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ELECTRIC CIRCUIT BREAKER

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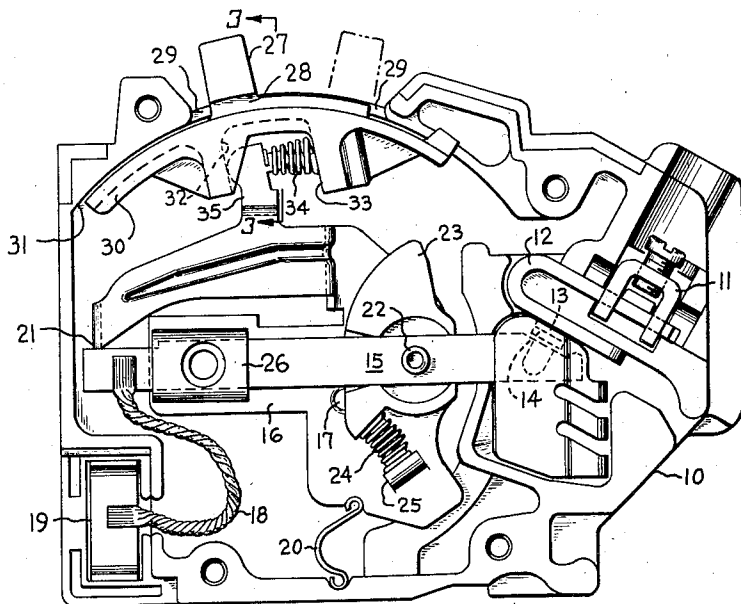


Fig. 1

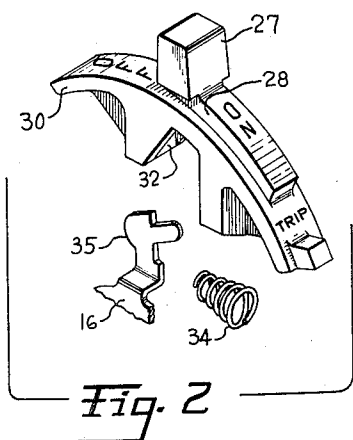


Fig. 2

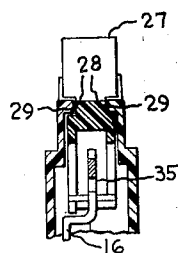


Fig. 3

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ELECTRIC CIRCUIT BREAKER

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3 Claims. (Cl. 200—67)

The present invention relates to electric circuit breakers and particularly to electric circuit breakers of the type adapted for use in the control of branch circuits in residential, industrial, and commercial buildings.

In the control of alternating current, it has long been appreciated that such current is more readily interrupted by contact mechanisms which operate to separate contacts by a relatively slow action. This is because such a slow action draws an arc between the two contacts and the current in the circuit has time to reach a zero point at which the arc goes out of its own accord. Since there is then a gap between the two contacts, the current will not restrike when the voltage again rises. This is to be contrasted with a quick separating action in which contacts are rapidly moved apart, in which such rapid movement serves only to lengthen the arc and to increase its damaging effects. On the other hand, it is generally recognized that it is ordinarily desirable that the closing of contacts, both in alternating and direct current be done rapidly or with a "quick-make" action. This is because a small amount of arcing almost invariably occurs in any closing operation, and if the operation be done slowly, this arcing is more severe. In addition, it is usually desirable to discourage any "teasing" of the contacts which causes severe arcing and burning by slowly moving the contacts into a lightly contacting position.

It is an object of the present invention to provide an electric circuit breaker mechanism having a "slow-break" action, and a "quick-make" action.

It is another object of the present invention to provide a "quick-make" action to a mechanism which is basically of the slow-make and slow-break type, by means of a simple handle mounting and connection.

