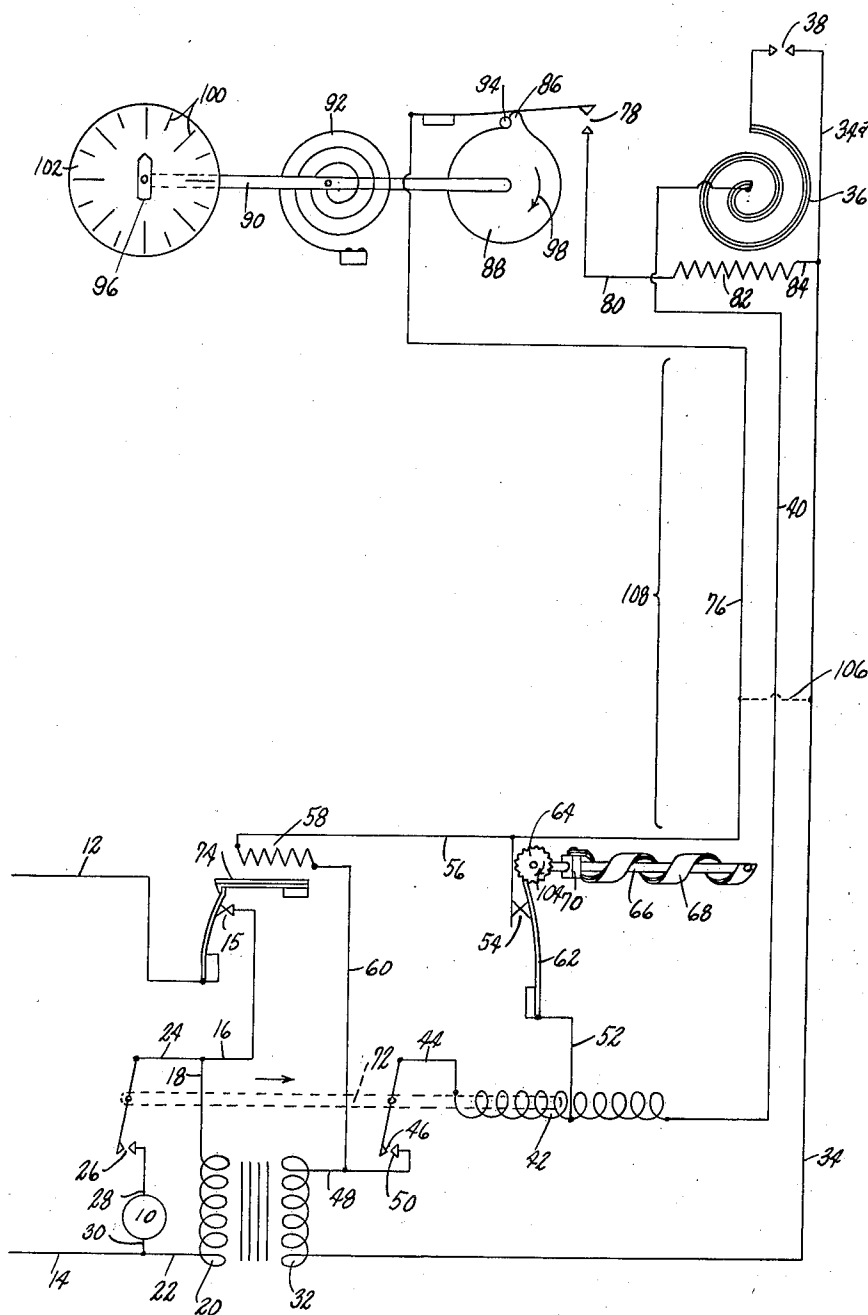
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TRANSFORMER PROTECTION CIRCUIT FOR BURNER SYSTEMS

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TRANSFORMER PROTECTION CIRCUIT
FOR BURNER SYSTEMSLawrence M. Persons, Des Moines, Iowa, assignor
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4 Claims. (Cl. 236—1)

An object of my invention is to provide in a burner circuit a means whereby the transformer usually provided for the control circuit is prevented from burning out upon short circuiting of certain of the low tension wires, such means being operable to cause a safety switch to function for opening the burner circuit and also the circuit of the transformer, so that the safety switch serves both in its normal capacity and as a protection against such short circuits.

