Oct. 30, 1945. S. J. MITCHELL 2,387,925

CIRCUIT BREAKER

Filed Aug. 11, 1943

Fig. 1.

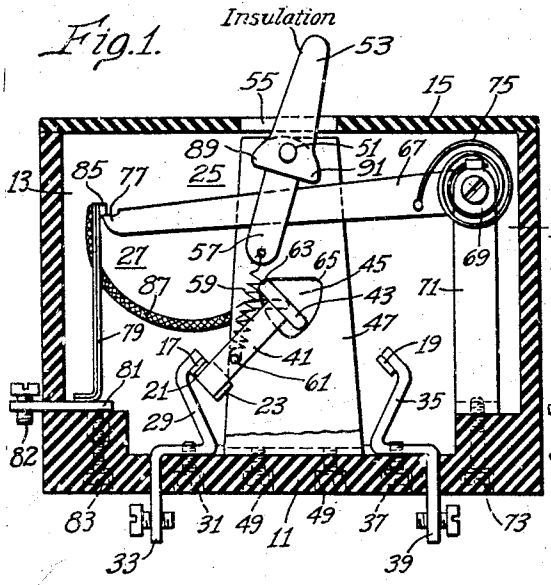


Fig. 2.

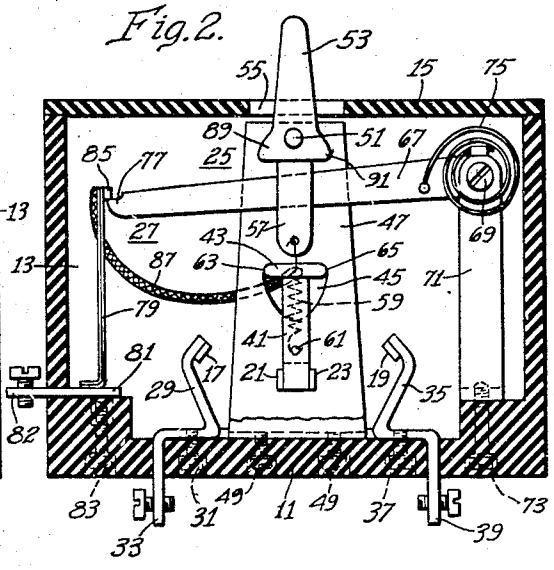


Fig. 3.

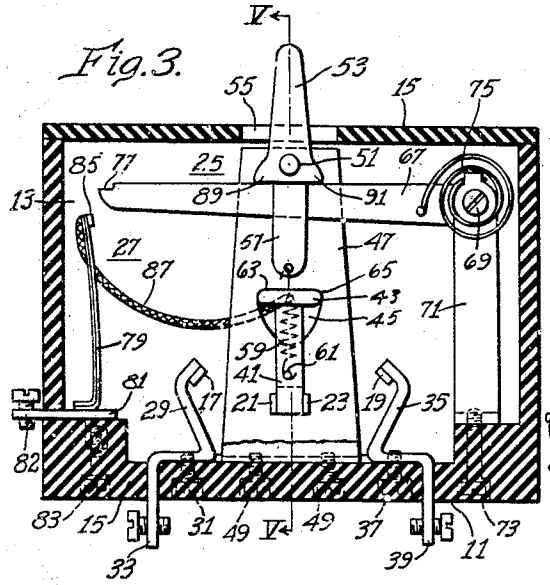


Fig. 4.

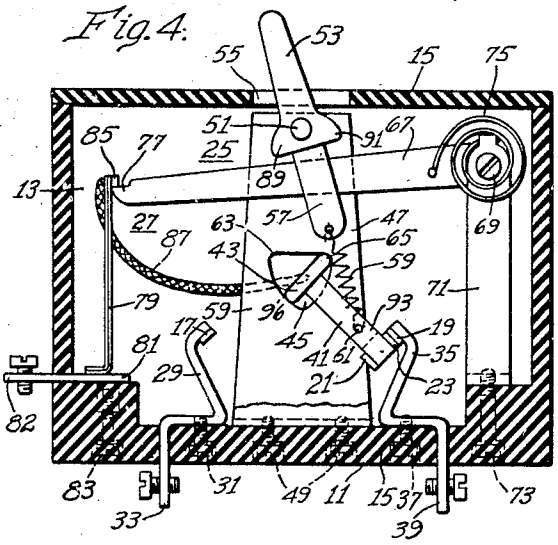
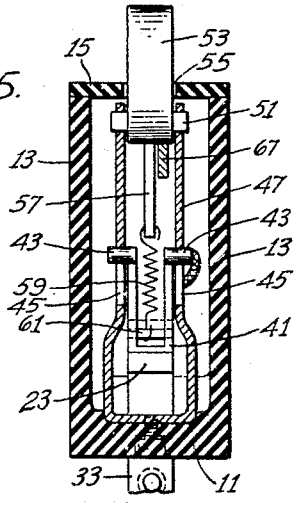


Fig. 5.



