April 18, 1950 H. G. BAXTER 2,504,793

CIRCUIT BREAKER

Filed April 27, 1943

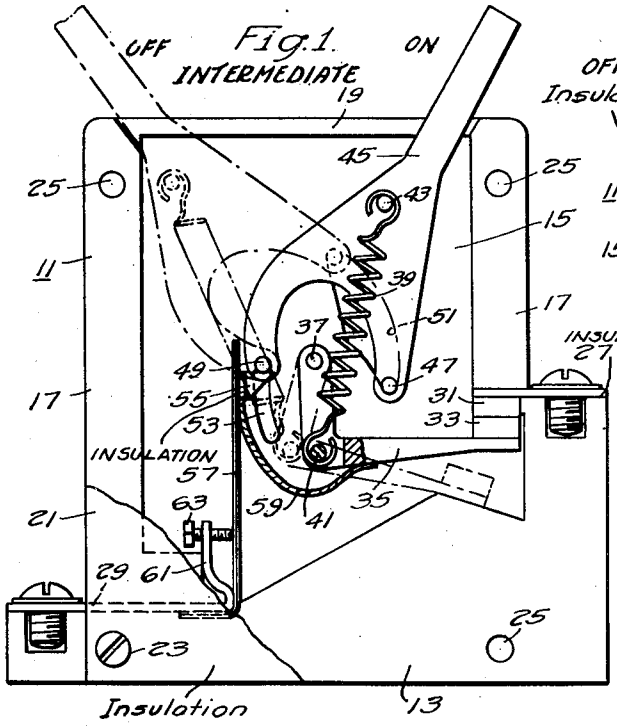


Fig. 1.

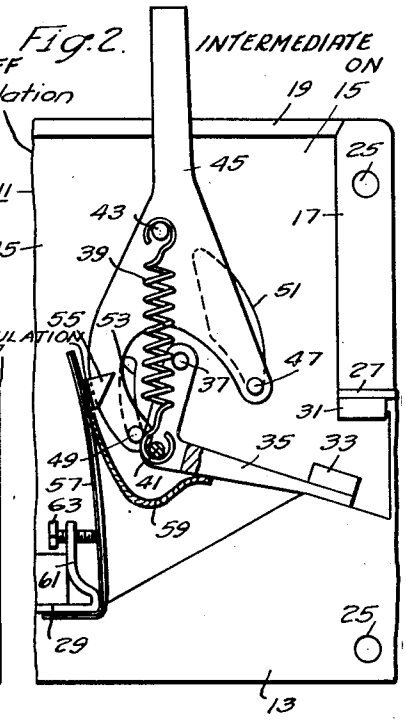


Fig. 2.

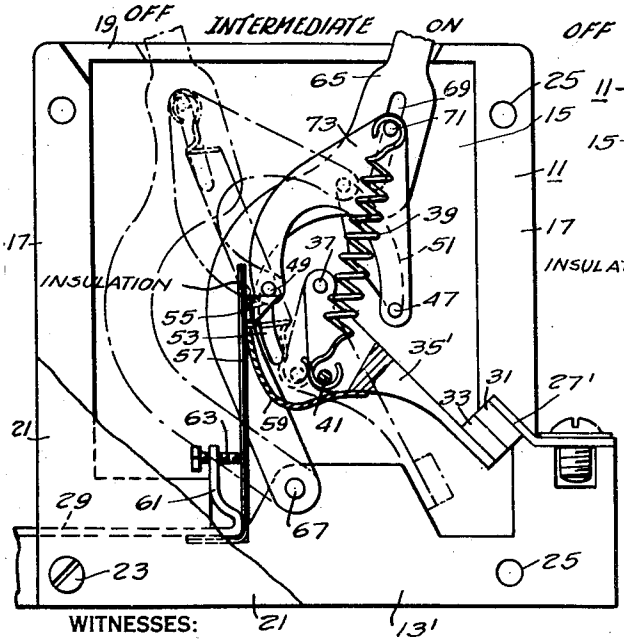


Fig. 3.

