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CIRCUIT BREAKER TRIP ASSEMBLY

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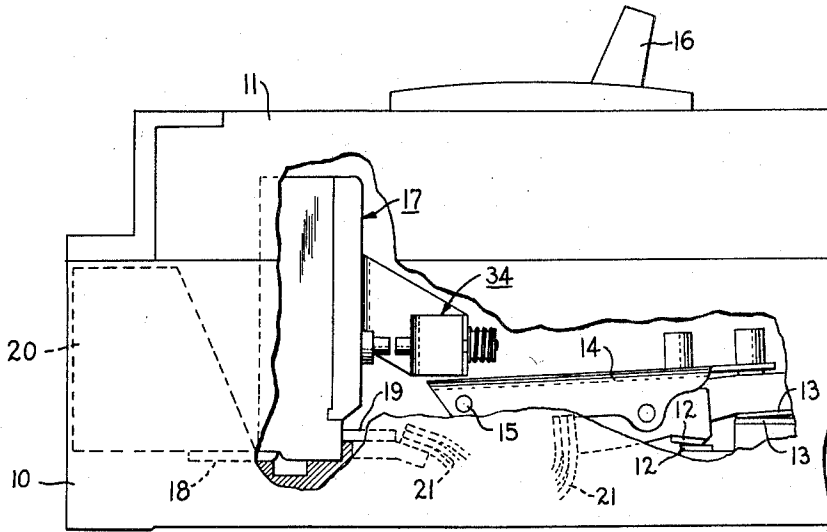


FIG. 1

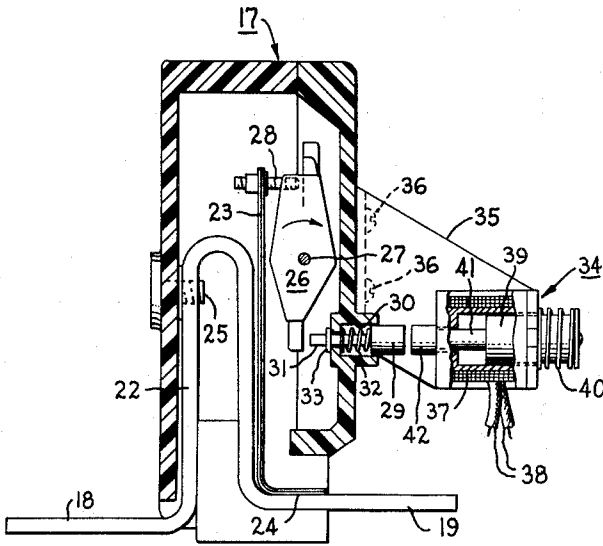


FIG. 2

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CIRCUIT BREAKER TRIP ASSEMBLY

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My invention relates to electric circuit breakers and particularly to electric circuit breakers of the type incorporating remotely actuable means for causing automatic opening.

Electric circuit breakers of type referred to comprise an insulating molded casing, separable contacts within the casing, mechanism for manually and automatically causing opening of such contacts, and separately enclosed current-responsive means for initiating the automatic operation of the mechanism upon the occurrence of predetermined current conditions through the circuit breaker.

Many applications for such circuit breakers include the need for some means to initiate automatic operation of the circuit breaker mechanism by means other than the current responsive means included in the circuit breaker proper. For this reason, a number of auxiliary devices are commonly made available for use with such electric circuit breakers, such, for example, as a remote tripping solenoid, and an undervoltage release solenoid. When such devices are added to the conventional circuit breaker, it has been necessary to provide an aperture in the trip unit housing and to provide means carried by the auxiliary device which enters the trip unit housing and engages a portion of the tripping mechanism to actuate it. The addition of such an auxiliary device to a conventional circuit breaker is therefore a relatively difficult operation, especially for the unskilled persons such as the user. Since the installation operation requires the making of an aperture in the trip unit housing and inserting an operating member into the trip unit housing, there is always a danger that the operation of the trip unit will be interfered with if the installation is not properly performed.

It is an object of the present invention to provide a circuit breaker construction including a remotely actuable device for initiating automatic operation of the circuit breaker, wherein the auxiliary device may be readily installed by an unskilled person without danger of affecting the calibration of the circuit breaker or affecting the operation of the trip unit.

In accordance with the invention, I provide an electric circuit breaker having a casing of insulating material and including a trip unit assembly having its own insulating casing and containing a tripping mechanism movable upon the occurrence of predetermined current conditions to cause tripping. I also provide an operating member movably supported in a wall of the trip unit housing, and an auxiliary device mounted adjacent the operating member and adapted to engage it to cause tripping.

The invention will be more fully understood from the following detailed description, and its scope will be pointed out in the appended claims.

In the drawing,

FIGURE 1 is a side elevation view of a portion of an electric circuit breaker incorporating the invention, a portion of the side wall being broken away;

FIGURE 2 is a sectional view of a portion of the tripping mechanism of the circuit breaker of FIGURE 1.