Still a further object is to provide in combination with a room thermostat controlled burner system having an electroresponsive means to modify the action of the room thermostat, a circuit arrangement which causes safety operation of a safety switch normally provided for other safety purposes, so that it can also serve as a means to prevent burning out of the wiring in the system caused by a short circuit of the wires extending to the room thermostat and the electroresponsive means so as to prevent danger of fires, and in case these wires are in the secondary circuit of a transformer to prevent burning out of the transformer by opening the circuit.

With these and other objects in view, my invention consists in the construction and arrangement of the various parts of my transformer protection circuit for burner systems, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawing, in which

The figure is an electrodiagrammatic view of a burner system including my transformer protection circuit therein.

In the accompanying drawing, a burner motor, such as the blower motor of a fuel oil burner is indicated at 10. The supply circuit wires are indicated at 12 and 14.

The wire 12 is connected with a normally closed safety switch 15, which in turn is connected by wire 16 and 18 to the primary coil 20 of a transformer. The coil 20 is connected by a wire 22 to the wire 14.

A wire 24 connects the wire 16 with a relay controlled motor switch 26, which in turn is connected by a wire 28 to one side of the motor 10. A wire 30 connects the other side of the motor with the wire 14.

The secondary coil of the transformer is indicated at 32.

A wire 34 extends therefrom through a room thermostat 36 the contacts of which are indicated at 38. The room thermostat is connected by a wire 40 to one end of a relay coil 42. The other

end of the relay coil is connected by wires 44, 46 and 48, and a relay operated holding switch 50 with the secondary coil 32.

The center of the relay coil 42 is tapped and connected by a wire 52 to a combustion switch, the contacts of which are indicated at 54. The switch 54 is connected by a wire 56 to a safety switch heater 58, which is also connected by a wire 60 to the secondary coil 32 of the transformer.

One of the combustion switch contacts is carried by a leaf spring 62, the free end of which engages in notches in the periphery of a disc 64. The disc is secured to a rod 66 and a bimetal coil 68 is anchored at one end to the rod and at its other end to a stationary bearing 70. The bimetal coil 68 is to be located in the stack or other portion of a furnace, so that it is responsive to combustion temperature.

The relay coil 42 when energized attracts an armature 72 for closing the switches 26 and 50.

The heater 58 when energized for a sufficient period with a sufficient amount of current warps a bimetal latch 74 to release the switch 15 and allow it to open.

A wire 76 is connected with the wire 56 and extends to a time switch 78, which is connected by a wire 80 to a heater 82 adapted to modify the action of the room thermostat 36. The heater 82 is connected by a wire 84 to the wire 34.

The contacts 78 are normally held open by a cam lobe 86 on a timer disc 88. The disc is secured to a shaft 90 and is actuated counter-clockwise by a spring 92 to the position shown on the drawing, with the lobe 86 engaging a stationary stop 94.

A manually operable knob 96 is provided for rotating the disc 88 clockwise or in the direction of the arrow 98 any portion of a turn, as indicated by graduation marks 100 on a dial 102. These marks for instance may indicate half hour periods.

Practical operation

In the operation of the burner circuit when the room thermostat calls for heat, the contacts 38 will close, thereby energizing the relay coil 42 for closing the switches 26 and 50.

The relay coil circuit may be traced from the lower end of the secondary coil 32 through the wires 34 and 34a, contacts 38, wire 40, right-hand half of the coil 42, wire 52, switch arm 62, contacts 54, wire 56, heater 58 and wires 60 and 48 to the top of the secondary coil 32. A small portion of the current will flow through the left-hand half of the coil 42, wire 44, contacts 46 and

50 and wire 48, depending upon the relative resistance between the two circuits of the left half of the coil 42 and the heater 58.

The closing of the contacts 26 will establish a circuit through the motor 10 as follows: From the wire 12 through the contacts 15, the wires 16 and 24, contacts 26 and wires 28, 30 and 14.

If combustion does not occur, the contacts 54 will remain closed and after a period of time, for instance, two minutes, the heater 58 will have heated the latch 74 sufficiently to open the safety switch contacts 15, thereby opening the circuit from the supply wire 12 to the entire system.

If combustion does occur, the disc 64 of the combustion switch which rotated in the direction of the arrow 104, caused by cooling of the stack, will rotate in an opposite direction to open the contacts 54, thus breaking the circuit through the heater 58, so that the safety switch does not operate, and the burner circuit can continue to operate, until its operation is terminated by opening of the room thermostat. On combustion failure, the contacts 54 will be closed and thereby cause the heater 58 to operate the switch 15 in its safety capacity as already described.