WITNESSES:

C. J. Weller.

Paul H. Harlow

INVENTOR.

Stanley J. Mitchell.

BY

Ralph H. Swingle

ATTORNEY

Patented Oct. 30, 1945

2,387,925

UNITED STATES PATENT OFFICE

2,387,925

CIRCUIT BREAKER

Stanley J. Mitchell, Wilkinsburg, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 11, 1943, Serial No. 498,188

14 Claims. (Cl. 200—116)

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

An object of the invention is the provision of a double-throw circuit breaker having contact means for controlling either of two circuits; and operating mechanism manually operable to selectively operate said contact means to open or close either circuit and automatically operable in response to predetermined overload conditions to cause opening of the contact means.

Another object of the invention is to provide a circuit breaker of the double-throw type wherein a single operating mechanism is operable in response to abnormal circuit conditions to cause automatic opening of either one of two circuits.

Another object of the invention is to provide a circuit breaker wherein an operating handle is operable in either direction from an open position to selectively close one or the other of two circuits, said handle being operable by a releasable operator in response to overloads in the closed circuit to effect opening of the closed circuit.

Another object of the invention is to provide a circuit breaker having an improved operating mechanism which is operable to selectively close one or the other of two circuits and a trip device operable in response to an overload in the selected circuit to effect automatic opening of the breaker.

Another object of the invention is the provision of a circuit breaker having an operating mechanism including an operating handle operable to selectively close any one of a plurality of circuits, and having a releasable means controlled by a trip device for causing automatic opening of the selectively closed circuit in response to predetermined overload conditions.

Another object of the invention is the provision of an improved circuit breaker construction that is simple, reliable in operation and relatively inexpensive to manufacture.

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 of one embodiment thereof when read in connection with the accompanying drawing, in which:

Figure 1 is a vertical sectional view of a circuit breaker embodying the principles of the invention, the switch arm being shown closed on one of the contacts;

Fig. 2 is a view similar to Fig. 1, but showing the mechanism in a manually opened position;

Fig. 3 is a vertical sectional view of the breaker showing the mechanism in the tripped open position;

Fig. 4 is a vertical sectional view of the circuit breaker showing the switch arm in the right-hand closed position and,

Fig. 5 is a vertical transverse sectional view through the breaker taken substantially on line V—V of Fig. 3.

Referring to the drawing, the circuit breaker is of double-throw construction and is mounted in a housing comprising a base portion 11 of molded insulating material having side walls 13, and a cover plate 15 also of insulating material. The circuit breaker itself comprises in general stationary contacts 17 and 19, movable contacts 21 and 23 adapted to cooperate respectively with the stationary contacts 17 and 19, operating mechanism indicated generally at 25 and a trip device 27.

The stationary contact 17 is rigidly mounted on a conductor 29 secured to the base 11 by means of a screw 31 and having a portion 33 extending perpendicularly through an opening in the base 11 to serve as a terminal connector for connecting the contact 17 to an electrical circuit. The stationary contact 19 is similarly rigidly supported on a conductor 35 secured by means of a screw 37 to the base. A portion 39 of the conductor 35 projects through the base 11 to form a terminal connector for connecting the stationary contact 19 in an electrical circuit. The movable contacts 21 and 23 are rigidly mounted on opposite sides of the inner end of a U-shaped switch arm 41 (see Fig. 5). Each leg of the switch arm is provided with a T-shaped projection 43 which engages generally triangular-shaped openings 45 in corresponding sides of a U-shaped frame 47 secured by means of screws 49 to the central portion of the base 11. Supported in the outer ends of legs of the frame 47 is a pivot pin 51 upon which is pivotally mounted an operating handle 53 projecting outwardly through an opening 55 in the cover plate 15. The inner end 57 of the handle is connected by means of an overcenter spring 59 to a pin 61

mounted in the legs of the switch arm 41 and extending therebetween.

