June 21, 1949. L. PIERCE 2,473,901

PUSH BUTTON OPERATED CIRCUIT INTERRUPTER

Filed July 31, 1947

Fig. 1.

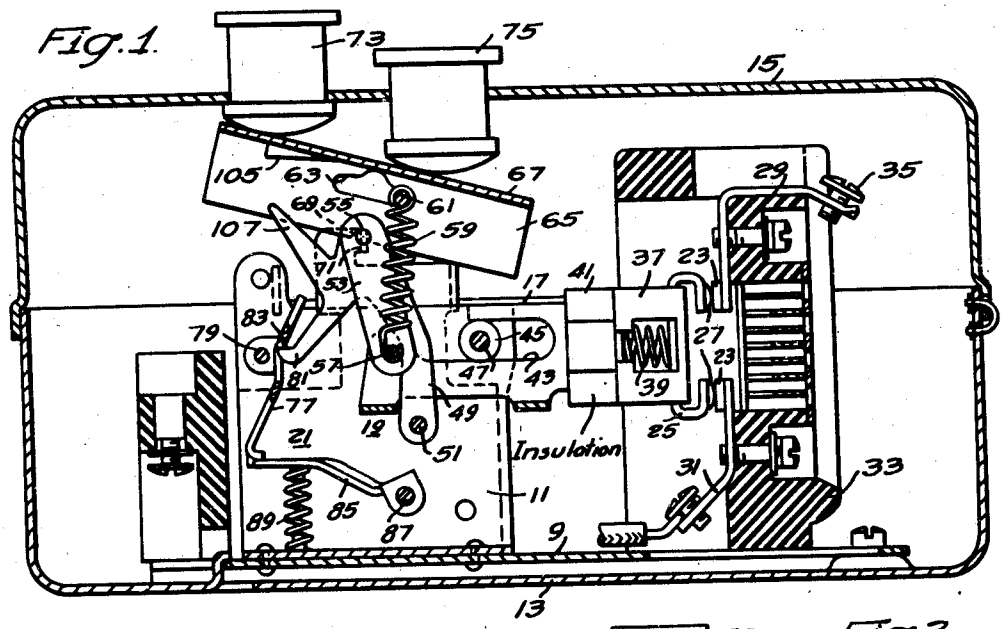


Fig. 2.

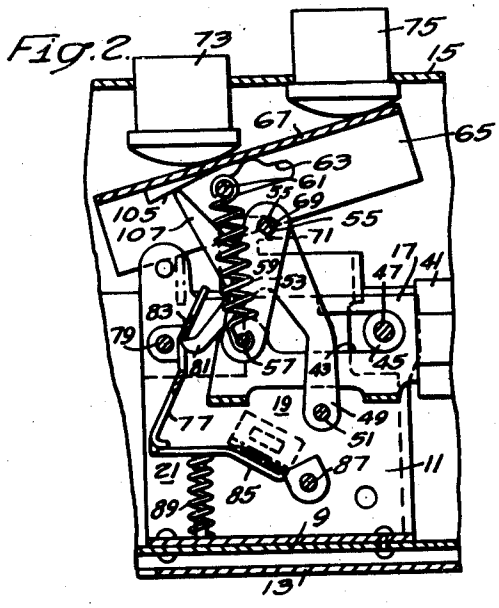


Fig. 3.

