July 4, 1950 R. C. INGWERSEN 2,513,564

BIMETALLIC OVERLOAD CIRCUIT BREAKER

Filed June 16, 1945

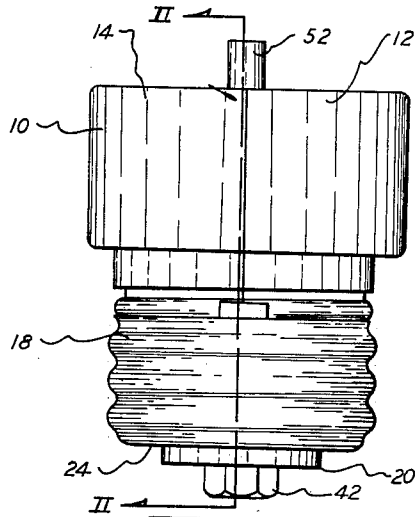


Fig. 1.

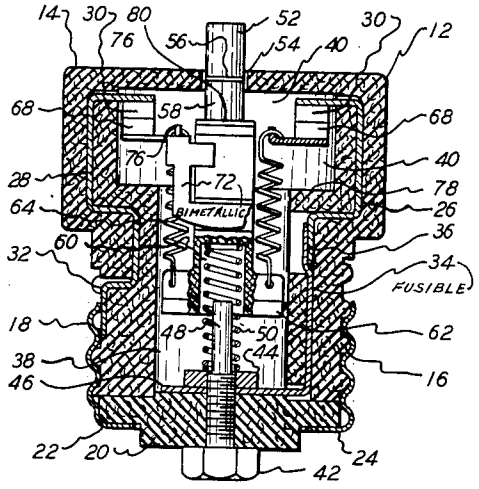


Fig. 2.

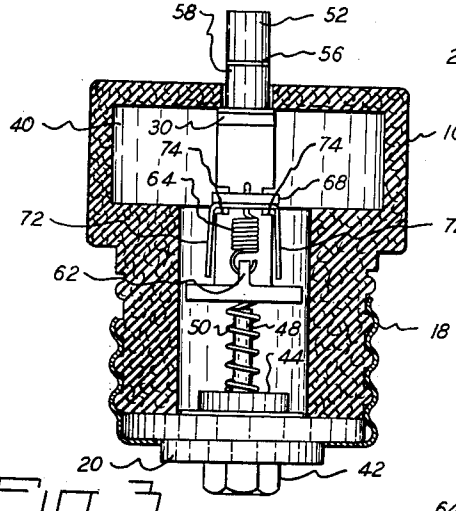


Fig. 3.

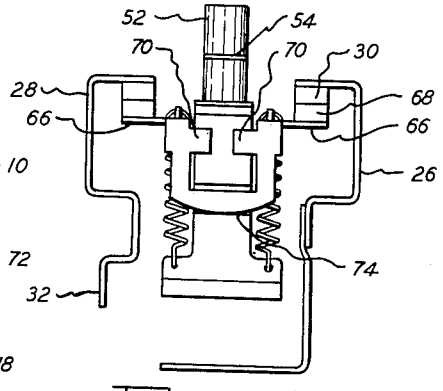


Fig. 4.

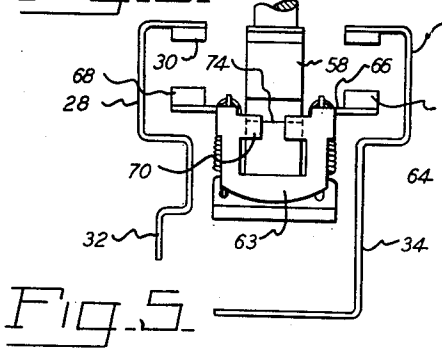


Fig. 5.

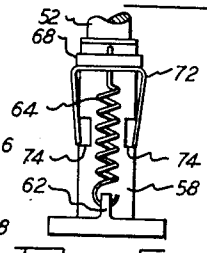


Fig. 6.

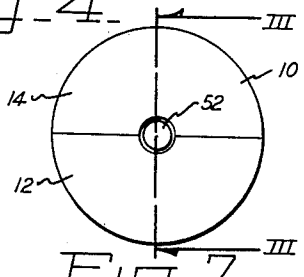


Fig. 7.

