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SAFETY CONTROL MECHANISM FOR LIQUID FUEL BURNERS

Original Filed April 16, 1923

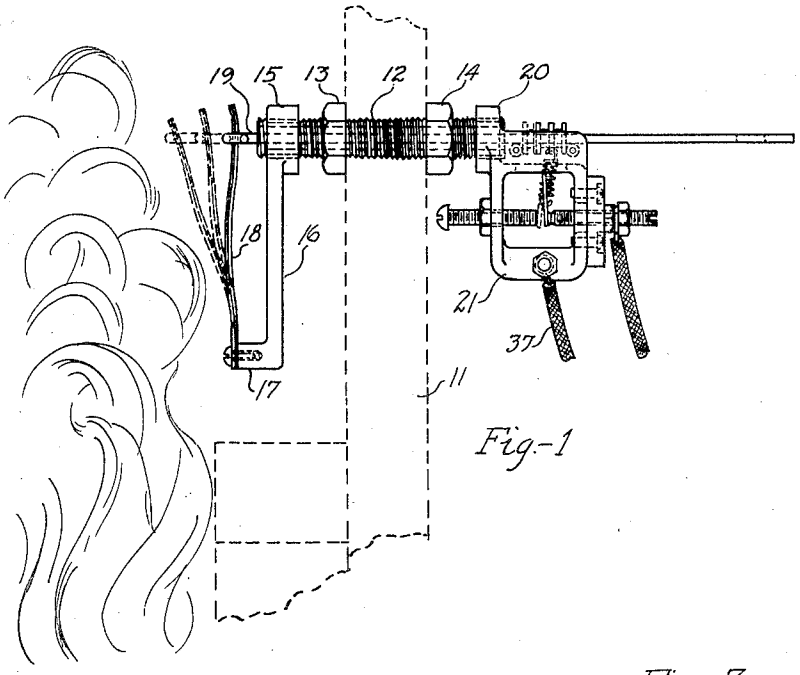


Fig.-1

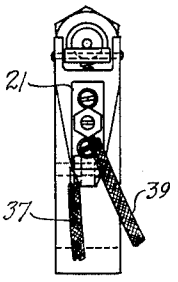
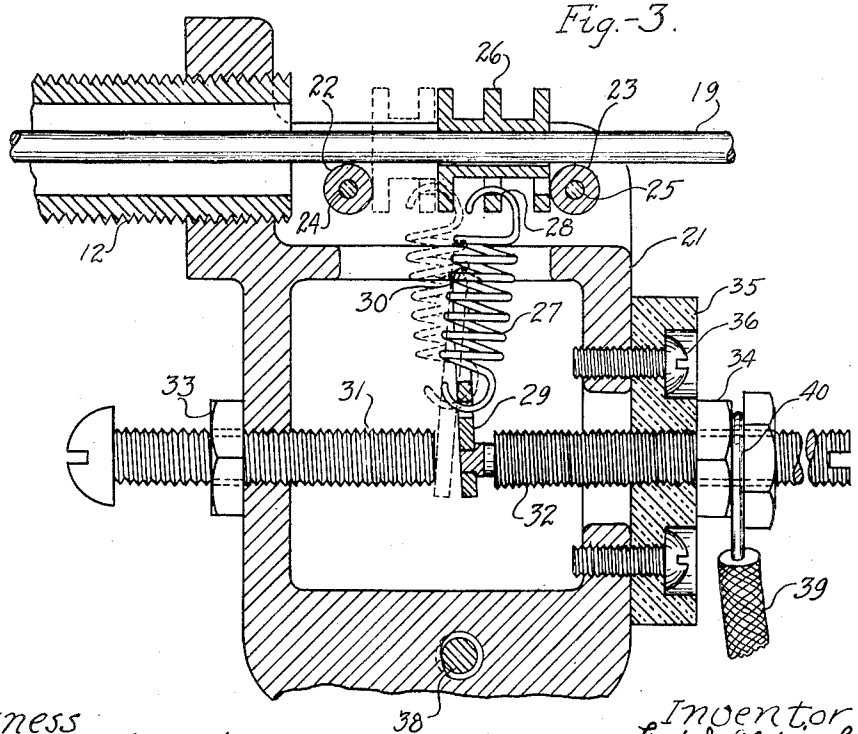


Fig.-2

Fig.-3.



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UNITED STATES PATENT OFFICE

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SAFETY CONTROL MECHANISM FOR LIQUID FUEL BURNERS

Application filed April 16, 1923, Serial No. 632,541. Renewed June 3, 1932.

My invention relates to safety control mechanism for electrically controlled fuel burning devices.

The object of my invention is in the provision of a thermal safety control mechanism mounted in a combustion chamber and co-operating with a conventional electrically operated fuel burning device in such manner that failure of combustion within said chamber during operation of the burner will result in a stopping of the action thereof.