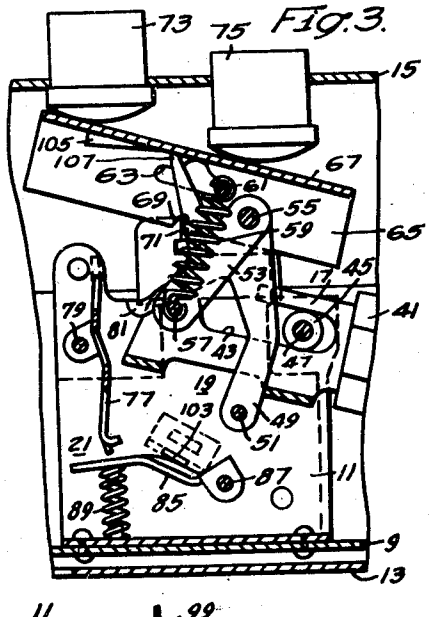
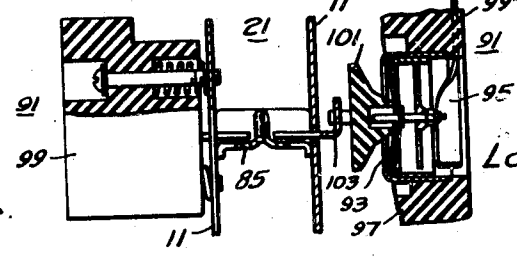


Fig. 4.



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PUSH BUTTON OPERATED CIRCUIT INTERRUPTER

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8 Claims. (Cl. 200—116)

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This invention relates to circuit interrupters and more particularly to circuit breakers of the push-button operated type.

An object of the invention is to provide a circuit breaker embodying an improved manual operating mechanism.

Another object of the invention is to provide a circuit breaker having a snap acting operating mechanism with an improved manual operating means.

Another object of the invention is to provide a circuit breaker having an operating mechanism comprising an overcenter spring with an improved push-button manual operating mechanism.

The novel features that are considered characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to structure and operation, together with additional objects and advantages thereof, will best be understood from the following description thereof when read in connection with the accompanying drawing, of which:

Fig. 1 is a vertical sectional view of the circuit breaker showing the operating mechanism and contact means in the closed position;

Fig. 2 is a fragmentary vertical sectional view showing the operating mechanism in the manually open position;

Fig. 3 is a fragmentary view similar to Fig. 2 but showing the operating mechanism in the tripped open position; and,

Fig. 4 is a fragmentary view partly in section, illustrating the current responsive trip device and a portion of the latching means of the breaker.

Referring to the drawing, the circuit breaker comprises a base 9 of sheet metal construction provided with a U-shaped frame 11 for supporting the circuit breaker unit. The base 9 and the circuit breaker unit are mounted in an enclosure comprising a casing 13 and a cooperating cover 15.

The circuit breaker unit comprises, in general, a movable switch operating member indicated generally at 17 for controlling the contact means of a breaker, an operating mechanism indicated generally at 19 for operating the switch member to open and to closed circuit positions, and a current responsive trip device indicated generally at 21 which is operable in response to predetermined overload conditions to cause the operating mechanism to move the switch operating member 17 to a tripped-open position.

The contact means of the circuit breaker comprises a plurality of sets of spaced stationary contacts 23 (only one set being shown) and a plurality of movable bridging contact members 25 (only one being shown), which serve to bridge the stationary contacts 23 in the closed position of the breaker. The conducting bridging contact member carries a pair of movable contacts 27 which cooperate with the stationary contacts 23 to open and close the circuit.

The stationary contacts 23 are mounted on the opposed ends of a pair of conducting strips 29 and 31 supported on an insulating block 33, suitably mounted on the base 9. The upper conducting strip 29 is formed at right angles and is provided with a terminal screw 35 for connecting the contact in an electrical circuit.

The bridging contact member 25 which carries the movable contacts 27 is mounted in a frame 37 and is biased by means of a spring 39 compressed between the back of the contact member 25 and the frame 37.

The frame 37 which supports the bridging member 25 is mounted on a cross-bar 41 of insulating material which is secured to the movable switch operating member 17 and extends across the device, and carries in like manner the bridging contact members for the other poles (not shown). The switch member 17 is channel-shaped and the sides thereof are provided with slots 43 which engage a roller 45 mounted on a fixed rod 47 extending between and supported in the side members of the U-shaped frame 11 to movably support the switch member.

