

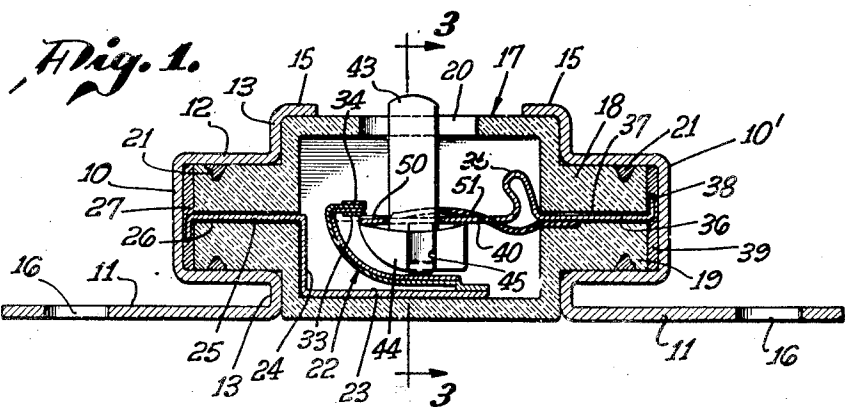
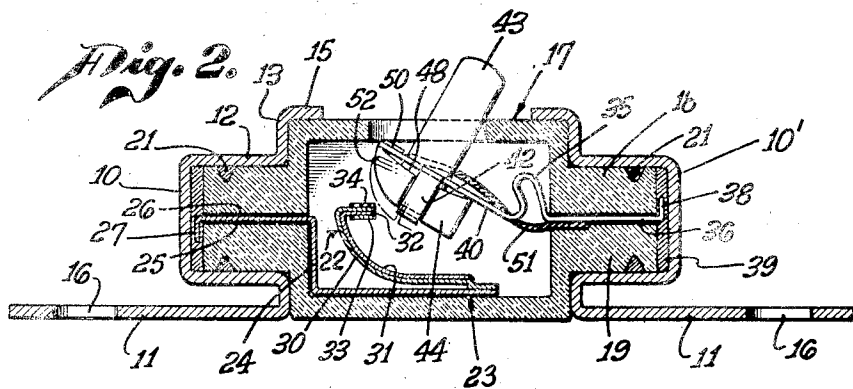
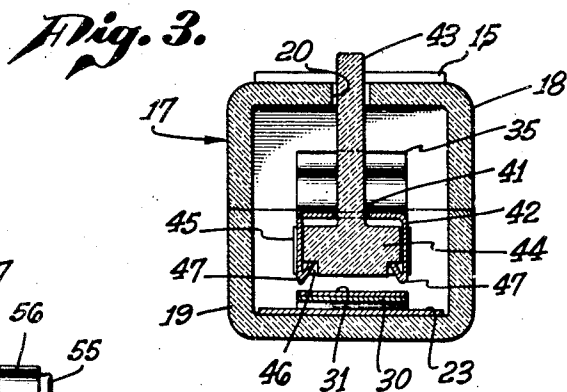
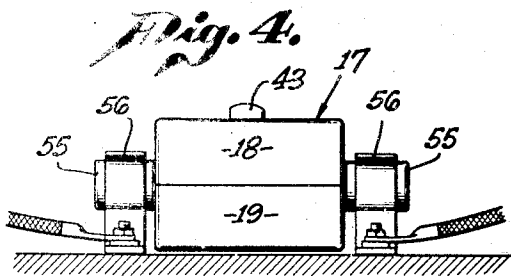
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2,458,804

CIRCUIT PROTECTOR

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CIRCUIT PROTECTOR

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1

This invention relates to a thermo-responsive circuit protector designed to be interchangeable with or used as a substitute for fuses of a corresponding size, whereby circuit protection is achieved which permits repeated restoration of the circuit from time to time without the inconvenience of changing or renewing fuses. My device may be employed in a form physically adapting it as interchangeable with a fuse in conventional fuse mountings such, for example, as spring clip terminals, or it may be embodied in a form for permanent mounting on a panel.