Another object of my invention is in the provision of a thermal safety control mechanism adapted to make or break an electrical connection upon its initial movement in either direction due to temperature variations.

A further object of my invention is in the provision of a special thermal safety control device adapted upon initial movement of the thermal member thereof in either direction to make or break an electrical circuit and to still be capable of further movement due to increased or reduced temperature conditions without a corresponding effect upon the contact portion of the device.

Other objects of my invention will appear in the following specification in connection with the annexed drawing in which

Figure 1 is a side elevation of my thermal safety control device showing its mounting with relation to a combustion chamber.

Figure 2 is an end elevation thereof.

Figure 3 is an enlarged side elevation showing in detail the contact portions of the device.

In the drawing in Figure 1 my thermal safety control device is shown mounted in connection with a combustion chamber 10 or rather a portion thereof. It might well be said at this time that my device is adapted to be used in connection with any formal electrically controlled fuel burning device and inasmuch as this application is directed merely to the safety control means therefor it is not thought necessary either to show or go into any detailed description of said burner member. The burner may include practically any type of fuel atomizer. Generally it may be said that an electric motor controls the discharge of the fuel mixture in the combustion chamber. The present day burner is automatic in its control and has in the combination which permits such automatic operation, a thermostat, a series of electrical switches, an ignition means for the fuel blast, and a safety control mechanism, this later portion forming the subject matter of the present application.

There are various forms of safety control mechanism including, overflow cups co-operating with electrical switches controlling the burner mechanism, those having connection with the so-called pilot light or ignition member which control the burner from the heat given therefrom, and again thermal safety control means, in which the operation of the burner is controlled by combustion conditions.

In the present application, for the purpose of joining it with the formal burner device, it is thought sufficient to say that it is included in the electrical circuit with said device and the series of switches controlling same including a so-called time switch.

My safety device is mounted as said before in either the wall of the combustion chamber or in the door 11 thereof, a portion of which is shown in Figure 1. There has been no attempt to show the complete combustion chamber because the present device is adapted to be used in connection with any form or type of chamber that is desired. A hollow tube 12, is inserted thru an aperture in the door of the combustion chamber and is positioned therein positively by the lock nuts 13 and 14 threaded thereon. Keyed to the inner end 15 of the tube 12 is a support 16 fashioned in such manner that its lower portion 17 is adapted to support in a vertical manner the thermal or bi-metal strip 18. Attached to the upper end of the thermal metal strip 18 is a longitudinally disposed rod 19 slidably related to the hollow tube 12. Keyed to the outer end 20 of said tube 12 is the frame generally designated as 21, this portion being clearly shown in the detailed Figure 3 wherein the rollers 22 and 23 are pivoted in the upper portion as at 24 and 25 respectively. Surrounding the longitudinally disposed

rod 19 and slidable thereon is a saddle member 26. A coil spring engages said saddle at 28 and is connected at its lower end to a split yoke or contact lever 29 pivoted to the frame 21 as at 30. The coil spring 27 has a tensioned mounting with relation to the saddle and yoke member. At 31 and 32 are shown the opposed stop screw and contact points having a gap there-between thru which the yoke or contact member 29 is adapted to oscillate. The stop screw 31 is positively positioned with relation to the frame by means of lock nut 33, and the contact point 32 is similarly locked by a nut 34, however, upon this side the nut engages an insulation member 35 attached by means of screws 36 to the block 21. A ground wire 37 is connected to the frame as at 38 and a second wire 39 is connected at 40 to the contact point 32 completing the electrical circuit when the yoke is in engagement therewith. The above electrical connections are in circuit with the various electrical controls and switches operating in conjunction with the before-mentioned burning device.

The operation of my device is as follows: Having in mind the fact that the present safety control mechanism is used with a burning device having electrical controls therefor, I will say that the present safety means is mounted as previously described with the thermal metal strip disposed within the combustion chamber in a position to be effected by the heat from the ignited fuel discharge. When the burner device is idle the safety control mechanism will be in the position shown in full lines in Figure 1. Now upon the operation of the burner device and consequent flame within the combustion chamber the thermal or bi-metal strip will be extended as shown in dotted lines in Figure 1 due to the raise in temperature. The inward movement of said strip will likewise draw the longitudinally disposed rod 19 outwardly to a similar extent. The movement of said rod will also result in movement of the saddle 26 tensioned thereon by the coil spring 27. The movement of the saddle likewise moves the coil spring which has connection at its lower end with the yoke 29 which movement subsequently withdraws said yoke or lever from engagement with the contact point 32 to the dotted line position shown in Figure 1; or in other words, breaks the contact. The initial inward movement of the rod 19 as is clearly shown, results in a similar movement of the saddle. However, any movement of said saddle beyond the roller 22 is prevented and hence increased temperature will result in a further inward movement of the thermal strip and consequent withdrawal of the rod 19, but not of the saddle. In other words, the initial movement of the thermal strip breaks the electrical circuit and said strip is still permitted to move as far as it will, this movement of course being controlled directly by the amount of heat in the combustion chamber.