In accordance with the present invention, an electric circuit breaker is provided including a contact carrying member which is pivotally movable between open and closed circuit positions against the bias of an "overcenter" spring, and which is automatically movable to a tripped position upon the occurrence of predetermined current conditions. The contact member is operated by means of an operating handle provided with a lost motion connection with the contact operating member, and a compression spring is provided between the two parts which is adapted to be compressed by movement of the handle in one direction so as to provide a quick-make action but which does not come into operation upon movement of the handle in the opposite direction whereby a slow-break action is provided.

In the drawing,

Figure 1 is a side elevation view of an electric circuit breaker incorporating my invention, one side of the casing being removed to expose the mechanism parts;

Figure 2 is a fragmentary exploded perspective view showing the handle of the circuit breaker of Figure 1 and the mounting means therefor;

Figure 3 is a sectional elevation view taken generally on the line 3—3 of Figure 1.

In the drawing, the invention is shown as embodied

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in an electric circuit breaker of the type disclosed in application Serial Number 689,422 filed concurrently herewith by H. J. Hammerly and H. Nadeau, assigned to the same assignee as the present invention. The circuit breaker comprises an insulating casing 10 having a load terminal clamping member 11 supported therein at one end and adapted to clamp a conductor, not shown, to a load terminal strap 12. The load terminal strap 12 carries a stationary contact 13 mounted thereon by suitable means such as by brazing or welding, adapted to be contacted by a relatively movable contact 14.

The movable contact 14 is mounted on an edge portion of an elongated bimetallic strip 15 pivotally supported on a generally planar frame member 16 which in turn is pivotally supported in the casing 10 at pivot point 17. The opposite end of the bimetallic strip 15 is provided with a flexible conductor 18 connected to a suitable line terminal 19. The frame member 16 is provided with an over-center type operating spring 20 which, when the circuit breaker is in the closed circuit position as shown in Figure 1, biases the frame member 16 for counterclockwise rotation. The bimetallic strip 15 has a releasable latch engagement with a portion 21 of the frame member 16, and in addition, is pivotally connected to the frame member 16 at pivot pin 22. The bimetallic strip 15 is, however, insulated from the frame member 16 adjacent the pivot point 22 by suitable insulating means such as by an insulating spacer 23. A kick-off compression spring 24 is provided positioned between an upstanding lug 25 carried by the frame member 16 and the insulating spacer 23.

When the circuit breaker is in the "on" position as shown in Figure 1, the overcenter spring 20 biases the frame member 16 in a counterclockwise direction, this force being transmitted to the bimetallic member by means of the latch engagement 21. When the plane member 16 is moved in a clockwise direction, the line of action of the spring 20 passes overcenter with respect to the pivot point 17 and then biases the frame member 16 in a clockwise direction, moving the frame and the bimetallic member to an open circuit position.

Upon the occurrence of predetermined overload current conditions through the circuit breaker, the bimetallic member 15 deflects toward the frame member 16 until it becomes disengaged from the latch member 21. When this occurs, the kick-off spring 24 is free to move the bimetallic member 15 clockwise about its pivotal support 22 to a tripped or automatically opened condition.

Automatic tripping or opening is either accelerated or instituted by a magnetic action resulting from the attraction set up between a magnetic field piece 26 carried by the bimetallic strip 15 and the corresponding adjacent portion of the frame member 16, which is preferably constructed of ferromagnetic material.

For the purpose of moving the frame member and associated parts between open and closed circuit position, there is provided an insulating handle member 27. The handle member 27 is provided with oppositely disposed notches 28 adapted to receive arcuate raised portions or tracks 29. This engagement, combined with the guiding action of the enlarged inner skirt portion 30 of the handle against the inner surface of the top wall of the casing 31, serves to maintain the handle 27 in position with respect to the casing and to guide its movement between the "on" and "off" conditions. The handle 27, therefore, has no positive connection with the frame member 16. Instead the handle member is provided with two spaced surfaces 32 and 33, and the frame member 16 is provided with an upstanding lug portion 35 adapted to project between the portions 32 and 33 to

provide a lost-motion connection between the handle 27 and the frame 16.

The handle 27 is maintained in a normal predetermined position relative to the frame member 16 by means of a compression spring 34 having one end abutting against the surface 33 of the handle and having the other end engaging the projecting lug 35 of the frame member.