The operating mechanism 19 comprises, in general, a releasable carrier 49 which is pivotally mounted by means of a pivot pin 51 supported in the side members of the main frame, a pair of actuating links 53 pivotally connected at their upper ends by a pivot pin 55 to the carrier 49 and pivotally connected at their lower ends by means of a pivot pin 57 to the movable switch member 17. A pair of over-center springs 59 (only one being shown) are disposed on opposite sides of the carrier 49 and the links 53. The lower ends of the over-center springs 59 are connected to the pivot pin 57 which connects the links 53 to the switch member 17 and the upper ends of the springs 59 are connected to a rod 61 movably supported in slots 63 in the side walls 65 (only one being shown) of a channel shaped rocker 67. The lower edges of the side walls 65 of the rocker are provided with aligned V-shaped notches 69 which engage formed over ears 71 on the side members of the main frame to pivotally support the rocker 67. Disposed one on each side

of the pivot 71 for the rocker 67 is a pair of push buttons 73 and 75 which are slidably mounted in suitable openings in the cover 15 and having their inner ends rounded for cooperation with the rocker 67.

The carrier 49 is releasably held in a normally latched position, as shown in Figs. 1 and 2, by means of a latch 77 which is pivotally mounted on a pivot pin 79 extending transversely between the side members of the frame 11. The free end of the carrier 49 is provided with a latch nose 81 which engages under the edge of an opening 83 in the latch member 77. The latch member 77 is releasably restrained in latching position by means of a second latch member 85 which is pivotally mounted on a pivot pin 87 extending between and supported by the side members of the frame 11. The latch member 85 is biased in latching direction about its pivot by means of a compression spring 89. The lower end of the latch member 77 normally abuts against the free end of the second latch member 85 so that the latch member 85 normally prevents releasing movement of the main latch 77.

With the parts in the closed position shown in Fig. 1, and it is desired to manually open the circuit, the push button 73 is pressed inwardly as far as it will go, thus rotating the rocker 67 in a counterclockwise direction from its Fig. 1 position to the position in which it is shown in Fig. 2. During the movement of the rocker 67, the rod 61 will be moved to the opposite end of the slot 63 by the force exerted by the springs 59 and thus carry the line of action of the springs 59 across to the left of the pivot 55 to effect movement of the actuating links 53 and the switch member 17, together with the movable bridging contact member 25 carried thereby, to the open circuit position with a snap action. If the over-center springs 59 were attached to the rocker 65 at its point of greatest overcenter movement, due to the limited movement of the rocker the springs would not be moved overcenter across the line 55—57 far enough to overcome the frictional forces and operate the switch members. By the provision of the slot 63 and the rod 61 to which the outer ends of the springs are attached, the ends of the springs associated with the rocker 65 are caused to move overcenter relative to the operator a greater distance than the overcenter movement of the operator or rocker. The movement of the switch member 17 to the manually open circuit position is limited by engagement of the right hand end of the slot 43 therein with the roller 45 as shown in Fig. 2.

In order to manually close the circuit breaker, the closing push button 75 is depressed rotating the rocker 67 in a clockwise direction from the position shown in Fig. 2, to the position in which it appears in Fig. 1. During this movement of the rocker 67 the roller 61 moves back to its original position carrying the line of action of the over-center springs 59 across to the right of the pivot 55 to effect movement of the actuating links 53 and the switch member 17 to the closed circuit position as shown in Fig. 1. The roller 45 permits the switch operating member 17 to be rolled freely to open and closed positions, and also serves to guide the switch member so that it is moved substantially in a straight line during manual switching operations.

The trip device is of the type disclosed in U. S. Patent No. 2,265,004, issued December 2, 1941, to Lawrence Pierce and Stephan Miller and assigned to the assignee of the present invention, for which reason only a brief description thereof will be given herein.

