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CIRCUIT BREAKER

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Fig. 1.

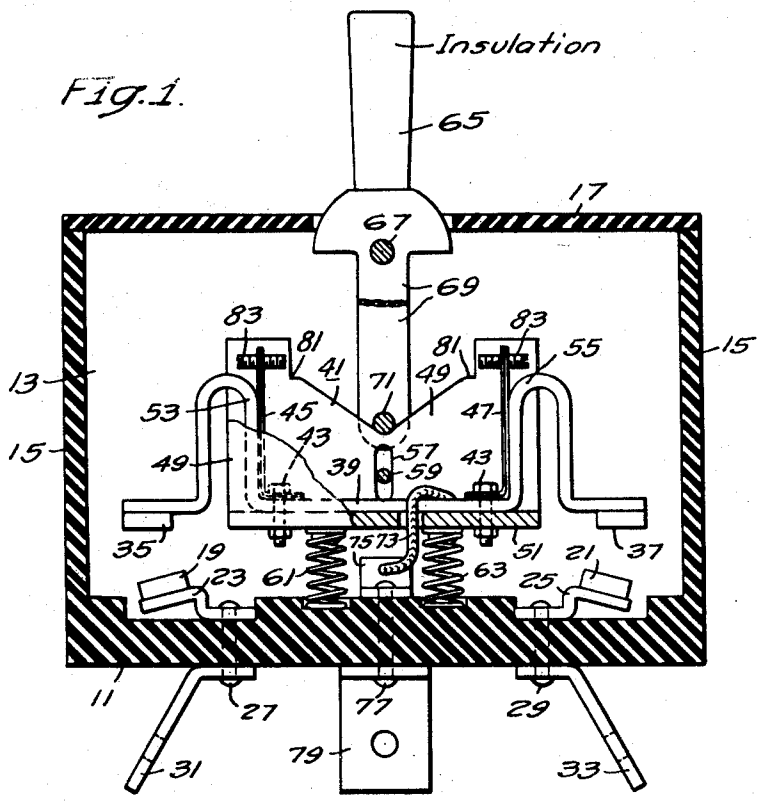
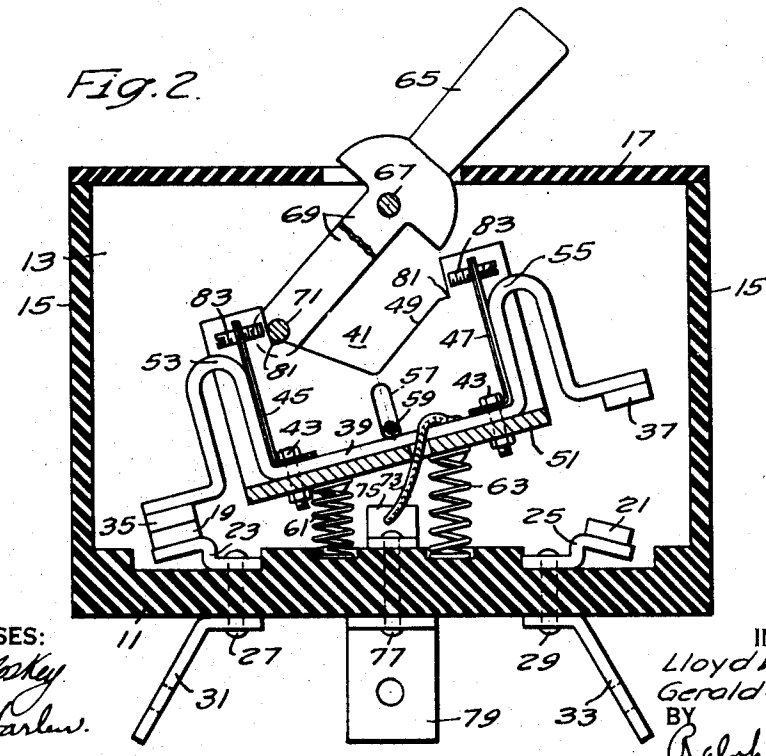


Fig. 2.



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CIRCUIT BREAKER

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19 Claims. (Cl. 200—116)

The invention relates to circuit breakers and, more particularly to a manually and automatically operable small air circuit breaker for controlling and protecting electrical circuits.

An object of the invention is to provide a double-throw circuit breaker for selectively controlling a plurality of circuits wherein a thermal element is related to each circuit, each of the thermal elements being operable when heated by the current of its related circuit to cause opening of the circuit.