The ends of the projections 43 on the switch arm 41 are rounded and are adapted to pivot in the rounded upper corners of the openings 45, as indicated at 63 and 65, to open and close the contacts. It will be obvious that with the handle 53—57 in the position shown in Fig. 1, the center line of the spring 59 lies to the left of the pivot point 63 and, therefore, biases the switch arm 41 in a direction to maintain the contact 21 in engagement with the corresponding stationary contact 17. In order to separate the contact 21 from the contact 17, the handle 53 is rotated in a counterclockwise direction (Fig. 1) to the intermediate "off" position shown in Fig. 2. During this movement, the inner end 57 of the handle carries the center line of the spring 59 to the right of the pivot point 63, at which time the spring 59 biases the switch arm 41 to the "off" position (Fig. 2). Due to the flat outer walls of the openings 45 or to the engagement at both pivot points 63 and 65, the spring 59 will maintain the switch arm 41 and the handle 53 in the "off" position in which these parts are shown in Fig. 2.

Movement of the handle 53 in a clockwise direction from the "off" position will carry the spring 59 overcenter to the left of the pivot point 63 and close the contacts 17—21 with a snap action, and if the handle is moved in a counterclockwise direction from the "off" position (Fig. 2), the center line of the spring 59 will be moved to the right of the pivot point 65 and effect closing of the contacts 19—23 with a snap action. It will thus be seen that by moving the handle 53 in the appropriate direction from its neutral position (Fig. 2), the contacts 17—21 or the contacts 19—23 may be closed at will.

The handle 53 is adapted to be automatically actuated to its "off" position from either of its "on" positions by means of a releasable actuator 67. The actuator 67 is pivotally supported on a pivot pin 69 mounted in the two legs of a U-shaped bracket 71 (only one leg being shown) secured by means of a screw 73 to the base 11. The actuator 67 is biased in a clockwise or opening direction by means of a coil spring 75 having one end anchored to the outer end of the bracket 71, and the other end hooked in a suitable hole in the actuator 67. The latch end 77 of the actuator 67 is normally engaged and releasably held in its operative position by the trip device 27.

The trip device 27 comprises a bimetal element 79 having one end rigidly secured to a conductor 81 which is, in turn, secured by means of a screw 83 to the base 11 of the housing. The conductor 81 extends through an opening in the end wall of the housing and serves as a line terminal connector 82 for connecting the breaker to the supply line of an electrical circuit. At its free end, the bimetal element 79 carries a latch member 85 which engages the latching end 77 of the actuator 67 to releasably restrain the actuator in its operative position.

The circuit through the breaker is completed by a flexible shunt conductor 87 which connects the free end of the bimetal element 79 to one leg of the switch arm 41 which is of conducting material. One circuit extends from the terminal 82 through the conductor 81, the bimetal 79, flexible shunt conductor 87, switch arm 41, contacts 21 and 17, conductor 29 to the terminal 33. If the switch arm 41 is operated to the position wherein the contact 23 engages the stationary contact 19, the other circuit will be completed from the terminal 82, through the bimetal element 79, conductor 87, switch arm 41, and contacts 23—19 to the terminal 39.

When an overload occurs either in the circuit including the terminal 33 or the terminal 39, depending on which of the contacts are closed, the bimetal element becomes heated by the overload current and when heated a predetermined amount it deflects toward the left and releases the actuator 67. When the actuator is released, the spring 75 rotates it sharply clockwise. During this movement, the actuator 67 engages a projection 89 or a projection 91 of a cam on the handle, depending on the position of the handle, and rotates the handle to the "off" position. As shown in Fig. 1, the actuator 67 would engage the projection 91 and rotate the handle 53 counterclockwise to the "off" position. If, however, the handle was in its extreme counterclockwise "on" position so that the contacts 23—19 were engaged, the actuator 67 would engage the projection 89 and rotate the handle in a clockwise direction to the "off" position. As previously explained, movement of the handle from either of its "on" positions to the "off" or central position moves the spring across the pivot point 63, or 65, to thereby effect opening movement of the switch arm 41 with a snap action. The mechanism is shown in Fig. 3 in the tripped open position.