When the operation of the burner ceases there is of course a consequent decrease in temperature with a corresponding outward movement of the thermal strip and rod 19. The initial inner movement of the rod carries with it the saddle 26 until said saddle abuts the opposite roller 23. This movement of the saddle due to the connection of the coil spring with the yoke 29 again permits said yoke to make contact with the point 32 and the safety control mechanism is again in its normal position.

Perhaps it might be well to bring out the reason for the making of the electrical contact upon the cessation of burner activity. When the burner commences its action there is an electrical circuit made, including the safety device, some electrical switches and a so-called time switch. Should there be a failure of ignition of the fuel mixture discharge there will of course be no increase of temperature within the combustion chamber to act upon the thermal strip. To prevent further activity of the burner which is discharging a continuous stream of unignited fuel mixture into the combustion chamber, the above mentioned electrical circuit including the safety device and the time switch has the current passing therethru with the result that said time switch within a determined period will be heated to such an extent that a contact in the circuit will be broken, with a consequent stopping of the burner and cessation of fuel discharge. However, the normal operation will result in the almost immediate breaking of the electrical contact due to the movement of the thermal strip and hence, the cutting out of the time switch from the circuit so that the burner is free to operate.

As said before, I have not included in my showing all the above mentioned electrical switches, burner member, etc., because they are merely formal and their operation has merely been described in connection with my safety device for the purpose of more clearly bringing out the action thereof.

What I claim is:

1. In a thermal safety control, in combination, relatively spaced contact points, a suitably supported thermal metal strip, a contact member, and means active to shift the contact member thru the deflective activity of the thermal strip including, a shiftable member connected with the thermal strip, a sleeve loosely mounted on the shiftable member, stop members adapted to limit the movement of the sleeve upon the shiftable member, and means connecting the sleeve and the contact member in a tensioning relation.

2. In a device of the class described, in combination, a thermal strip, contact points, a contact arm, connecting means between

the thermal strip and the contact member including, a shiftable member connected with the thermal strip, including a shiftable bar, a sleeve thereon, a tensioning member connecting the sleeve and contact member active under normal conditions to effect concurrent movement of the bar and sleeve, and stop members suitably disposed to limit the movement of the sleeve member under movement of the bar thru the activities of the thermal strip beyond the reasonable requirement to effect contacts.

3. In a device of the class described, in combination, a thermal strip, contact points, a contact lever, a shiftable member controlled by the action of the thermal strip, a sleeve thereon, means for holding the sleeve and contact lever in tensioned relation, and stop members adapted to limit the movement of the sleeve member in either direction beyond its required limit for movement of the contact lever, but not restricting the further movement of said shiftable member.

4. In a device of the class described, in combination, a thermal strip adapted to be disposed within a combustion chamber, contact points, a contact lever adapted to oscillate between said points, a shiftable member controlled by the thermal metal strip and tensioned connecting means between the shiftable member and contact lever whereby the initial movement of said shiftable member in either direction snaps said contact lever against one of said contact points without further movement thereof, due to the continued movement of said shiftable member.

5. In a device of the class described, in combination, a thermal metal strip, contact points, a contact member adapted to oscillate between said points, and means including a shiftable rod and connecting mechanism whereby the initial movement of said shiftable rod in either direction controlled by the said thermal strip will result in an immediate movement of the contact member without further disturbance thereof due to the continued movement of said shiftable member.

6. In a device of the class described, in combination, a thermal member sensitive to combustion conditions, a contact point and a stop member suitably and adjustably distanced from one another, a contact member cooperating with said point to make or break an electric circuit, and connecting means between said thermal member and contact member whereby the initial movement of said thermal member in either direction will immediately snap said control member against either the contact point or stop to make or break the electrical circuit and thereafter permit further movement of said thermal member without movement of the contact member.

7. The combination with an electric circuit including a switch, of a thermostatic control for said switch including a thermal member, and means for immediately actuating the switch upon initial movement of the thermal member in either direction comprising a longitudinally movable member and a sliding friction element bearing against said member, said means permitting continued movement of the thermal member in either direction without actuating the switch.

8. The combination with an electric circuit, of a thermostatic control therefor including a thermal member, and mechanism actuated by the thermal member for opening and closing the circuit comprising a longitudinally movable member, a sliding friction element bearing against said member, said mechanism including spring operated means operative immediately upon the initial movement of the thermal member in either direction to open and close the circuit, said means permitting continued movement of the thermal member without further actuation of said means.

In testimony whereof he affixes his signature.

LOYD I. ALDRICH.