The trip device comprises a plurality of current responsive devices 91 (Fig. 4), there being a current responsive device 91 associated with at least two poles of the breaker. Each of the current responsive devices 91 (only one being shown in detail) comprises a snap-acting bimetallic disc 93, a heater coil 95, a supporting cylinder 97 mounted in an insulating block 99 secured to the frame 11, an insulating button 101 and a trip member 103 for engaging and operating the latch member 85. The bimetallic disc 93 is of the type which, when heated a predetermined amount in response to overload currents, snaps suddenly from one position to another and, when cooled below a predetermined temperature, snaps back to its original position.

When the bimetal disc 93 is heated a predetermined amount in response to overload currents and snaps from the position in Fig. 4, the trip member 103 engages the latch member 85 and operates it to the position shown in Fig. 3, thus effecting release of the main latch 77 which is actuated to releasing position under the influence of the overcenter springs 59 to effect release of the carrier 49. When the carrier 49 is released, it is moved in a clockwise direction by the force exerted by the over-center springs 59. This clockwise movement of the pivoted carrier 49 carries the pivot pin 55 to the right across the line of action of the over-center springs 59 to the position shown in Fig. 3. As soon as the pivot pin 55 crosses to the right of the line of action of the over-center springs, these springs act to move the switch operating member 17 to a tripped open position. The switch member 17 in moving to its tripped open position pivots in a clockwise direction about the roller 45 and is then moved by the force exerted by the over-center springs 59 to the open circuit position, as shown in Fig. 3.

Before the circuit breaker can be reclosed following an automatic opening operation, it is necessary to reset the carrier 49 and the latches 77 and 85 to their latching positions. In order to reset the mechanism, the push button 73 is depressed to the limit of its movement, thus rocking the rocker 67 in a counterclockwise direction from its Fig. 3 position to its Fig. 2 position. During this counterclockwise movement of the rocker 67, a cam portion 105 thereof engages a projection 107 on the carrier 49 and moves the carrier 49 counterclockwise to the position shown in Fig. 2. The counterclockwise movement of the carrier 49 causes the latch nose 81 to engage the lower edge of the opening 83 of the latch member 77 and move that member to its latching position. At this time the bimetal element 93 has cooled and snapped to its Fig. 4 position withdrawing the trip member 103 and releasing the latch member 85. When the latch member 77 has been restored to its latching position, the second latch member 85 is moved by the spring 89 to its latching position wherein its end reengages the end of the latch member 77. The mechanism is now completely reset and the circuit breaker can be reclosed by depressing the "on" button 75 to close the circuit breaker in the previously described manner.

From the foregoing description, it will be apparent that there is provided an improved automatic circuit breaker operating mechanism wherein one end of an over-center spring is controlled by a push button operated rocking member to move the spring over center for the pur-

pose of operating the breaker to open and closed positions, the end of the spring that is controlled by the rocking member moving relative thereto a greater distance over center than it would if the spring were secured to the rocking member.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details thereof may be made without departing from some of the essential features of the invention.

I claim as my invention:

1. In a circuit breaker having a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and to closed circuit positions comprising a pivoted operator, an over-center spring having one end associated with said switch operating member, a spring support member supporting the other end of said over-center spring on said operator for movement relative to said operator, manual means for moving said pivoted operator, said pivoted operator having a slot therein for permitting the end of said over-center spring related to said pivoted operator to move over-center a greater distance than the over-center movement of said pivoted operator to effect operation of said pivoted member, means releasable to effect automatic movement of said switch operating member to open position, and means on said pivoted operator for resetting said releasable means upon opening movement of said generator.

2. In a circuit breaker having a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and closed circuit positions comprising an over-center spring, an operator movable to two positions to effect over-center movement of said spring to thereby move said switch operating member to said open and closed circuit positions, manually operable means for moving said operator to said two positions, a spring support member mounting one end of said over-center spring on said operator and movable relative to said operator upon movement of said operator to either one of said two positions to effect over-center movement of said spring, a releasable member operable when released to effect automatic movement of said switch operating member to open position, and means on said operator for engaging and resetting said releasable member upon opening movement of said operator.