Another object of the invention is to provide a circuit breaker for controlling a plurality of circuits wherein a common operating mechanism is operable to selectively close any one of a plurality of circuits, each circuit having a current-responsive device individually related thereto, the current-responsive devices being operable when heated a predetermined amount by excessive current in its related circuit to effect automatic opening of said circuit.

Another object of the invention is to provide a circuit breaker wherein a single movable member is provided with a plurality of contacts each engageable with related cooperating stationary contacts to alternately close a plurality of circuits, each circuit being provided with a thermostatic element operable when heated a predetermined amount by overload current in the related circuit to effect opening movement of the movable member.

Another object of the invention is to provide a circuit breaker wherein a movable member is manually operable from an open position in opposite directions to selectively close either one of two circuits, each of said circuits being provided with a current responsive device mounted on the movable member and operable in response to overload current in its related circuit to cause movement of the movable member from either of its closed positions to the open position.

Another object of the invention is the provision of a double-throw circuit breaker having two sets of contacts and an operating mechanism manually operable to selectively close said sets of contacts and automatically operable in response to predetermined overload conditions to cause opening of the contacts, the construction of the mechanism being such that no manual resetting is required following a tripping operation.

Another object of the invention is the provision of a manually and automatically operable double-throw circuit breaker of simple and inexpensive construction.

Another object of the invention is the provision of a manually and automatically operable circuit breaker mechanism of compact and low-cost construction which is also usable in a single-throw circuit breaker.

The novel features that are considered characteristic of the invention are set forth in the appended claims. The invention itself, however, both as to structure 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 which:

Figure 1 is a vertical sectional view of a circuit breaker constructed in accordance with the invention, the section being taken on a line just inside one side wall of the casing, the breaker mechanism being partly broken away and shown in the "off" position; and

Fig. 2 is a view similar to Fig. 1, but showing the mechanism operated to one of its "on" positions.

Referring to the drawing, the circuit breaker is a double-throw circuit breaker operable to selectively close either one of two circuits. The breaker mechanism is mounted in a housing comprising a base 11 of molded insulating material having side walls 13 (only one of which is shown), end walls 15, and a cover plate 17 also of insulating material. Two stationary contacts 19 and 21 are provided and are rigidly mounted respectively on brackets 23 and 25 of conducting material. The brackets 23 and 25 are rigidly secured to the base 11 by means of rivets 27 and 29 or by other suitable means. The rivets 27 and 29 also serve to mechanically secure external terminal connectors 31 and 33 to the base 11 and to electrically connect said terminals respectively to the brackets 23 and 25. A pair of movable contacts 35 and 37 are mounted on opposite ends of a conductor 39 and are adapted to cooperate respectively with the stationary contacts 19—21 to close their respective circuits. The conductor 39 is rigidly mounted on a U-shaped carrier 41 by means of bolts 43 which also secure a pair of bimetal elements 45 and 47 to the conductor 39 and to the carrier 41. The carrier 41 comprises spaced parallel side members 49 connected by an integral cross-member 51, to which the conductor 39 and the bimetal elements 45 and 47 are secured. The bimetal elements 45 and 47 are disposed respectively in intimate relation to heater elements or loops 53 and 55 formed in the conductor 39 near its ends, and are adapted to be heated in response to excessive currents flowing through the conductor. The side members 49 of

the carrier are provided with elongated slots 57 (only one being shown) through which extends a rod 59 rigidly supported in the side walls 13 of the housing. This construction permits the carrier to rotate about the rod 59 and to slidably move relatively thereto and function as a floating switch member.

Compression springs 61 and 63 seated in spring seats in the base 11 bias the carrier 41 outwardly away from the base, which movement is controlled by means of an operating handle 65 rotatably mounted on a pin 67 mounted in and extending between the side walls 13 of the housing. The inner end of the operating handle 65 is bifurcated, and the two legs 69 thereof between them carry a pin 71 which engages V-shaped recesses in the side members 49 of the carrier 41 for controlling and operating the carrier to manually open and close the contacts 19—35 and 21—37.

The conductor 39 is connected by means of a flexible shunt conductor 73 to a connector 75 which is secured to the base 11 by a rivet 77 of conducting material. The rivet 77 also mechanically secures a line terminal 79 to the base and electrically connects the line terminal 79 to the connector 75. When the contacts 19—35 are closed (see Fig. 2), as will presently be described, a circuit is completed from the line terminal 79 through the rivet 77, connector 75, flexible shunt conductor 73, the conductor 39, contacts 35 and 19, the bracket 23, and rivet 27 to the load terminal 31. If the contacts 21—37 are closed, a circuit will be completed from the line terminal connector 79 through the rivet 77, connector 75, flexible shunt 73, conductor 39, contacts 37 and 21, bracket 25, rivet 29 to the other load terminal 33.