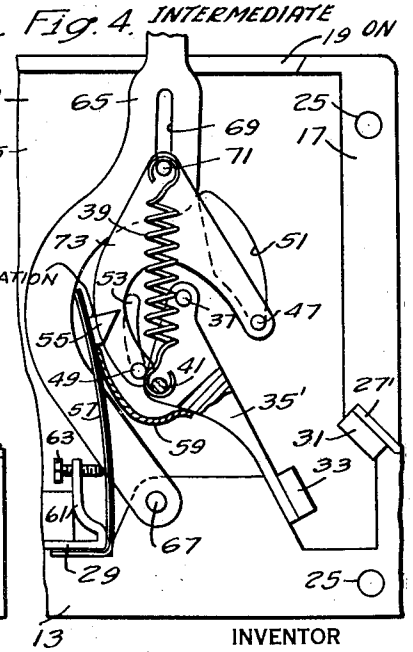


Fig. 4.

Patented Apr. 18, 1950 2,504,793

UNITED STATES PATENT OFFICE

2,504,793

CIRCUIT BREAKER

Harold G. Baxter, Baldwin, N. Y., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

Application April 27, 1943, Serial No. 484,682

15 Claims. (Cl. 200—116)

1

This invention relates to circuit breakers, and more particularly to circuit breakers of the type which may be operated manually and which are operated automatically in response to overload currents.

An object of the invention is the provision of a circuit breaker having an improved operating mechanism in which the point of operation of the operating member is variable from one position to another, depending on whether the operation is manual or automatic.

Another object of the invention is the provision of a circuit breaker embodying an improved operating mechanism wherein an operating member is provided with a plurality of centers of rotation, the member being manually or otherwise operable about one of the centers and being automatically operable about another of the centers.

Another object of the invention is the provision of a circuit breaker embodying an improved operating mechanism wherein an operating member is provided which has a pair of centers of rotation, one of the centers being releasably restrained by a trip device, the operating member being manually operable about the restrained center and automatically operable about the other center upon release of the restrained center.

Another object of the invention is the provision of a circuit breaker having an improved operating mechanism wherein an operating member is operable about a pair of spaced pivots, one of the pivots being releasably restrained to provide for manual operation of the member and breaker, said one pivot being releasable to effect automatic operation of the operating member and breaker.

Another object of the invention is the provision of a circuit breaker having an improved operating mechanism which, when moved to an intermediate position and then released, will open and automatically reclose the contacts.

Another object of the invention is the provision of a circuit breaker with an improved operating mechanism having an intermediate position from which the contacts are automatically reclosed and a full open position in which the contacts are maintained in the open position.

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 be best understood from the following detailed description of several embodiments

2

thereof when read in conjunction with the accompanying drawing, in which:

Figure 1 is a side-elevational view, with the side-cover plate removed, of a circuit breaker embodying the principles of the invention. The breaker mechanism is shown in full lines in the closed position and in dotted lines in the manually opened position.

Fig. 2 is a fragmentary-elevational view of the mechanism shown in Fig. 1, but showing the breaker mechanism in the tripped-open position.

Fig. 3 is a side-elevational view of a modification of the breaker mechanism shown in Fig. 1, the mechanism being shown in full lines in the closed position and in dotted lines in the manually-opened position.

Fig. 4 is a side-elevational view of the breaker mechanism shown in Fig. 3, but showing the mechanism in the tripped-open position.

Referring to Fig. 1 of the drawing, the circuit-breaker mechanism is mounted in a casing 11 of molded-insulating material having a base portion 13, a side wall 15, end walls 17, and a slotted outer wall 19. A cover plate 21 (shown partly broken away), also of molded-insulating material, is secured to the open side of the casing 11 by means of screws 23 (only one being shown) which pass through holes in the cover plate 21 and matching holes 25 in the casing 11. Terminals 27 and 29 are supported in suitable slots in the casing 11 and are held in place by the cover plate 21. The terminal 27 extends into the interior of the casing 11 and has secured to its inner end a stationary contact 31 with which a movable contact 33 cooperates. The movable contact 33 is secured to the free end of a pivoted L-shaped switch member or contact arm 35. The pivoted end of the contact arm 35 is bifurcated and the two legs are pivotally supported on pins 37 one projecting inwardly from the side wall 15 and the other (not shown) projecting inwardly from the cover plate 21. An over-center spring 39 has one end anchored to a pin 41 supported in the legs of the switch member or contact arm 35. The other end of the spring 39 is hooked over a pin 43 mounted on an operating handle 45 movable between an "on" position and an "off" position. The inner end of the operating handle 45 is U-shaped and the two legs carry pins 47 and 49 extending on both sides of their respective legs. The pins 47 and 49 project respectively into arcuate slots 51 and 53 molded in the side wall 15 and into matching slots (not shown) molded in the cover plate 21.