The actuator 67 is manually reset following an automatic opening operation by moving the handle 53 in either direction from the "off" position slightly beyond either of the "on" positions. Near the extremities of such movement, one of the projections 89 or 91 on the handle engages the actuator 67 and moves it in a direction to reengage the latching end 77 thereof with the latch member 85. This movement of the handle, as previously set forth, effects closing of the contacts. The desired contacts 17—21 or 19—23 are closed, and the mechanism reset by a single movement of the handle in the proper direction. After the mechanism has been reset by movement of the handle in either direction past either of its "on" positions, the handle is released and the spring 59 returns it to the "on" position. The spring 59 provides contact pressure for the closed contacts and also functions to provide quick make and break for both sets of contacts. It may be noted that when the breaker is in either of its "on" positions the actuator 67 is normally clear of the projections 89—91. This insures a constant latch load when the contacts for either circuit are closed.

From the foregoing description, it will be seen that there is provided a very simple double-throw circuit breaker having a single operating mechanism for selectively closing any one of a plurality of circuits, each of the circuits when closed, being protected against overload currents by the provision of an overload trip device.

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.

I claim as my invention:

1. A circuit breaker for controlling a plurality of circuits comprising a support frame, a switch member supported on said frame, said switch member having a plurality of spaced pivots about

which it pivots to selectively close said circuits, an operating handle having a neutral "open" position and operable in either direction from said "open" position to closed positions for selectively closing said circuits, means comprising a spring operable by said handle to move said switch member about said pivots to selectively effect manual opening and closing of said circuits, a biased member releasable to effect automatic opening of said circuits, and means on said handle engageable by said releasable member and operable by said releasable member to automatically actuate said handle to "open" position from either of its closed positions.

2. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of sets of separable contacts, a switch member having a plurality of spaced pivots, said switch member being operable from an open position about one of said pivots to close one of said sets of contacts and about another of said pivots to close another of said sets of contacts, operating mechanism for said switch member including a manual handle and an overcenter spring connecting said handle to said switch member, said spring being operable by said handle to move the switch member about said pivots to selectively close and open said contacts, biased means releasable to effect automatic opening movement of said handle, means on said handle engageable by said biased means upon release thereof to actuate said handle to open position to thereby cause opening movement of said switch member.

3. A circuit breaker for controlling a plurality of circuits comprising a plurality of stationary contacts, there being a stationary contact for each of said circuits, a switch member having a plurality of spaced pivots, movable contact means carried by said switch member, said switch member being movable about one or the other of said pivots to selectively engage the movable contact means with one or the other of said stationary contacts to close said circuits, operating mechanism including an operating handle having a plurality of closed positions and operable to move said switch arm from a central "open" position in either direction to selectively close said circuits, and tripping means operable in response to predetermined overload conditions to cause opening of said movable contact means and movement of said handle to "open" position.

4. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of stationary contacts, a switch arm having a plurality of spaced pivots, movable contacts mounted on said switch arm, operating mechanism including a manual handle for operating said switch arm to selectively engage said movable contacts with said stationary contacts, a biased member releasable to effect separation of the closed contacts, and a trip device comprising a thermostatic member heated in response to overload current of whichever circuit is closed and operable when heated a predetermined amount to release said biased member.

5. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of stationary contacts, a single switch arm movable to engage each of said stationary contacts to selectively close said circuits, operating mechanism for said switch arm including an operating handle for moving said switch arm in either direction from an open position to closed said circuits, releasable actuating means normally disengaged from said handle and biased to engage and move said handle from either of said closed positions to the open position when said means is released, and means operable in response to abnormal circuit conditions to effect release of said actuating means.

6. A circuit breaker for selectively controlling a plurality of circuits comprising a pair of spaced stationary contacts, a switch member movable in either direction from an open position to selectively close said circuits, operating mechanism for said switch member including an operating handle, an overcenter spring connecting said handle to said switch member, the same spring being operable by said handle to move the switch member in opposite directions and selectively close the circuits through each of said stationary contacts, an actuator normally held in fixed position during manual movement of said handle and releasable to actuate said handle in either direction to an open position, and a current-responsive trip device operable in response to overload currents in any of said circuits to release said actuator to thereby effect movement of the switch member in either direction to an open position, said handle being operable to effect opening of said contacts without releasing said actuator.