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BIMETALLIC OVERLOAD CIRCUIT BREAKER

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2 Claims. (Cl. 200—116)

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The present invention relates to a resettable overload switch, especially designed for installation in home lighting and similar electrical circuits. At the present time inexpensive, nonreplaceable fusible link fuses are generally used varying from 15 to 30 amperes in capacity at 110 volts. These devices, although inexpensive, are troublesome to detect following an overload, with most people being timid about removing the same and replacing them with new ones.

While simple, inexpensive resettable overload switches capable of being inserted into the standard household fuse sockets have heretofore been proposed, their design has not been such as to permit their approval by the fire underwriters. Although overload switches of the type above described are principally designed for and used with alternating current, in order to be approved for installation they are required to function on test under extremely heavy direct current loads.

Thus one of the objects of the present invention is to provide an improved resettable overload switch of the type described.

Another object is to provide a compact, inexpensive overload switch designed for installation in standard household fuse outlets and capable of operating on excessive direct current overloads.

A further object is to provide an improved overload switch in which the overload trip is independent of the reset whereby the switch cannot be held closed against an overload.

A still further object is to provide a compact socket type overload switch in which the conductor leads are heavily insulated and shielded right up to the contacts with provision for more than adequate spacing of the contacts upon overload.

These and other objects and advantages residing in the construction, arrangement and combination of parts will be more fully understood from a consideration of the following specification and annexed claims.

In the drawing,

Fig. 1 is a side elevational view of one form of the circuit breaker,

Fig. 2 is a cross-sectional view taken on line II—II of Fig. 1,

Fig. 3 is a cross-sectional view taken on line III—III of Fig. 7,

Fig. 4 is a schematic layout showing the conductive parts with the switch closed,

Fig. 5 is a view similar to Fig. 4 with the switch open,

Fig. 6 is an enlarged fragmentary elevational view of a detail of construction, and

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Fig. 7 is an end view of Fig. 1.

Referring to the drawing, in Fig. 1 is shown the compact form the present invention may take for screw-in installation into a standard outlet for fusible link fuses used in household lighting or other similar circuits carrying normally in the order of 15 to 30 amperes of alternating current.

While I do not wish to be restricted to any specific housing design other than limited by the appended claims, the illustrated form has numerous advantages. The main housing 10 comprises two similar sections 12 and 14 of molded insulating material. The lower ends of the sections 12 and 14 have integral thread portions 16 to receive the internally and externally threaded metallic conductor ferrule 18. The ferrule performs three functions, namely, that of holding the sections 12 and 14 in assembly, acting as a conductor, and holding the closure plate 20 in abutment with the lower open end of the housing 10. As shown, the plate 20 is of molded insulating material with a flange 22 under which the flange 24 of the ferrule 18 engages.

Conductive inserts 26 and 28, carrying the contacts 30 are molded into the sections 12 and 14. Insert 28 comes to the outer surface of the section 14 where it is exposed for a solder joint with ferrule 18 at 32. This integral joint at 32 also serves to fix the ferrule 18 and sections 12 and 14 in a permanently assembled state. A conductive fusible link 34 is integrally connected to the unit 26 at 36 and extends across the inner surface of the plate 20.

The cavity 38 defined by the sections 12 and 14 is enlarged at 40 to form the separable contact chamber into which the contacts 30 extend. A conductor stud 42 is threaded through the plate 20 to receive a nut 44 which functions to clamp the end 46 of the link 34 against the plate 20. Through this arrangement the link 34 is brought into good electrical contact with the conductor stud 42 through the nut 44. As an extension of the stud 42 is a pilot portion 48 for the spring 50.

To describe the switch parts having movement upon overload, at the time of reset, the reset button 52 projects through the opening 54 in the housing 10. An open switch indicating band 56 provides visual indication of the circuit in which the overload has occurred. As shown in Fig. 2, with the switch closed, the band 56 is hidden from view.

The button 52 has an enlarged shank 58 recessed at the lower end to provide a chamber 60 for the upper end of the spring 50. Lateral ears

62 provide anchors for the lower ends of the springs 64.