The overcenter spring 39 biases the switch

member 35 to the closed position, shown in full lines in Fig. 1, and biases the operating handle in a counterclockwise direction about the pin 47 which in the closed position is seated in the lower end of the slot 51. Movement of the operating handle 45 in a counterclockwise or opening direction under the influence of the spring 39 is normally prevented by the engagement of a latch member 55 with the pin 49. The latch member 55 is rigidly secured to but insulated from a bimetal element 57 which is rigidly secured to the inner end of the terminal conductor 29. The inner end of the terminal conductor is formed over as indicated at 61 (Figs. 1 and 2) and supports an adjusting screw 63 by which the tripping time of the breaker may be adjusted or varied. The free end of the bimetal element 57 is connected by means of flexible conductor 59 to the switch member 35, completing the electrical circuit which extends through the breaker from the terminal 27 to the contact 31, movable contact 33, contact arm 35, flexible conductor 59, bimetal element 57 to the terminal conductor 29.

When normal-rated current flows through the circuit of the breaker, the parts will remain in the closed position as shown by the full lines in Fig. 1, since normal value current will not cause deflection of the bimetal element to release the pivot pin 49. However, upon the occurrence of an overload the excessive current traversing the bimetal element will heat the bimetal and cause it to deflect toward the left (Fig. 1) moving the latch 55 out of the path of the pin 49. The spring 39 then acts to immediately rotate the operating handle 45 counterclockwise to an "intermediate" position about the pin 47 as a pivot until the handle is arrested by the pin 49 striking the bottoms of the slots 53. During the counterclockwise movement of the handle 45, the center line of the spring 39 passes to the left of the pivot pin 37 for the contact arm 35 whereupon the force of the spring acts to rotate the switch member 35 in a clockwise direction with a snap action disengaging the movable contact 33 from the stationary contact 31. The opening movement of the switch member is arrested by the arm striking the base portion 13 of the casing 11. The parts are shown in Fig. 2 in the tripped-open position with the handle in the "intermediate" position wherein it indicates the open condition of the breaker.

The breaker is operated to close the contacts manually, following an automatic-opening operation, by rotating the handle 45 clockwise about the pin 47 as a pivot to the "on" position. During this movement the line of action of the overcenter spring 39 passes to the right of the pivot pin 37 of the switch member 35 at which time the spring acts to close the contacts with a snap action. Also during the clockwise or closing movement of the handle from the automatically-opened position, after the bimetal 57 has cooled, the pin 49 wipes by the latch member 55 which, due to the inherent resiliency of the bimetal element 57, immediately resumes its position under the pin 49 and thereby restrains the operating handle 45 in the "on" position.

The contacts are opened manually by rotating the operating handle 45 counterclockwise about the pivot pin 49, which at this time rests on the latch member 55, to the "off" position shown by dotted lines in Fig. 1. During this movement of the handle the line of action of the spring 39 passes to the left of the pivot pin 37 at which time the spring acts to rotate the switch member

35 clockwise to open the contacts with a snap action. Continued counterclockwise movement of the handle 45 carries the line of action of the spring 39 overcenter to the left of the pin 49 in which position the spring biases the switch member 35 to its open position and biases the handle 45 to its "off" position.

With the breaker mechanism in the fully-open position (dotted lines Fig. 1) the contacts are closed by clockwise rotation of the handle 45 to the "on" position. During this movement, the line of action of the spring 39 first passes to the right of the pin 49 where it biases the handle in a clockwise or closing direction. Continued clockwise movement of the handle 45 carries the spring 39 to the right of the pivot pin 37 whereupon the spring acts to close the contacts with a snap action.

