

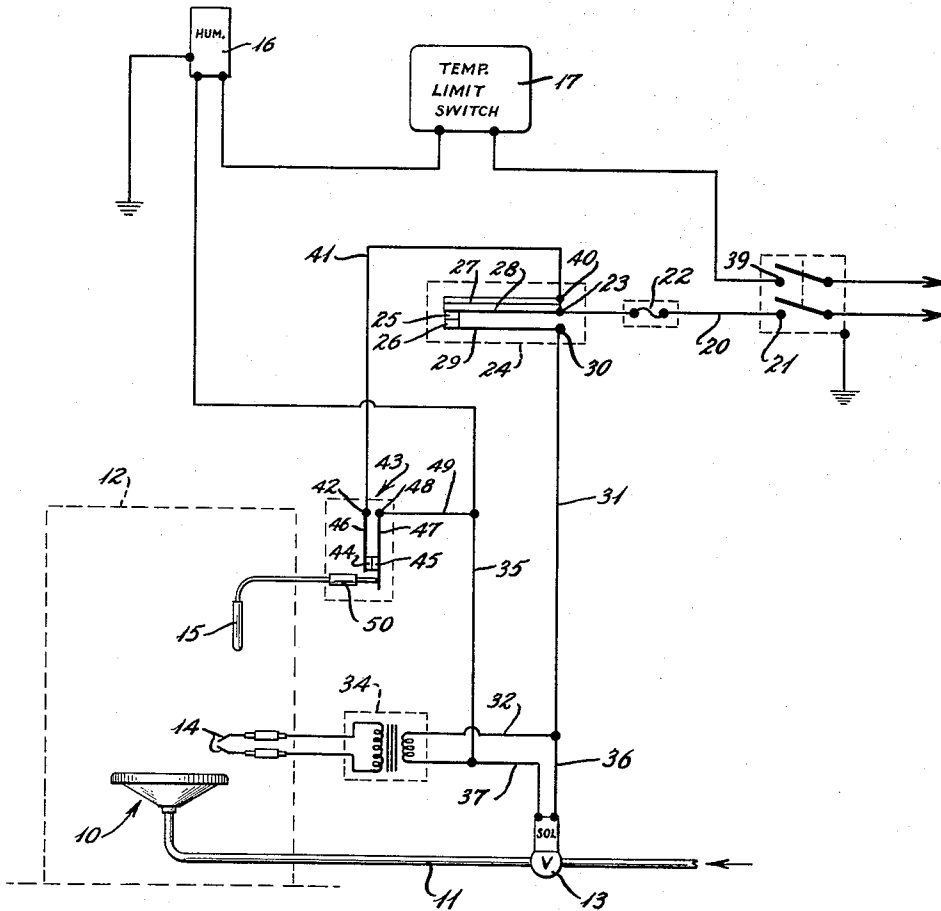
**Nov. 24, 1964**

P. J. T. RAWLINS

**3,158,194**

## SAFETY CUTOFF FOR HEATER

Filed Nov. 15, 1960



INVENTOR

*Philip J.T. Rawlins*

BY

A. J. Bates. Worcester.

ATTORNEY

1

3,158,194

## SAFETY CUTOFF FOR HEATER

Philip Joseph Thomas Rawlins, Tarboro, N.C., assignor  
to Long Manufacturing Company, Tarboro, N.C.  
Filed Nov. 15, 1960, Ser. No. 69,462  
1 Claim. (Cl. 158—123)

This invention relates to heater control and more particularly to a circuit for automatically cutting off a burner supply when the burner is inoperative or fails to operate above a predetermined level.

In the operation of a gas or other burner it is necessary to provide a safety device for cutting off the heat producing material in the event the burner ceases or becomes so impaired that a hazardous or undesirable condition may result. Heretofore, various safety devices have been proposed for the purpose of shutting off the supply of gas or other substance. However, these have suffered from various deficiencies, including being relatively short lived or relatively costly.

It is an object of the present invention to provide a control for a gas burner or the like which is adapted to shut off the material supply and, if appropriate, the ignition current, if the burner fails to operate or to provide a minimum heat level, and which is relatively simple and inexpensive and so constructed that its life should be relatively long.

These and other objects of the invention will become apparent from the following description in conjunction with the accompanying drawing in which the figure diagrammatically represents an illustrative application of the invention to a gas or other fluid-fired burner.

Briefly stated, the present invention includes a pair of electrical circuits, one of which includes the burner control including the load and normally closed contacts of a time delay relay, and the second of which includes a normally closed relay which is opened in response to normal burner operation and the time delay portion of the first mentioned relay. Normal burner operation opens the second circuit before the time delay relay opens the circuit to the load. Failure or inadequacy of burner operation for longer than the operating time of the time delay opens the circuit to the load.

With further reference to the drawing, there is illustrated a burner 10 to which gas or other fluid is applied through a conduit 11 and which may be mounted in a housing 12. Conduit 11 has a solenoid or other electrically operated means 13 in its line and ignition points 14 are mounted in appropriate position adjacent to the outlet of the burner 10. A temperature device such as a mercury bulb 15 is mounted near the outlet of the burner in order that it may be responsive to the temperature of the flame or the heat output from the burner.

