April 28, 1953 H. D. DORFMAN ET AL 2,636,958

CIRCUIT BREAKER

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Fig.1.

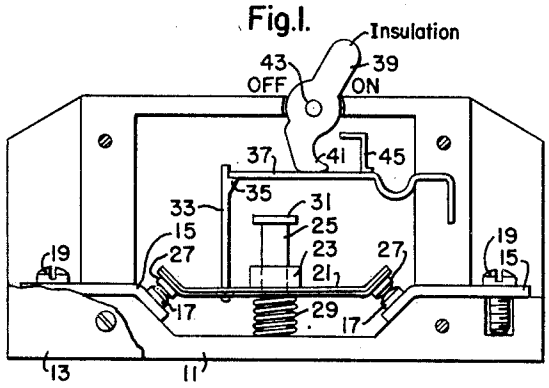


Fig.2.

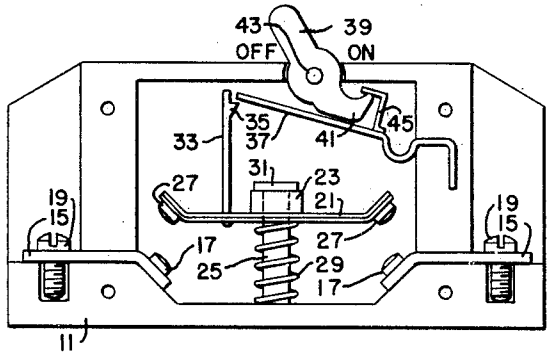
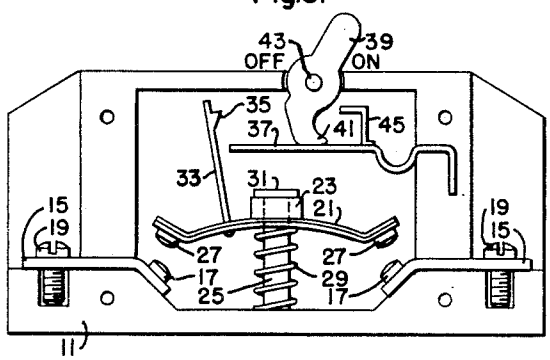


Fig.3.



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CIRCUIT BREAKER

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9 Claims. (Cl. 200—116)

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This invention relates to circuit breakers and more particularly to circuit breakers embodying a thermally responsive element for automatically actuating the contacts thereof.

An object of the invention is to provide a circuit breaker embodying a thermally responsive element which is operable to automatically open the contacts free of the manually operable handle.

Another object of the invention is to provide a circuit breaker embodying a normally latched thermally responsive element having movable contacts thereon, the thermally responsive element being movable bodily to open the contacts.

Another object of the invention is to provide a circuit breaker embodying a normally latched, slow-acting bimetal element having movable contacts thereon, the bimetal element bending slowly when heated to effect unlatching and opening of the contacts.

Another object of the invention is to provide a circuit breaker having few parts which is simple, compact, safe and reliable in operation, and inexpensive to manufacture.

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

In said drawing:

Figure 1 is an elevational view of a circuit breaker embodying the principles of the invention, the breaker being shown with the cover plate partly broken away and in the closed-circuit position:

Fig. 2 is a view similar to Fig. 1, but showing the breaker in the manually-opened position with the cover plate removed; and

Fig. 3 is a view similar to Fig. 2, but showing the breaker in the tripped-open position.

Referring to Fig. 1 of the drawing, the circuit breaker is mounted in a housing 11 of molded insulating material and a cover plate 13 also of molded insulating material, only a portion of the cover plate 13 being shown in Fig. 1. Disposed at the ends of the housing 11 are terminal conducting strips 15 extending through openings in the end walls of the housing and having secured to the inner ends thereof stationary contacts 17. At their outer ends the terminal strips 15 are provided with suitable connecting means 19 for

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connecting the circuit breaker in an electrical circuit.

A movable switch member 21, comprising a strip of slow-acting bimetallic material, has secured thereto a bearing 23 which is slidably mounted on a stud 25 rigidly secured to the base portion of the housing 11. The bimetallic switch member 21 has rigidly secured thereto movable contacts 27 for cooperating with the stationary contacts 17 to open and close the circuit. The switch member 21 is biased to open the contacts 17—27 by means of a spring 29 coiled about the stud 25 and compressed between the base portion of the housing 11 and the switch member 21, the opening movement of the switch member being liimted by a head 31 on the end of the stud 25.

A latch member 33 rigidly secured to the bimetallic switch member 21 has, at its outer end a latch surface 35 which normally engages the free end of a biased or spring actuator 37 to releasably hold the switch member 21 in the closed-contact position. One end of the resilient actuator 37 is rigidly mounted in one end wall of the housing 11 and has an inherent bias to the position in which it is shown in Fig. 2. The spring actuator 37 is normally held in the closed position as shown in Fig. 1 by an operating handle 39 of molded insulating material, the inner end 41 of which engages the spring actuator 37. The handle 39 is provided with trunnions 43 (only one being shown) molded integral therewith which pivotally mount the handle in matched openings in the housing and in the cover plate.