Figures 3 and 4 illustrate a modified form of the invention. Some of the parts in this modification are the same as the corresponding parts in the Figure 1 modification and have been given the same reference characters. According to the modification shown in Fig. 3, a manual operating handle 65 is pivotally mounted on a fixed pivot pin 67 supported in the base portion 13 of the casing 11. The outer portion of the handle 65 is provided with a radially-extending slot 69 which engages a pin 71 projecting laterally from the outer end of a U-shaped operating member 73. The legs of the member 73 carry the pins 47 and 49 which project respectively into the slots 51 and 53 formed in the side wall 15 of the casing and corresponding slots (not shown) in the cover plate 21.

When the bimetal element 57 is heated a predetermined amount in response to overload currents it deflects toward the left (Fig. 3) moving the latch member 55 from beneath the pin 49 thus releasing the operating member 73. The spring 39 thus acts to rotate the operating member 73 counterclockwise about the pin 47 to the "intermediate" position in which it appears in Fig. 4 where it is arrested by engagement of the pin 49 with the bottom of the slot 53. Through the pin and slot connection 71—69, the handle 65 is also rotated in a counterclockwise direction to the "intermediate" position with the operating member. During the counterclockwise movement of the operating member the spring 39 moves overcenter to the left of the pivot 37 whereupon the force of the spring is exerted to rotate the switch member 35' clockwise to open the contacts with a snap action. The parts are now in the positions in which they appear in Fig. 4.

From the automatically tripped-open position (Fig. 4) the contacts are closed by manually rotating the operating handle in a clockwise direction to the "on" position during which movement the spring 39 is carried overcenter to the right of the pivot 37 for the switch member. The force of the spring is thereupon exerted to close the contacts with a snap action and to bias the switch member 35' to its closed position (full-line position Fig. 3). As the operating member 73 nears its closed position the pin 49 wipes by the latch member 55 which, due to the inherent resiliency of the bimetal 57 if it has cooled, immediately resumes its position beneath the pin 49 where it releasably restrains the operating member in the "on" position.

The contacts of the embodiment of the invention shown in Fig. 3 are opened manually by rotating the operating handle 65 counterclock-

wise from its full-line position (Fig. 3) to its dotted-line position. Due to the pin and slot connection 71—69 movement of the handle 65 is transmitted to the operating member 73 which, upon counterclockwise movement of the handle, rotates in the same direction about the pin 49 as a pivot. During the counterclockwise rotation of the operating member 73, the spring 39 is moved overcenter to the left of the pivot pin 37 for the switch members 35' and this arm is then moved to open the contacts with a snap action. Continued movement of the handle 65 in opening direction carries the spring 39 to the left of the pivot pin 49 in which position the spring biases the switch member 35', the operating member 73 and, due to the pin and slot connection 71—69, the handle 65 to their off positions.

The contacts are operated to the closed position by manual movement of the handle 65 in a clockwise direction to its "on" or full line position (Fig. 3). Early in this movement, the spring 39 passes to the right of the pivot pin 49 where it biases the operating member 73 in closing direction. Later in the clockwise movement of the handle the spring 39 crosses to the right of the pivot pin 37 and closes the contacts with a snap action.

In both embodiments of the invention, if the handle 65 is not moved to its "off" position during an opening operation by the handle, that is, if the handle is moved to the intermediate position wherein the center line of the spring 39 lies between the pivot pins 37 and 49, the contacts will have opened, but if the handle is released without moving it to the full-open position, the spring 39 will immediately move the operating member and the handle to the "on" position. This will automatically reclose the contacts as the spring moves to the right of the pivot 37 for the switch member. However, if the handle is moved to its "off" position, it will, as previously stated, move the spring 39 to the left of the pivot pin 49 where the spring will bias the handle 65 (Fig. 1) or the operating member 73 (Fig. 3) in their respective "off" positions and maintain the switch member in the open position until the handle is manually displaced in closing direction.