With the mechanism in the open position (Fig. 1), the contacts 19—35 and 21—37 can be closed by manual movement of the handle 65 from its central "off" position respectively in a clockwise or counterclockwise direction. If it is desired to close the contacts 19—35, the handle 65 is rotated in a clockwise direction from its Fig. 1 position to the position shown in Fig. 2. During this movement, the pin 71 wipes along the left-hand edges of the V-shaped recesses in the side members 49 and cams the carrier 41 in a counterclockwise direction about the pin 59. During the counterclockwise movement of the carrier 41, the contact 35 engages the stationary contact 19 and thereafter continued clockwise movement of the handle 65 causes clockwise movement of the carrier 41 about the contact 19 as a fulcrum until the pin 71 engages a notch 81 at the extreme left-hand end of each V-shaped recess. The slot 57 permits the carrier to move relative to the pin 59 during this action. The parts are now in the positions in which they appear in Fig. 2, and the springs 61 and 63 both exert a force against the bottom of the carrier 41 biasing the carrier in a counterclockwise direction about the pin 71 to apply contact pressure to the closed contacts 35—19. The engagement of the handle pin 71 in the notches latches the circuit breaker closed in this position.

The contacts 35—19 are opened by movement of the handle 65 from its Fig. 2 position in a counterclockwise direction to the "off" position (Fig. 1). This movement of the handle reverses the movement of the carrier 41, and as the pin 71 arrives at its Fig. 1 position, the springs 61—63 act to center the carrier 41 in the "off" position as shown in Fig. 1.

In order to close the contacts 37—21, the handle 65 is rotated counterclockwise from its "off" position, which action moves the carrier 41 to close the contacts 37—21 in the same manner as was described previously for the contacts 19—35 excepting that the parts move in the opposite direction.

It will be seen that the contacts 19—35 and 21—37 may be selectively closed by manipulation of the manual handle 65 from the "off" position in the direction to close the desired contacts, and that either sets of contacts may be manually opened.

Means are provided for automatically opening the contacts upon the occurrence of abnormal circuit conditions in the related circuit. To this end, the bimetal elements 45 and 47 are provided. As previously stated, the bimetal elements are rigidly secured to the conductor 39 and to the carrier 41, and are disposed in intimate heating relation to their respective heater loops 53 and 55, so as to be heated in response to overload currents in the circuits including their respective heater loops. The heater loops 53 and 55 may be of less width than the main part of conductor 39 to concentrate the heating adjacent the bimetal elements 45 and 47.

Assuming the contacts 19—35 to be closed as shown in Fig. 2, an overload may occur in the circuit including the contacts 19—35, conductor 39 and the heater 53. The bimetal 45 associated with the heater 53 is disposed to deflect toward the right when heated a predetermined amount by overload current. During the deflection of the bimetal element 45, an adjusting screw 83 mounted in the free end thereof engages the pin 71 and dislodges it from the notch 81, whereupon the upward pressure of the springs 61 and 63 causes the carrier to resume its center position, thus opening the contacts 19—35. During the opening movement of the carrier, the edge of the V-shaped recess acts on the pin 71 to cam the handle 65 to its "off" position. The contacts 21—37, when closed, are opened automatically upon the occurrence of an overload current in the circuit including these contacts and the heater element 55, the action being the reverse of that described for the automatic opening of the contacts 19—35.

The two bimetal elements 45 and 47 may be arranged to release the handle 65 and effect opening of their related circuits at different values of overload current, if desired. For example, the double-throw circuit breaker of the instant invention may be used for controlling a lighting system arranged to give either bright or dim lighting. If, for example, the bright lights require 20 amperes and the dim lights require only 10 amperes, the wire of the dim light circuit may be smaller than the bright light circuit, and each bimetallic element will be chosen to cause opening of the breaker when the safe current for its particular circuit is exceeded.

From the foregoing description, it will be apparent that there is provided a double-throw circuit breaker in which either one of two circuits may be selectively closed and opened by manual means. Each of the circuits controlled by the breaker is provided with a trip device mounted on the movable contact structure and responsive to the current in the related circuit to effect opening of the corresponding circuit.

Having described the invention in accordance with the patent statutes, it is to be understood that various changes and modifications may be

made in the structural details thereof without departing from some of the essential features of the invention.