In devices of this type, as the breaker approaches the point of break, the contact area between the points diminishes, and by causing an increase in unit area pressure a satisfactory low contact resistance is maintained. It has been found through research that a lower contact resistance is obtained by a relatively high unit area pressure concentrated on a small area rather than the same amount of pressure spread out over a broad, flat, contact surface with a resulting low unit area pressure.

It is an object of my invention to provide a circuit interrupter in harmony with these findings and utilizing the advantages therefrom.

Another object of the invention is to incorporate improvements in a device of the character described by which to reduce the arc drawn between the two contact points when they separate, by the use of an insulating baffle or shoe which passes closely adjacent to the contact on the bi-metal element. The arc drawn between the points is in this way subjected to a squeezing action, that is to say the arc in order to follow the points must pass through a small opening, and by its nature an arc has difficulty in sustaining itself under these conditions.

A still further particular object is to improve the general construction and operation of a circuit protector of this type by the addition of an insulating element on the upper surface of the bi-metal trigger, to co-operate with the insulating shoe in snuffing out any arc.

A still further object of the invention is to provide a flexible cable by-pass for the spring whereby the spring is short circuited at high amperages to avoid overheating the spring with a consequent loss of temper.

These and other objects and advantages of the invention will become more apparent from a further consideration of the description and drawing.

In the drawing:

Figure 1 is a vertical cross-sectional view of one form of my invention adapted for mounting upon a panel, showing the circuit closed.

Figure 2 is a similar view illustrating the parts in position when the circuit is broken.

2

Figure 3 is a cross-sectional view taken on the line 3-3 of Figure 1.

Figure 4 is a side elevation of a modified form of my invention having similar operating parts but adapted to mounting in conventional fuse spring clip terminals.

Referring to Figures 1 to 3, the circuit interrupter comprises complementary end brackets 10 and 10' including flat base plates 11, cylindrical pockets 12, and flanges 13, the upper flange preferably having an extending lip 15. The base plates 11 are provided with holes 16 for mounting screws not illustrated, which latter may also serve as terminals or binding posts.

Retained within the complementary brackets 10 and 10' is a case 17 of insulating material, preferably a molded phenolic material or other synthetic resin conveniently made in two halves 18 and 19 which are similar except that the upper half 18 is formed with a longitudinal slot 20. The halves are retained within the bracket in the relationship illustrated by any suitable means, friction alone being sufficient, but preferably by drops of solder 21 or other equivalent means such as projections struck in from the bracket. If desired, cement may be employed in addition to or in lieu of the other suggested means of attachment.

Mounted on the lower section 19 is a base 23 which supports a bi-metal element or latch 22 having a base 23, a vertical section 24, and a lead 25 extending longitudinally through a slot 26 formed between the sections 18 and 19 and terminating in an anchor 27, which may be solder, securing it firmly in position and establishing an electrical connection with the bracket 10.

The bi-metal element 22 incorporates two bowed metal pieces 30 and 31 having different thermal coefficients of expansion as is well known in this art, these pieces terminating in a horizontal lip 32 on the lower face of which is a contact element 33 of suitable metal such as silver, and on the upper face of which is an insulating plate 34.

On the opposite end of the housing is supported a spring 35 having an extension 36 retained in a slot 37 between the upper and lower halves of the housing and its end 38 anchored in solder 39 for connection with the bracket 10'. The forward end 40 of this spring is normally flat, is formed with a slot 41 for reception of a reset knob 43, and is provided with laterally and downwardly extending resilient wings 42. The spring is formed with an intermediate loop of the peculiar configuration illustrated, which permits the flat forward end 40 to withdraw horizontally from left to right as viewed in Figure 1, but accompanied by an increased tension in a vertical direction, as later described.