In order to manually open the breaker, the handle 39 is rotated counterclockwise from the Fig. 1 position to the position shown in Fig. 2. This frees the actuator 37 which moves to the Fig. 2 position by its own bias permitting the spring 29 to move the switch member 21 to the open position separating the contacts 17—27. From the normally open position, as shown in Fig. 2, the contacts are closed by reverse movement of the handle 39. The clockwise movement of the handle 39 causes the inner end 41 thereof to engage and move the spring actuator 37 to the closed position. During this movement, the free end of the actuator 37 engages the latch 35 on the latch member 33 and moves the switch member inwardly against the bias of spring 29 to close the contacts.

The circuit breaker is opened automatically in response to overload currents traversing the bimetallic switch member 21. The high-expansion side of the bimetallic switch member is disposed

on the upper side thereof so that when heated a predetermined amount in response to overload current flowing therein, it bows upwardly as indicated in Fig. 3. The bowing of the bimetallic switch member 21 causes the latch member 33, which is rigidly attached thereto, to swing to the left in unlatching direction. As soon as the latch surface 35 escapes the free end of the actuator 37, the spring 29 snaps the switch member 21 outwardly to open the contacts 17—27, the switch member being stopped in the open position by the bearing 23 engaging the head 31 on the stud 25.

The circuit breaker is shown in Fig. 3 in the automatically tripped-open position but before the bimetallic switch member 21 has cooled and resumed its normal shape. Before the contacts can be closed following an automatic opening operation, it is necessary to wait until the bimetal element 21 has cooled and resumed its normal shape. In order to close the contacts following an automatic opening operation, the handle 39 is first moved to the "off" position permitting the spring actuator 37 to move to the Fig. 2 position. After the bimetallic switch member 21 has cooled and the latch member 33 has resumed its normal position (Fig. 2) the contacts are closed in the previously described manner. Should the bimetal cool before the handle 39 is moved to the "off" position, the free end of the actuator 37 will, upon movement of the handle to the "off" position, wipe by the latch 35 which will then assume the position shown in Fig. 2 in the path of the end of the actuator 37. There is provided an angular member 45 rigidly secured to the actuator 37 which is engaged by the inner end 41 of the handle upon counterclockwise movement of the handle to the full "off" position to positively move the actuator 37 past the latch 35 where it will engage the latch and close the contacts upon closing movement of the handle.

It will be noted that the bimetal cannot be manually moved to close the contacts until it has cooled and resumed its normal shape. This avoids the possibility of the bimetal taking a permanent set which might occure if the bimetal could be forced to move to the closed position while hot and in its bowed condition.

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 and arrangement of parts thereof may be made without departing from some of the essential features of the invention.

We claim as our invention:

1. A circuit breaker comprising spaced stationary contacts, a switch member biased to open position, said switch member comprising a single strip of bimetallic material heated in response to the current of the circuit, movable contacts mounted on said bimetallic switch member adjacent the ends thereof and cooperating with said spaced stationary contacts to open and close said circuit, means mounting said bimetallic switch member for sliding movement, a latch member rigidly mounted on said bimetallic switch member, operating means for said bimetallic switch member including an actuator normally engaging said latch member to restrain said bimetallic switch member in the closed contact position, an operating handle for operating said actuator to effect manual opening and closing movement of said bimetallic switch member, and said bimetallic switch member when heated a predetermined amount in response to overload currents bowing in a direction to bodily move said latch member to effect release of said bimetallic switch member and opening of said contacts.

2. A circuit breaker comprising spaced stationary contacts, a switch member biased to open position, said switch member comprising a single strip of bimetallic material heated in response to the current of the circuit, movable contacts mounted on said bimetallic switch member adjacent the ends thereof and cooperating with said spaced stationary contacts to open and close said circuit, means mounting said bimetallic switch member for sliding movement, a latch member rigidly mounted on said bimetallic switch member, said bimetallic switch member forming the sole support for said latch member, operating means for said bimetallic switch member including an actuator normally engaging said latch member to restrain said bimetallic switch member in the closed contact position, an operating handle for operating said actuator to effect manual opening and closing movement of said bimetallic switch member, and said bimetallic switch member when heated a predetermined amount in response to overload currents bowing in a direction to bodily move said latch member to effect release of said bimetallic switch member and opening of said contacts.

3. A circuit breaker comprising spaced stationary contacts, a switch member biased to open position, said switch member comprising a single strip of bimetallic material heated in response to the current of the circuit, movable contacts mounted on said bimetallic switch member adjacent the ends thereof and cooperating with said spaced stationary contacts to open and close said circuit, means mounting said bimetallic switch member for sliding movement, a latch member rigidly mounted on said bimetallic switch member, said bimetallic switch member forming the sole support for said latch member, operating means for said bimetallic switch member including an actuator normally engaging said latch member to restrain said bimetallic switch member in the closed contact position, an operating handle for operating said actuator to effect manual opening and closing movement of said bimetallic switch member, and said bimetallic switch member when heated a predetermined amount in response to overload currents bowing in a direction to bodily move said latch member to effect release of said bimetallic switch member and opening of said contacts irrespective of the position of said handle.