Assuming the parts to be in the "on" or closed circuit position as shown in Figure 1, if the handle is moved toward the right, the surface 32 of the handle being in engagement with the lug portion 35 of the frame 16, immediately moves the frame 16 and causes a separating action of the contacts, which motion is in direct relation to the speed of movement of the operating handle. Since such speed of movement of the operating handle is ordinarily relatively slow, the separating action of the contacts is also relatively slow. When the frame member 16 is in the open circuit position, and the handle 27 is in the open circuit position, indicated in dotted lines in Figure 1, movement of the handle 27 in a counterclockwise direction does not initially cause movement of the frame member 16. Instead such movement causes a compression of the spring 34, until the wall 33 of the handle engages the lug 35 of the frame member directly. When this occurs, movement of the frame member 16 ensues. When the frame member 16 has been moved to a point where the overcenter spring 20 passes across the pivot point 17 of the frame member, the frame member moves to its fully closed position with a snap or quick-made action. This quick-closing movement is not dependent upon the speed of movement of the operating handle 27. In addition, the speed of movement of the contact member is due to the force of the overcenter spring member 20 and is further supplemented by the force of the compression spring 34.

It will also be observed that while the force of the overcenter spring 20 normally contributes to latch pressure, that is the pressure of engagement between the latch portion 21 of the frame member 16 and the latched end of the bimetallic strip 15, the compression spring 34, although it contributes to quick-make action of the contacts, does not contribute in any way to the latch pressure under ordinary conditions such as when the circuit breaker is not being manually operated.

While I have shown my invention in one particular embodiment, it will be appreciated that many modifications thereof may be made by those skilled in the art, and 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 an insulating casing, a switch member pivotally supported in said insulating casing and movable between open and closed circuit positions, a contact carried by said switch member and normally fixed with relation thereto, an overcenter spring between said switch member and said insulating casing, manually operable means for operating said switch member between said open and closed circuit positions comprising an insulating handle slidably

supported on said insulating casing, a projection carried by said manually operable handle portion, and spring means between said insulating handle and said switch member biasing said projection of said handle member in contact-opening direction normally into engagement with said switch member, said handle member being movable at least a short distance in contact-closing direction against the bias of said spring means without movement of said switch member whereby said contact moves to said closed circuit position with a snap action at a speed independent of the speed of movement of said handle and moves away from said closed circuit position at a speed dependent on the speed of movement of said handle.

2. An electric circuit breaker comprising an insulating casing, a switch member pivotally mounted in said casing, an overcenter spring connected between said casing and said switch member, a handle member slidably supported on said insulating casing and having a pair of inwardly directed spaced apart projections and a single manually engageable outwardly directed projection extending outwardly of said casing, said switch member having a portion extending between said inwardly directed portions of said handle member, the distance between said inwardly directed projections of said handle member being greater than the portion of said switch member extending therebetween whereby a lost motion connection is provided between said handle member and said switch member, and spring means between said switch member and said handle member normally biasing a predetermined one of said inwardly directed projecting portions into engagement with said switch member.

3. An electric circuit breaker comprising an insulating casing, a switch member pivotally supported in said insulating casing, an overcenter spring connected between said casing and said switch member, a handle member adapted to be mounted adjacent the top wall of said circuit breaker housing and having a portion projecting outwardly of said housing for manual operation of said circuit breaker, said handle having a pair of spaced apart inwardly directed projections for operating said switch member, said handle having opposed slots in the opposite outer side walls of said manually engageable handle portion, said casing having a pair of elongated guiding bosses adapted to be received within said slots of said handle to support and guide said handle for movement with respect to said insulating casing, said switch member having a portion extending between said inwardly directed spaced apart projections of said handle member, said handle projections being spaced apart a distance substantially greater than the portion of said switch member extending therebetween to provide a lost motion connection between said handle member and said switch member, and a compression spring between one of said handle projections and said switch projection.

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