7. A circuit breaker for selectively controlling a plurality of circuits comprising a pair of spaced stationary contacts, a switch member operable in either direction from a central open position to selectively close the circuit through each of said stationary contacts, operating mechanism for said switch member comprising an operating handle and one overcenter spring for operating said switch member to open and to selectively close said circuits, releasable actuating means normally disengaged from said handle and held stationary during manual opening movement of the handle, means biasing said actuating means to engage and actuate said handle to open position, and a trip device operable in response to overload currents in the closed circuit to release said actuating means and thereby effect movement of said switch member to open position.

8. A double-throw circuit breaker for selectively controlling a plurality of circuits comprising a switch member having an open position and movable to a plurality of closed positions for selectively closing said circuits, a plurality of spaced pivots for said switch member, an operating handle having an open position, said handle being movable to a closed position in either direction from said open position, an overcenter spring operable by said handle for moving said switch member about one or another of said pivots to selectively close said circuits, a cam on said operating handle, a biased member releasable to engage said cam and actuate said handle to the open position to thereby cause automatic movement of the switch member from either one of its closed positions to open position, and a trip device operable in response to overload currents in said circuits to release said biased member.

9. A circuit breaker comprising a U-shaped frame, a pair of stationary contact means, a switch member movably supported in said frame, movable contact means on said switch member for cooperating with each of said pair of stationary contact means, operating mechanism for said switch member comprising an operating handle and an overcenter spring having one end attached to said handle and the other end connected to said switch member, biased actuating

means releasable to engage and operate said handle to cause automatic opening of said contact means, and current responsive means operable when heated a predetermined amount to initiate movement of said actuating means, said handle being operable to effect opening and closing of said contact means without releasing said actuating means.

10. A circuit breaker having a support frame provided with a substantially triangular opening, stationary contact means, a switch member having a substantially flat end for engaging said opening for movement therein, movable contact means on said switch member for cooperating with said stationary contact means, operating mechanism for operating said switch member to open and closed positions comprising an operating handle and an overcenter spring connecting said switch member to said handle, an actuator releasable to engage and operate said handle to cause automatic opening of said contact means, and current responsive means operable in response to abnormal current conditions to release said actuator.

11. A circuit breaker for selectively controlling either of two circuits comprising a frame, two sets of contacts, one switch member mounted solely on said frame and movable to selectively close either set of contacts, manual means including a handle separate from said switch member for moving said switch member to selectively close said sets of contacts, actuating means other than said manual means for causing automatic opening of said sets of contacts, and trip means operable in response to abnormal conditions in whichever circuit is closed for causing operation of said actuating means to open the corresponding set of contacts.

12. A circuit breaker for selectively controlling either of two circuits comprising two sets of contacts, a switch member having a central "open" position and movable to selectively close either set of contacts, manual means having a central "open" position for moving said switch member to selectively close said sets of contacts, one releasable trip member biased to tripping position for engaging and moving said manual means to the "open" position and thereby causing opening of whichever set of contacts is closed, current responsive trip means operable in response to overload currents in whichever circuit is closed to release said trip member and cause automatic movement of said switch member to said central "open" position, and said manual means being operable to effect opening of said sets of contacts without operating said trip member.

13. A circuit breaker for selectively controlling a plurality of circuits comprising a plurality of stationary contacts, a single switch arm having contact surfaces thereon movable to engage said stationary contacts to selectively close said circuits, operating mechanism for said switch arm comprising an operating handle for moving said switch arm in either direction from an open position for closing said circuits, releasable actuating means normally disengaged from said handle and held in a fixed position when the handle is moved, means biasing said actuating means to engage and move said handle from either of said closed positions to the open position when said means is released, and means operable in response to abnormal circuit conditions to release said actuating means, said handle when moved to close said circuits resetting said actuating means.

14. A circuit breaker for selectively controlling either of two circuits comprising a frame, two sets of contacts, a switch member mounted solely on said frame and movable to selectively close either set of contacts, manual means for moving said switch member to selectively close said sets of contacts, means mounting said two sets of contacts substantially in line with the plane of movement of said manual means, releasable trip means biased to tripping position and operable when released to cause automatic opening of said sets of contacts, and a trip device operable in response to abnormal conditions in whichever circuit is closed to release said trip means and cause automatic opening of the corresponding set of contacts, said manual means when moved to selectively close said sets of contacts resetting said trip means.

STANLEY J. MITCHELL.