Other condition responsive devices such as a humidistat or thermostat 16 and a temperature limiting switch 17 may be mounted in the space or enclosure (not shown) within which the burner is positioned. Such space or enclosure, for example, might consist of a tobacco barn in which tobacco leaves are dried, although obviously other uses are contemplated.

In order to supply electrical energy for the operation of the solenoid valve 13 and to the ignition points 14, these constituting the load, in the illustration, a first circuit is employed. The first circuit includes a lead 20 from main switch terminal 21 to fuse 22 to terminal 23 of the time delay relay 24. The relay illustrated is of the thermal type, having normally closed contact points 25, 26 and a high resistance thermal device or impedance 27 which may be of the bimetallic type and which is operable after energization for a predetermined time to open the contacts 25, 26. From terminal 23 the first

2

circuit continues through arm 28 to contact points 25, 26 and through arm 29 and terminal 30 to lead 31. From lead 31 the circuit branches to lead 32 of transformer 34 for the ignition points and to the line 35. The other branch goes to lead 36 to the solenoid valve 13 then to lead 37 to the line 35.

Line 35 in the illustration has a humidistat 16 and a temperature limiting switch 17 in series and terminates at terminal 39 connected to the supply.

A second circuit is connected in parallel with the portion of the circuit containing the relay contact points 25, 26 and the load which has been described. The second circuit includes terminal 23, the time delay resistance device 27, terminal 40 and lead 41 to terminal 42 of the burner temperature responsive relay 43. Relay 43 has contact points 44, 45 which are held in normally closed position by arms 46, 47. Terminal 48 of relay 43 is connected by lead 49 to line 35. The temperature responsive device 15 has its other end 50 mounted in association with relay 43 so that the attainment of a predetermined temperature by the device 15 causes the contact points 45, 46 to open, in a manner well known to those skilled in the art.

In the operation of the device, in starting the line switch is closed to apply voltage across the terminals 21, 39. Since the relay contacts 25, 26 and 44, 45 are normally closed, current will pass through the circuits described. Thus, the valve 13 is opened to admit fluid to the burner and the ignition points 14 are energized. In normal operation this results in the burner discharging gas over the igniting points 14 and producing a flame which impinges upon or adjacent to the temperature responsive device 15. Temperature device 15 reacts rapidly and opens contacts 44, 45 if it attains sufficient temperature. This occurring, the circuit through the thermal delay device 27 opens before the time delay passes for which it is set, thus permitting contact points 25, 26 of relay 24 to remain closed and maintaining energization of valve 13 and ignition points 14.

In the event of failure of the burner to light or to remain lit or to burn with the minimal heat necessary to cause the device 15 to hold the contact points 44, 45 open for more than the operating time of delay relay 24, then points 25, 26 open, thus closing solenoid valve 13 and deenergizing ignition points 14. This condition will remain so long as the device 15 does not attain a predetermined temperature. Relay 24 may have an operating delay time adequate to afford reasonable opportunity for the burner to light, say of approximately 90 seconds, depending on the characteristics of the equipment and the material used.

During operation the supply of energy to the circuits described is controlled by space condition responsive devices 16 and 17, to which reference has been made.

In devices of this general nature failure often occurs as the result of wear upon the contact points of the relays. In the present invention the relay points 44, 45 which are opened each time the burner is ignited are in series with the relatively high resistance of the time delay device 27 of relay 24 and hence carry only a small electrical load. As a result, little wear occurs from such points opening and closing. On the other hand, contact points 25, 26 which are in series with the principal load and therefore carry a relatively high current, are normally closed and open only in the event of an emergency condition, which is expected to occur rarely or not at all. Hence, the operating life of these points should be indefinitely long.

Accordingly, the present invention includes a relatively simple, inexpensive control circuit for a heat emitting device and which is so constructed and arranged that the portions which are normally of relatively short life in such circuits are subjected to minimum wear.

3

Although the invention is described for use with a gas or other fluid burner, it is obvious that it is applicable to any burner having a supply which may be electrically controlled.

It will be obvious to one skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof and therefore the invention is not limited by that which is illustrated in the drawing and described in the specification, but only as indicated in the accompanying claim.

What is claimed is:

A safety cutoff for a fluid material burner of the ignition fired type, comprising a first electrical circuit having the normally closed contacts of a time delay relay switch in series with an electrically operated valve for the supply

4

of fluid and with the ignition, a second circuit having the impedance of the thermal delay relay switch in series with the contact points of a second normally closed relay, said circuits being in parallel for connection to a source of electrical energy, and temperature responsive means mounted adjacent to said burner and operatively associated with said second relay and adapted to open its contact points in response to the attainment of a predetermined temperature by said temperature responsive means.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

|           |                |               |
|-----------|----------------|---------------|
| 2,369,530 | Bulger         | Feb. 13, 1945 |
| 2,678,814 | Geldhof et al. | May 18, 1954  |