The timing mechanism represented by the reference numerals 78 to 102 inclusive is described in detail in my co-pending application, Serial No. 737,059 filed July 26, 1934. It is adapted for manual setting at night for the predetermined number of hours through which it is desired to have the burner operate at a lower temperature, so that the high temperature maintained during the day time is not maintained during the selected number of hours of the night, for which the timer knob 96 is set.

The shaft 90 is connected with clockwork in the ordinary manner, so that its reverse rotation caused by unwinding of the spring 92 is slowed down to the desired degree, this being one revolution per eight hours in the illustrative example on the drawing.

The timer is set by clockwise rotation of the disc 88 which permits the contacts 78 to close and the heater 82 to be energized from the secondary coil 32. This raises the temperature surrounding the room thermostat 36, so that its cut-in and cut-out periods are lowered by the number of degrees that its temperature is raised by the heater 82. For instance, if the heater 82 provides a ten degree modification, the thermostat will operate at 60° rather than 70°, when it is set for 70° operation. This condition will obtain throughout the number of hours selected by setting of the knob 96 and will be terminated by the lobe 86, when adjacent the stop 94, opening the contact 78.

Heretofore it has been customary to secure the current for the heater 82 direct from the transformer secondary 32. In my circuit, however, it is secured through the heater 58, the circuit being traceable through the following elements on the drawing: 48, 60, 58, 56, 76, 78, 80, 82, 84 and 34.

Not much current is required for the heater 82 and accordingly the current flowing through the heater 58 is not sufficient to trip it to the safety cut-out position. However, if a short circuit should occur, such as indicated by the dotted line 106, the resistance of the element 82 is cut out of the circuit, thus energizing the heater 58 to a greater degree and causing the safety switch 15 to open the circuit. Thus I provide protection against short circuiting of the wires 76 and 34, which would cause burning out of

the transformer 32, if the heater 58 did not operate in its safety capacity.

Short circuits of these wires are quite common as they are merely bell wires exposed along the rafters and the like, and because they need not be enclosed in conduits as required for the high tension wires 12 and 14. Either the transformer will burn out or an expensive transformer, which will stand short circuiting must be provided, if the circuit arrangement I provide is not used. It is therefore obvious that by a simple circuit arrangement, I make the safety switch 15 perform its usual function of breaking the circuit when combustion does not occur, or when it fails after occurrence and it opens the circuit to protect the transformer against short circuits of the wires 76 and 34.

Short circuits of the wires 40 and 34 are not serious as they merely cause the burner to operate continuously instead of overloading the transformer and boiler switches or other safety devices are usually provided for protection in a case of that kind.

Some changes may be made in the construction and arrangement of the various parts of my transformer protection circuit for burner systems, without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of construction or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. The combination with a burner system including a room thermostat operable to normally control the circuit and a safety switch having electroresponsive means to open the circuit upon predetermined energization of said electroresponsive means, of means to modify the action of said room thermostat, said last means being electrically operable and the circuit thereof being arranged through said electroresponsive means whereby to cause such predetermined energization thereof upon a short circuit occurring which shunts out said last means.

2. The combination with a burner system including a room thermostat operable to normally control the circuit and a safety switch having electroresponsive means to open the circuit upon predetermined energization of said electroresponsive means, of means including a resistance element to modify the action of said room thermostat, said resistance element being electrically operable and the circuit thereof being arranged through said electroresponsive means whereby to cause such predetermined energization thereof upon a short circuit occurring which shunts out said resistance element.

3. The combination with a burner system including a room thermostat operable to normally control the circuit and a safety switch having electroresponsive means to open the circuit upon predetermined energization of said electroresponsive means, of means including a resistance element to modify the action of said room thermostat, said resistance element being electrically operable and the circuit thereof being arranged through said electroresponsive means whereby to cause such predetermined energization thereof upon a short circuit occurring which shunts out said resistance element, the resistance value of said resistance element being such as to prevent such energization of said electroresponsive means to cause opening of said circuit.

4. The combination with a burner system in-

cluding a room thermostat operable to normally control the circuit and a safety switch having electroresponsive means to open the circuit upon predetermined energization of said electroresponsive means, of electrically operable means to modify the action of said room thermostat, the circuit therefor extending through said electro-

responsive means but the current of said circuit being of insufficient value to cause such predetermined energization except when said electrically operable means is shunted out of the circuit by a short circuit.

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