We claim as our invention:

1. A circuit breaker for selectively controlling a plurality of circuits comprising, a plurality of stationary contacts, a single switch member movable to selectively engage said stationary contacts to selectively close any one of said plurality of circuits, manual means for moving said switch member from a neutral open position in either direction from said open position to close said circuits, separate electroresponsive means for each circuit disposed to be heated by overload currents in the related circuit, each of said electroresponsive means being operable when heated a predetermined amount to actuate the manual means and effect opening of the corresponding circuit.

2. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of pairs of stationary and movable contacts, a single switch member carrying said movable contacts for selectively closing said pairs of contacts, manual means for moving said switch member to selectively close said contacts, a plurality of thermostatic elements, each of said elements being disposed to be individually heated in response to the current of its related circuit, each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the corresponding pairs of contacts.

3. A circuit breaker for selectively controlling a plurality of circuits comprising spaced stationary contacts, a floating switch member, manual means for moving said switch member to selectively engage either of said contacts, said manual means restraining said switch member in closed position, separate electroresponsive trip means associated with each of said circuits and disposed to be heated by the current of the related circuit, each of said electroresponsive trip means being operable when heated a predetermined amount to effect release of said switch member, and means for moving said switch member to open position away from said contacts.

4. The invention according to claim 3 characterized by the fact that the electroresponsive trip devices are mounted on and movable with said switch member.

5. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of stationary contacts, a floating switch member movable from a central open position to a plurality of closed positions to selectively engage said contacts, manual means for moving said switch member to selectively engage said contacts, means on said switch member engageable by said manual member to restrain the switch member in each of said closed positions and a thermostatic element related to each circuit, each of said elements being disposed to be heated by the current of its related circuit, said thermostatic elements being operable when heated a predetermined amount to cause movement of the switch member to open position.

6. A circuit breaker for selectively controlling a plurality of circuits comprising a switch member movable from a central open position to a plurality of closed positions to selectively close said circuits, manual means operable to move said switch member in either direction from the open position to its closed positions, said manual means being operable to engage and releasably restrain the switch member in either of its closed positions, thermostatic members one for each circuit disposed to be heated by the current of the related circuit, said thermostatic members being operable when heated to operate the manual means to release said switch member, and spring means for moving said switch member in either direction to the open position.

7. A circuit breaker for controlling a plurality of circuits comprising a floating switch member biased to an open position and movable in either direction from said open position to a plurality of closed positions to selectively close said circuits, manual means for moving said switch member to selectively close said circuits, said manual means engaging and releasably restraining the switch member in either of its closed positions, and a plurality of electroresponsive means mounted on and movable with said switch member, there being an electroresponsive means associated with each circuit, each of said electroresponsive means being operable in response to overload currents in the related circuit to effect release of said switch member.

8. A circuit breaker for controlling a plurality of circuits comprising a plurality of stationary contacts, a floating switch member having a plurality of contacts mounted thereon for cooperating with said stationary contacts to close said circuits, means biasing said switch member to an open position, an operating handle for moving said switch member in either direction from the open position to selectively engage the movable contacts with said stationary contacts, means on said handle engageable with spaced recesses in said switch member for releasably restraining the switch member in either closed position, a separate bimetal element heated by the current of each circuit controlled by the breaker, said bimetal elements being mounted on and movable with the switch member, each of said bimetal elements deflecting independently when heated to effect release of the switch member.

9. A circuit breaker for controlling either one of two circuits comprising two sets of separable contacts, a switch member pivoted intermediate its ends and movable to selectively close said sets of contacts, said switch member being provided with a V-shaped recess, an operating handle engaging said recess and operable to move said switch member in either direction to selectively close said sets of contacts, said switch member being biased to a neutral open position, means for releasably restraining said switch member in closed position, a separate bimetal element for each circuit disposed to be heated by the current of the associated circuit, each of said bimetal elements deflecting when heated a predetermined amount in a direction to effect release of the switch member.

10. A circuit breaker for controlling either of two circuits comprising two sets of separable contacts, a switch member pivoted intermediate its ends and having a V-shaped recess therein, an operating handle having a part engaging said recess and operable to move said switch member to selectively close said sets of contacts, said handle releasably restraining said switch member in either closed position and a separate bimetal element for each circuit mounted on said switch member, each of said bimetal elements being heated by the current of its corresponding circuit and operable when heated a predetermined amount to effect release of the switch member.

11. In a circuit breaker for selectively controlling either one of two circuits comprising two sets of contacts, the combination of a switch member pivoted intermediate its ends and movable to selectively close said sets of contacts, said switch member being provided with a V-shaped recess and also provided with spaced locking recesses, means biasing said switch member to a central "open" position, an operating handle engaging said V-shaped recess and operable to move said switch member in either direction from said open position to close said sets of contacts, said operating handle engaging said locking recesses to releasably restrain said switch member in the selected closed position, a separate bimetal element for each circuit disposed to be heated by the current of the associated circuit, each of said bimetal elements deflecting when heated a predetermined amount by the current of its associated circuit to effect release of the switch member.