4. A circuit breaker comprising spaced stationary contacts, a switch member formed from a single strip of bimetallic material and disposed to be heated by the current of the circuit, movable contacts on said switch member for cooperating with said spaced stationary contacts to open and close said circuit, means mounting said switch member for sliding movement, biasing means biasing said switch member to the open position, a latch member rigidly mounted on said switch member, operating means for said switch member comprising a biased actuator normally engaging said latch member to restrain said switch member in closed position and an operating handle normally restraining said biased actuator in closed position, said handle being movable to a position to permit said biasing means to move said switch member to open position, and said bimetallic switch member when heated a predetermined amount in response to overload currents bowing in a direction to bodily move

said latch in unlatching direction to effect release of said switch member and opening of said contacts.

5. A circuit breaker comprising spaced stationary contacts, a switch member formed from a single strip of bimetallic material and disposed to be heated by the current of the circuit, movable contacts on said switch member for cooperating with said spaced stationary contacts to open and close said circuit, means mounting said switch member for sliding movement, biasing means biasing said switch member to the open position, a latch member rigidly mounted on said switch member, said switch member comprising the sole support for said latch member, operating means for said switch member comprising a biased actuator normally engaging said latch member to restrain said switch member in closed position and an operating handle normally restraining said biased actuator in closed position, said handle being movable to a position to permit said biasing means to move said switch member to open position, and said bimetallic switch member when heated a predetermined amount in response to overload currents bowing in a direction to bodily move said latch in unlatching direction to effect release of said switch member and opening of said contacts.

6. A circuit breaker comprising spaced stationary contacts, a switch member biased to open position, said switch member being formed from a single strip of bimetallic material disposed to be heated in response to the current of the circuit, movable contacts mounted on said switch member cooperating with said stationary contacts to open and close the circuit, means mounting said bimetallic switch member for sliding movement, a latch member rigidly mounted on said bimetallic switch member for movement therewith at all times, operating means for said bimetallic switch member comprising a flat spring having a normal bias biasing said actuator in opening direction, said actuator normally engaging said latch member to restrain said bimetallic switch member in closed position, an operating handle having a portion normally engaging said actuator to maintain said actuator in closed position against its normal bias, said handle being movable to a position to permit said biased switch member to move to open position, and said bimetallic switch member when heated a predetermined amount in response to overload currents bending in a direction to bodily move said latch member and effect release thereof from said actuator and automatic opening of said contacts.

7. A circuit breaker comprising spaced stationary contacts, a switch member biased to open position, said switch member being formed from a single strip of bimetallic material disposed to be heated in response to the current of the circuit, movable contacts mounted on said switch member cooperating with said stationary contacts to open and close the circuit, means mounting said bimetallic switch member for sliding movement, a latch member rigidly mounted on said bimetallic switch member for movement therewith at all times, operating means for said bimetallic switch member comprising a flat spring having a normal bias biasing said actuator in opening direction, said actuator normally engaging said latch member to restrain said bimetallic switch member in closed position, an operating handle having a portion normally engaging said actuator to maintain said actuator in closed position against its normal bias, said handle being movable to a position to permit said biased switch member to move to open position, and said bimetallic switch member when heated a predetermined amount in response to overload currents bending in a direction to bodily move said latch member and effect release thereof from said actuator and automatic opening of said contacts, and means on said actuator engageable by said handle to positively move said actuator to a reset position to effect reengagement of said actuation with said latch member.

8. A circuit breaker comprising spaced stationary contacts, a bimetallic switch member comprising a single strip of slow-acting bimetallic material heated in response to the current of the circuit, spring means at all times biasing said bimetallic switch member in opening direction, movable contact means mounted on said bimetallic switch member for cooperating with said stationary contacts, operating mechanism for said bimetallic switch member comprising an actuator movable to open and closed positions to open and close said contacts, a latch member rigidly supported on said bimetallic switch member releasably engaging said actuator to restrain said bimetallic switch member in the closed position against the bias of said spring, and said bimetallic switch member when heated a predetermined amount in response to overload currents slowly bending and bodily displacing said latch members in a direction to unlatch said latch member and release said bimetallic switch member from said actuator to permit said spring to move said bimetallic switch member to open position free of said actuator.

9. A circuit breaker comprising spaced stationary contacts, a bimetallic switch member having movable contacts thereon for cooperating with said stationary contacts, said switch members comprising a single strip of slow-acting bimetallic material heated in response to the current of the circuit and slidably movable in a straight line to open and closed positions, a compression spring at all times biasing said bimetallic switch member toward said open position, operating mechanism comprising an actuator movable to open and closed positions, a latch member rigidly supported on said bimetallic switch member, said latch member having a latch portion releasably engaging said actuator to normally restrain said bimetallic switch member in closed position, and thermal bending of said bimetallic switch member moving said latch member bodily to an unlatching position to release said bimetallic switch member from said actuator and permit said spring to move said bimetallic switch member to open position irrespective of the position of said actuator.

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