In the drawing, the invention is shown as embodied in an electric circuit breaker having a molded insulating casing comprising a base 10 and a cover 11. The enclosing case serves to house separable main and arcing contacts 12 and 13, supported on a movable contact arm 14, pivotally supported in the insulating casing on a pivot

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pin 15 and adapted to be operated between open and closed circuit position by means of an operating mechanism, not shown, which may be operated manually by means of a manually engageable handle member 16. The circuit breaker also includes a separately housed trip unit 17 having its own insulating casing and having a pair of terminal straps 18 and 19 projecting therefrom. The terminal strap 18 is connected to a terminal connector 20 while the terminal strap 19 is connected by means of a flexible conductor 21 to the movable contacts 12 and 13.

Referring to FIGURE 2, the trip unit 17 includes a conductor 22, the terminal portions of which constitute the terminal members 18 and 19, and the intermediate portion of which constitutes a heater for providing heat to a thermally deformable bimetallic member 23 which is rigidly attached thereto at 24 by suitable means such as by welding. The conductor 22 is attached to the insulating housing of the trip unit 17 by suitable means such as by a screw 25. The trip unit 17 also includes a trip bar 26 which is pivotally supported on a pivot pin 27 and is adapted to be rotated by the engagement therewith of a calibrating screw 28 carried by the bimetallic strip 23. Rotation of the trip bar 26 causes release of a latch, not shown, which initiates the automatic operation of the circuit breaker mechanism. It will be understood that the operation of the trip unit 17 may be of any desirable construction, including magnetically operable means so long as there is provided therein a member which is movable to cause automatic actuation of the circuit breaker mechanism.

For the purpose of facilitating the use, with the circuit breaker shown in FIGURE 1 of an auxiliary device, to be described, I provide an actuating plunger 29 slidably supported in a recess 30 in the insulating casing of the trip unit 17 and having a reduced portion 31 projecting through an aperture in the back wall of the recess 30 and adapted to engage the trip bar 26. The plunger 29 is biased outwardly of the chamber 30 by means of a compression spring 32, the outward movement thereof being limited by a stop member 33 carried by the reduced portion 31 of the plunger 29.

For the purpose of permitting a remote actuation of the trip bar 26, a solenoid 34 is provided, supported on a bracket 35 mounted on the trip unit housing by suitable means such as by screws 36. The solenoid 34 includes a field winding 37 having terminal conductors 38 and a plunger or armature 39 normally retained in an inoperative position as shown by means of a compression spring 40. The armature 39 has a reduced extension portion 41 of non-magnetic material having an enlarged end portion 42 limiting travel of the armature 39 in an outward (right-hand) direction, and also adapted to engage the plunger 29 of the trip unit 17.

In operation, when sufficient current is passed through the solenoid 34, the plunger 39 is drawn inwardly, and the end 42 of the extension engages the plunger 29 of the trip unit 17, causing the inner end portion of the plunger 29 to engage the trip bar 26 and to rotate it in a direction to initiate automatic operation of the circuit breaker mechanism.

It will be observed that the solenoid 34 may be installed and/or removed without interfering with any portion of the trip unit 17, without the necessity of making an opening in the trip unit housing, and without the necessity of inserting any portion of the accessory device into the trip unit itself.

While I have shown only one particular embodiment of the invention, it will be readily apparent that many modifications may be made. Thus, for example, it will be obvious that more than one plunger 29 may be provided such as for example as one of each pole of a multi-

pole circuit breaker. I therefore intend by the appended claims, to cover all such modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric circuit breaker comprising:
 - (a) an outer casing of insulating material,
 - (b) at least one pair of relatively movable contacts in said casing,
 - (c) manually operable operating mechanism within said casing including means to cause automatic opening of said circuit breaker contacts,
 - (d) a separately enclosed trip unit removably mounted within said outer casing containing tripping means movable to initiate automatic opening operation of said operating mechanism,
 - (e) said trip unit enclosure having an opening therein in the side thereof adjacent said operating mechanism,
 - (f) a trip operating plunger slidable in said opening, said plunger being supported solely and directly by said trip unit casing, said plunger including a first portion extending within said trip unit enclosure and disposed and arranged to engage said tripping means in said trip unit and a second portion extending outside of said trip unit within said outer housing on the side of said trip unit adjacent said operating mechanism,
 - (g) and remotely operable actuating means within said outer casing at the side of said trip unit adjacent said operating mechanism and disposed and arranged to operatively engage said outwardly extending portion of said plunger without being positively attached thereto.
2. An electric circuit breaker including:
 - (a) an outer casing of insulating material,
 - (b) at least one pair of relatively movable contacts in said casing,

- (c) manually operable mechanism within said casing for moving said contacts between open and closed circuit position, said operating mechanism including means to cause automatic opening of said contacts,
- (d) a separately enclosed trip unit removably mounted within said outer casing,
- (e) said trip unit including a pivotally supported trip bar movable to initiate automatic opening operation of said operating mechanism,
- (f) an opening in the wall of said trip unit enclosure adjacent said operating mechanism,
- (g) a trip operating plunger slidable in said opening, said plunger being supported solely and directly by said trip unit casing, said plunger including a first portion extending within said trip unit enclosure adjacent said trip bar and a second portion extending outwardly of said trip unit enclosure towards said operating mechanism,
- (h) an electric solenoid supported within said outer insulating casing at the side of said trip unit adjacent said operating mechanism, said solenoid including an actuating portion disposed closely adjacent but not positively connected to said outwardly extending portion of said plunger, whereby said solenoid may be installed and replaced without disturbing said trip operating plunger.

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