The reset knob 43 is of general inverted T cross-

3

section as seen in Figure 3, and is preferably made of fiber or other insulating material. The lower end, as seen from the side, has the form of a shoe 44 provided with vertical side grooves 45 and with notches 46 in the lower face, whereby the resilient wings 42 of the spring may engage the sides of the shoe within the slots 45 and the lower ends 47 of the wings seat in the notches 46. The upper surface of the shoe 44 is preferably concaved as illustrated at 48 whereby the flat section 40 of the spring may be temporarily depressed for the purpose of engaging the wings 42 with the shoe, whereupon the spring and latch are retained in the relationship illustrated. The concavity 48 is exaggerated in the drawing for illustrative reasons. A silver or other low contact material 50 is provided on the upper forward surface of the spring. The forward end of the shoe is curved as shown to correspond with the arc of movement described by it when released, whereby this end face of the shoe will initially ride against the end of the bi-metal element.

A flexible cable 51 is connected to the spring and the contact element 50 as illustrated, so that in case of heavy overloading the spring will be short-circuited by the cable and prevent overheating of the spring.

In use, the switch is closed as illustrated in Figure 1, and current is sent through the bracket 10, the bi-metal element or latch 22, the spring 35 and through to the other bracket 10'. When excessive overload is carried, the unrestrained portion of the bi-metal element or trigger tends to straighten causing the contact element 33 to retract downwardly and backwardly, thus accomplishing two purposes. It increases the contact pressure while diminishing the unit area of contact, the spring yielding, and withdrawing in the opposite direction by reason of the loop shown and described. When the current has exceeded its rated maximum, the latch releases the spring 35, and the curved end face 52 of the shoe 44 slides immediately adjacent to the contact element 33, in that way effectively breaking the circuit and at the same time eliminating any tendency to arc over between the contacts. This advantage is further amplified by the insulating material 34 on the upper surface of the latch.

The circuit may be again restored by pushing the reset knob 43 down into the normal contact position.

In the modification shown in Figure 4, the internal operating parts are the same as in the form previously described. In lieu of the brackets 10 and 10' I substitute fuse caps 55 whereby the device may be inserted in spring terminal clips 56.

Although I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A circuit protector comprising: a bowed bi-metal conductor having a flat terminal provided with a contact member, a leaf spring conductor provided with a contact member adapted to normally engage said first contact member and mounted so that its tension disengages said contact members when an overload retracts said first contact member, and an insulating shoe support-

4

ed by said spring and having a curved surface which moves in close proximity to the end of said first contact member to suppress any tendency to arc between said contact members when said second contact member is disengaged by said spring from said first contact member.

2. A circuit protector including a bi-metallic member having an arcuate portion, one end of said portion being fixed and a contact end portion disposed approximately at right angles to said arcuate portion and extending toward the concave side thereof, a leaf spring having one end fixed and a contact portion on the other end, said last named contact portion engaging under said first named contact portion, said spring being under tension for movement away from said bi-metallic member, and an arc reducing non-conducting baffle member mounted on the side of said leaf spring opposite the contacting area of said spring, said baffle member being constructed and positioned to pass in close proximity to the extremity of said contact portion of said bi-metallic member upon the separation of said contact portions by excessive heat.

3. The structure described in claim 2 characterized by a resetting button on said leaf spring and a cam-like edge on said baffle member effective for moving said bi-metallic member from its operated position to a position for engaging over the normal working position of said contact portion on said spring when said button is pushed inwardly.

4. A circuit protector for use in a limited space, said protector including a receptacle having one flat side adapted to fit against a wall or the like, an arcuate bi-metallic member having one end portion fixed relative to said flat side and approximately parallel thereto, the other end portion being bent transversely to the arcuate portion of said member to serve as a contact element, a leaf spring having one end portion fixed relative to said receptacle and the other end portion disposed under said contact element, a spark-reducing baffle member on the side of said leaf spring next to said bi-metallic member, said baffle member having an arcuate cam-like edge effective for moving said bi-metallic member out of the way of said second contact portion as the latter is returned to normal operative position, the arcuate form of said baffle member permitting it to be compactly positioned closely adjacent the concave side of said arcuate bi-metallic member when said circuit protector is in normal operating condition.

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