3. In a circuit breaker comprising a switch operating member movable to open and closed positions to open and close said circuit, the combination of an operating mechanism for moving said switch operating member to said open and closed positions comprising an over-center spring having one end pivotally connected to said switch operating member, an operator having a slot therein, a spring support member engaging said slot for movement relative to said operator upon movement of said operator, the other end of said over-center spring being attached to and movable with said spring support member, manual means for actuating said operator to cause movement of said spring support member relative to said operator whereby the end of the over-center spring attached to said spring support member is moved over-center a greater distance than it would if attached directly to said operator, and a member releasable to effect movement of said switch operating member to open position irrespective of the closed position of said operator.

4. In a circuit breaker comprising a switch

operating member movable to open and closed positions to open and close said circuit, the combination of an operating mechanism for moving said switch operating member to said open and closed positions comprising a pivoted operator having a slot therein and movable to an open and to a closed position, a member engaging said slot for movement therein relative to said operator, an over-center spring connecting said switch operating member and said member, manually operable means comprising a pair of push buttons disposed one on each side of the pivot of said operator and operable to effect movement of said operator to said open and closed positions, said member upon movement of said operator to either of its positions moving within said slot relative to said actuator to effect over-center movement of said spring to thereby actuate said switch operating member, a member releasable to effect automatic movement of said switch member to open position, a trip device operable in response to over-load currents to release said releasable member, and means on said operator for resetting said releasable member.

5. In a circuit breaker having a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and to closed circuit positions comprising a pivoted operator having a longitudinal slot therein, an over-center spring having one end associated with said switch operating member, a member disposed in said slot for supporting the other end of said over-center spring on said operator for movement relative to said operator, manual means for moving said operator, and said operator having a longitudinal slot therein for permitting the end of said over-center spring related to said operator to move a greater distance than the movement of said operator to effect over-center movement of said spring, and means releasable to effect movement of said switch operating member to open position irrespective of the closed position of said operator.

6. In a circuit breaker having a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and to closed circuit positions comprising a pivoted operator, an over-center spring having one end associated with said switch operating member, a support member supporting the other end of said over-center spring on said operator for movement relative to said operator, manual means for moving said operator, said operator having a longitudinal slot therein for permitting the end of said over-center spring supported by said operator to move a greater distance than the movement of said operator to effect over-center movement of said spring, means releasable to effect movement of said switch operating member to open position irrespective of the closed position of said operator, and means on said operator for engaging and resetting said releasable means upon opening movement of said operator.

7. In a circuit breaker comprising a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and closed positions comprising a releasable member, means operatively connecting said switch operating member to said releasable member, an operator movable between a first and a second position to move said switch member to said open and closed positions, a member carried by said operator and movable relative thereto upon movement of said operator to either

of its positions, an over-center spring connected between said member and said switch operating member, manual means for moving said operator to its first and second positions to effect over-center movement of said spring, said member upon movement of said operator to either of its positions moving relative thereto a distance greater than the movement of said operator, and trip means operable to release said releasable members to effect opening movement of said switch operating member.

8. In a circuit breaker comprising a movable switch operating member, the combination of an operating mechanism for moving said switch operating member to open and closed positions comprising a releasable member, means operatively connecting said switch operating member to said releasable member, an operator movable between a first and a second position to move said switch operating member to said open and closed positions, a member carried by said operator and movable relative thereto upon movement of said operator to either of its positions, an over-center spring connected between said member and said

switch member, manual means for moving said operator to its first and second positions to effect over-center movement of said spring, said member upon movement of said operator to either of its positions moving relative thereto a distance greater than the movement of said operator, trip means operable to release said releasable members to effect opening movement of said switch operating member, and cam means on said operator engageable with said releasable member when said operator is moved to open position to reset said releasable member.

LAWRENCE PIERCE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,265,004	Pierce et al.	Dec. 2, 1941
2,388,617	Link	Nov. 6, 1945
2,430,138	Parker	Nov. 4, 1947