12. A circuit breaker for selectively controlling either one of two circuits comprising two sets of contacts, a switch member pivotally and slidably mounted intermediate its ends and movable to selectively close said sets of contacts, said switch member having a V-shaped recess and a pair of locking recesses therein, an operating handle having a part engaging said V-shaped recess and operable to move said switch member to selectively close said sets of contacts, said part engaging one or the other of said locking recesses to releasably restrain the switch member in the selectively closed position, and a separate bimetal element for each circuit disposed to be heated by the current of its associated circuit, each of said bimetal elements deflecting when heated a predetermined amount in a direction to effect release of said switch member.

13. A circuit breaker for controlling either of two circuits comprising two sets of contacts, a switch member pivotally and slidably mounted intermediate its ends and movable to selectively close said sets of contacts, means biasing said switch member to a neutral open position, said switch member being provided with a V-shaped recess, an operating handle having a part engaging said recess and operable to move said switch member to selectively close said sets of contacts, means for releasably restraining said switch member in each closed position, and a pair of spaced bimetal elements one associated with each circuit mounted on said switch member, said bimetal elements being disposed to be heated by the current of their associated circuits and each bimetal element being operable when heated a predetermined amount to effect release of the switch member.

14. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of pairs of stationary and movable contacts, a switch member for selectively closing said pairs of contacts, manual means for moving said switch member to selectively close said contacts, a plurality of thermostatic elements, each of said thermostatic elements having different operating characteristics and being disposed to be individually heated in response to the current of its related circuit, and each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the corresponding pair of contacts.

15. A circuit breaker for selectively controlling a plurality of circuits for energizing electrical translating devices having different characteristics, a pair of stationary and co-operating movable contacts associated with each circuit, a switch member carrying both said movable contacts and operable to open and to selectively close said pairs of contacts, manual means for moving said switch member to selectively close said pairs of contacts, a separate thermostatic element associated with each circuit, each of said thermostatic elements having different characteristics and being disposed to be individually heated in response to the current of its related circuit, and each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the associated pair of contacts.

16. A circuit breaker for selectively controlling a plurality of circuits comprising, a plurality of stationary contacts, contact means movable to selectively engage said stationary contacts to selectively close any one of said plurality of circuits, manual means for moving said contact means from a neutral open position in either direction from said open position to close said circuits, separate electroresponsive means for each circuit disposed to be heated by overload currents in the related circuit, said plurality of stationary contacts and said separate electroresponsive means all being substantially in line along the plane of movement of said manual means, and each of said electroresponsive means being operable when heated a predetermined amount to actuate the manual means and effect opening of the corresponding circuit.

17. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of pairs of stationary and movable contacts, a single switch member carrying said movable contacts for selectively closing said pairs of contacts, manual means for moving said switch member to selectively close said contacts, a plurality of thermostatic elements, said plurality of pairs of stationary and movable contacts and said plurality of thermostatic elements all being substantially in line with the plane of movement of said manual means, each of said thermostatic elements being disposed to be individually heated in response to the current of its related circuit, and each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the corresponding pair of contacts.

18. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of pairs of stationary and movable contacts, a single switch actuating member for selectively closing said pairs of contacts, manual means for moving said single switch actuating member to selectively close said contacts, spring means biasing said single switch actuating member and applying contact pressure between one pair of stationary and movable contacts when said manual means is in one position and the same said spring means also applying contact pressure between the other pair of stationary and movable contacts when said manual means is in another position, a plurality of thermostatic elements, each of said elements being disposed to be individually heated in response to the current of its related circuit, each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the corresponding pair of contacts.

19. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of pairs of stationary and movable contacts, a single

switch actuating member for selectively closing said pairs of contacts, manual means for moving said single switch actuating member to selectively close said contacts, spring means biasing said single switch actuating member and applying contact pressure between one pair of stationary and movable contacts when said manual means is in one position and the same said spring means also applying contact pressure between the other pair of stationary and movable contacts when said manual means is in another position, a plurality of thermostatic elements, said plurality of pairs of stationary and movable contacts and said plurality of thermostatic elements all being substantially in line with the plane of movement of said manual means, each of said thermostatic elements being disposed to be individually heated in response to the current of its related circuit, and each of said thermostatic elements being operable when heated a predetermined amount to cause automatic opening of the corresponding pair of contacts.

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