An advantage of the invention is that the breaker may be controlled from a remote point to open the contacts, and upon deenergization of the control means, the contacts will be immediately reclosed by the operating spring. In order to accomplish this function it is necessary to actuate the operating mechanism in opening direction only to the intermediate position. Any suitable remotely-controllable actuating means may be employed.

Having described several embodiments of the invention in accordance with the patent statues, it is to be understood that various changes and modifications may be made therein without departing from some of the essential features of the invention.

I claim as my invention:

1. A circuit breaker comprising a switch member mounted on a fixed pivot and movable to open and closed positions, an operating member having a plurality of pivots, means operable by said operating member to move said switch member to open and closed positions, said operating member being manually movable about one of said pivots to effect opening and closing movement of said switch member with a snap action, and current responsive means operable to permit said operating member to be moved about another of said pivots to thereby effect an automatic opening movement of said switch member.

2. A circuit breaker comprising a switch member mounted on a fixed pivot and movable to an open and to a closed position, an operating member having a plurality of spaced pivots, said operating member being operable about either of said pivots to effect opening movement of said switch member with a snap action, manually-operable means for moving said operating member about one of said pivots, and current responsive means operable when heated a predetermined amount to permit said operating member to be moved about another of said pivots, said manually-operable means being operable to move said operating member about either pivot to move the switch member to closed position with a snap action.

3. A circuit breaker comprising a switch member movable to open and closed positions, operating means for said switch member comprising a member having a plurality of pivots, an overcenter spring operable by said member to cause movement of said switch member to open and closed positions, a bimetal element normally supporting one of said pivots to releasably restrain said operating member, said bimetal element being operable when heated a predetermined amount to release said one pivot and permit operation of the operating member about another of said pivots to effect movement of the switch member to open position, and manually operable means for operating said operating member about said one pivot to effect opening movement of the switch member.

4. A circuit breaker comprising a switch member, operating mechanism for said switch member comprising an operating member movable to an "off" position and to an "on" position, an overcenter spring operatively connecting the switch member and said operating member operable to cause movement of said switch member to an open position and to a closed position with a snap action, a plurality of spaced pivots for said operating member, means for releasably restraining one of said pivots, said restraining means being responsive to predetermined abnormal circuit conditions to release said one pivot and permit the overcenter spring to operate the operating member about another of said pivots to effect opening movement of the switch member, and means for operating said operating member about said one pivot to effect opening movement of the switch member.

5. A circuit breaker comprising a switch member, operating mechanism for said switch member comprising a member operable about a plurality of pivots to "off" and "on" positions, an overcenter spring operatively connecting the switch member and the operating member to cause movement of the switch member to open and closed positions with a snap action, electro-responsive means engaging and supporting one of said pivots to releasably restrain said operating member in the "on" position, said electro-responsive means being operable in response to predetermined circuit conditions to release said operating member to permit said overcenter spring to operate said operating member about another of said pivots to effect automatic opening of said switch member, and manual means for operating said operating member about said one pivot to operate said switch member.

6. A circuit breaker comprising a switch member, operating mechanism for said switch member

comprising an operating member movable to effect opening and closing movement of said switch member, an overcenter spring operable by said operating member to move said switch member to open and closed positions with a snap action, a plurality of pivots on said operating member one of said pivots being releasable to effect automatic movement of said operating member in opening direction, a trip device for releasably restraining said releasable pivot, said trip device being responsive to overload currents to release said releasable pivot and permit said overcenter spring to move the operating member about a second of said pivots, and manually operable means operatively connected to said operating member for operating said member about the releasable pivot to effect manual opening of said switch member.

7. A circuit breaker comprising relatively movable contacts, releasable operating mechanism for causing automatic opening of said contacts, said operating mechanism including an operating member having a pair of spaced pivots, means comprising a thermal element disposed to engage and support one of said pivots to releasably restrain said operating member, said thermal element being operable when heated by overload currents to release said one pivot and permit operation of the operating member about the other of said pivots to effect automatic opening of the contacts, manual means for moving the operating member about said one pivot, and an overcenter spring operable by said operating member to effect opening and closing of the contacts with a snap action.