Loosely mounted upon the shank 58 for both unitary and relative movement is the thermal circuit breaker unit 63. This unit comprises lateral arms 66 carrying the contacts 68 in opposed relation to the contacts 30. The upper portions 70 of the unit 63 embrace the shank 58 and loosely guide the unit 63 thereon. Projecting downwardly on opposite sides of the shank 58 are bimetallic supports 72 normally stressed inwardly to engage notches 74 in the shank 58. The upper ends of the springs 64 are attached to the unit 63 at 76 to stress the unit 63 downwardly with movement resisted by the engagement between the supports 72 and the notches 74.

In Figs. 4 and 5 the relative positions of the principal parts of the switch are shown diagrammatically illustrated in open and closed position. With the switch open as shown in Fig. 5, the arms 66 are supported on the shoulders 78 with the tension springs 64 substantially contracted, as shown in Fig. 3. To close the switch the button 52 is pushed inwardly, compressing the spring 50 and lowering the notches 74 to the position shown in Fig. 6 at which point the bimetallic supports 72 engage with the notches to support the unit 63 on the shank 58 with the springs 64 under tension. Upon releasing the button 52, the compression of the spring 50 will raise the unit 63 into the position shown in Fig. 2, with contacts 30 and 68 abutting under the stress of the spring 50.

In the event of an overload, the excessive current flow through the divided path defined by the bimetallic supports 72 will result in rapid movement into the position shown in Fig. 3, releasing the unit 63 through the stress of the springs 64. As a result, the contacts 30 and 58 are suddenly separated with the spacing of the contacts determined by the location of the shoulder 78. At the same time, the spring 48 is free to move the button 52 upwardly to the position shown in Fig. 3 until the shoulder 80 engages the housing as a stop. Upon observing the indicating line 56, a person may reset the switch by pressing the button 52. This will bring the supports 72 into engagement with the notches 74, providing the overload has been removed. Upon releasing the button 52, the stress in the spring 48 will lift the unit 63 into the position shown in Fig. 2, with the contacts 30 and 58 abutting to close the circuit.

Structural features of the present development which contribute substantially to the ability of the unit to handle heavy direct current overloads without damage to the structure, include substantial insulation and shielding of conductors 26 and 28, maximum spacing of the contacts 30 and 58 upon overload determined by location of the shoulder 78, and division of thermal active structure between the supports 72.

Having thus described my invention, what I desire to cover by Letters Patent and claim is:

1. In an electric circuit breaker, casing structure, a fixed contact in said casing, a movable contact in the casing adapted to make and break electrical contact with the fixed contact, a contact reset actuator, spring means mounting said actuator in the casing for rectilinear movement constantly into the contact making position, a thermal responsive latch connected with said movable contact to constitute therewith a movable contact-latch unit, said latch being responsive to overload currents and being adapted to have latching engagement with said actuator to restrain the movable contact-latch unit and actuator to have unified movement with respect to the fixed contact and in the contact making direction, a second spring means connecting said movable contact-latch unit with said actuator and operable to break the electrical contact with a snap action when the latch is disengaged from the actuator, said second spring means being stressed when the electrical contact is made consequent upon said unified movement, an abutment on said casing structure limiting said snap action movement of the movable contact-latch unit and an abutment limiting movement of said actuator by its said spring mounting means when the latch is disengaged.

2. In an electric circuit breaker, a hollow casing, a fixed contact in said casing, a movable contact also in said casing in position to make and break contact with said fixed contact, a thermal responsive latch connected with said movable contact to constitute therewith a movable contact-latch unit, said thermal latch being responsive to overload currents, a contact reset button in the form of a plunger mounted for rectilinear movement in said casing, said plunger having an end portion extending to the outside of the casing, said movable contact-latch unit being adapted to have latching engagement with said plunger to have unified movement therewith or being latch releasable from the plunger to move relatively thereto, spring means mounting said plunger in the casing so as continuously to urge the plunger to either of two projected positions with respect to the outside of the casing, in one of which positions the contacts are closed and in the other of which positions the contacts are open, a second spring means connecting said movable contact-latch unit with said plunger and adapted to move the said unit to the contact open position with a snap action when the latch is released, said second spring means being stressed when the plunger is projected with the said unit latched thereto, abutment means on the casing limiting the contact opening snap action of said unit, said fixed contact limiting the projecting movement of the plunger when the latch is effective, and the contacts are closed, and further abutment means on the casing limiting the final projecting movement of the plunger attendant upon release of the latch in response to said overload currents.

RICHARD C. INGWERSEN.

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