8. A circuit breaker comprising relatively movable contacts, operating mechanism for causing automatic opening of said contacts, said operating mechanism including a releasable member having a pair of spaced pivots, an overcenter spring operable by said releasable member to cause opening and closing of the contacts with a snap action, means for rotating the releasable member about one of said pivots to open and close the contacts, and a trip device operable in response to predetermined abnormal circuit conditions to release said releasable member and permit said member to rotate about the other pivot to automatically open the contacts.

9. A circuit breaker comprising relatively movable contacts, operating mechanism for said contacts, a releasable member having a pair of spaced pivots and operable to cause automatic opening of the contacts, means comprising an overcenter spring operable by said releasable member to cause opening and closing of said contacts with a snap action, manually operable means operatively associated with said releasable member for operating said member about one of said pivots to open and close said contacts, and current-responsive means operable when heated a predetermined amount to release the releasable member and thereby permit operation of said member about the other pivot to automatically open the contacts.

10. A circuit breaker comprising relatively movable contacts, operating mechanism for said contacts including a releasable operating handle provided with a plurality of pivots, said operating handle being manually operable about one of said pivots to "off" and "on" positions, means operable by said handle when said handle is moved to "off" and "on" positions to cause opening and closing of said contacts, and electroresponsive means normally engaging said one pivot to restrain said handle in said "on" position, said electroresponsive means being operable to release said handle and thereby permit movement of said handle about another of said pivots to effect automatic opening of said contacts.

11. A circuit breaker comprising relatively movable contacts, operating mechanism for said contacts including a releasable member provided with a plurality of pivots, an operating handle operatively related to said releasable member, said handle being operable to move the releasable member about one of said pivots to open and close said contacts with a snap action, means operable by said releasable member to effect opening and closing of said contacts, and a trip device operable to permit movement of said releasable member about another of said pivots to effect automatic opening of the contacts.

12. A circuit breaker comprising relatively movable contacts, operating mechanism for said contacts including a releasable member provided with a plurality of pivots, means operable by said releasable member to open and close said contacts, manually-operable means having a pin and slot connection with said releasable member, said manual means being operable to move the releasable member about one of said pivots to open and close the contacts, a bimetal element for releasably restraining said one pivot, said bimetal element being operable when heated in response to overload currents to release said one pivot and thereby permit the releasable member to move about another of the pivots to effect automatic opening of the contacts, said manual means being operable to move the releasable member about the other pivot to effect closing of the contacts.

13. A circuit breaker comprising relatively movable contacts, operating mechanism including an operating member movable to an intermediate position and to an "off" position to effect opening of said contacts, a trip device operable in response to abnormal circuit conditions to effect automatic opening of said contacts, and means for operating said operating member from said intermediate position to automatically close the contacts, said operating member when moved to said "off" position maintaining said contacts in the open position.

14. A circuit breaker comprising relatively movable contacts, operating mechanism for said contacts including an operating member, a plurality of pivots for said operating member, said operating member being movable about one of said pivots to an intermediate position and to an "off" position to effect manual opening of said contacts, said operating member being automatically operable about said one pivot from said intermediate position to close said contacts, said operating member in said "off" position maintaining said contacts in the open position, and a trip device operable in response to abnormal circuit conditions to effect movement of said operating member about the other of said pivots to cause automatic opening of said contacts.

15. A circuit breaker comprising relatively movable contacts, operating means for said contacts including an operating member operable about a plurality of pivots to effect opening and closing of said contacts, manual means for operating said operating member about one of said pivots, an over-center spring operable by said operating member to effect manual opening and closing of said contacts with a snap action, and a trip device operable in response to abnormal

circuit conditions to permit said over-center spring to operate said operating member about a second pivot to cause automatic opening of said contacts.

HAROLD G. BAXTER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
2,073,103	Hodgkins	Mar. 9, 1937
2,107,246	Jackson	Feb. 1, 1938
2,188,949	Jackson	Feb. 6, 1940
2,212,732	Fisher	Apr. 27, 1940
2,315,633	May	Apr. 6, 1943
2,320,357	Platz et al.	June 1, 1943
2,371,738	Christofferson	Mar. 20, 1945