

June 22, 1943.

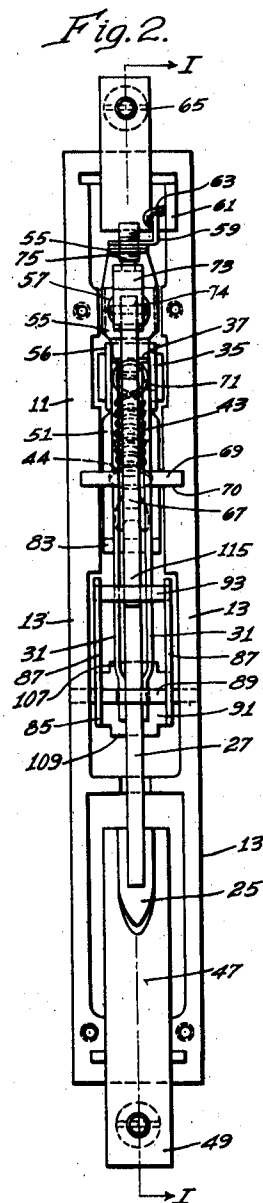
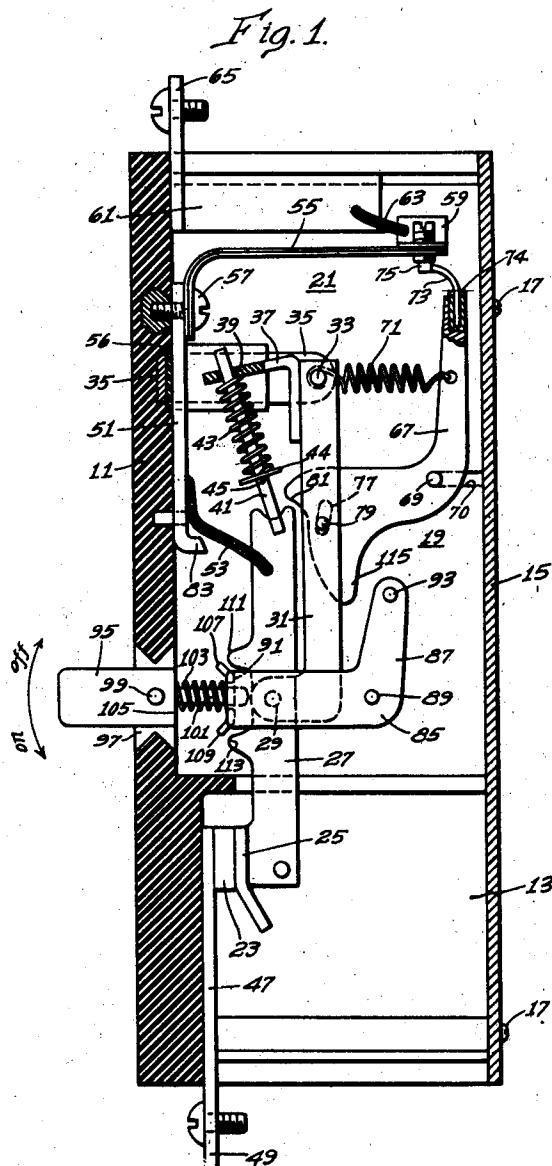
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2,322,285

CIRCUIT BREAKER

Filed May 29, 1941

2 Sheets-Sheet 1



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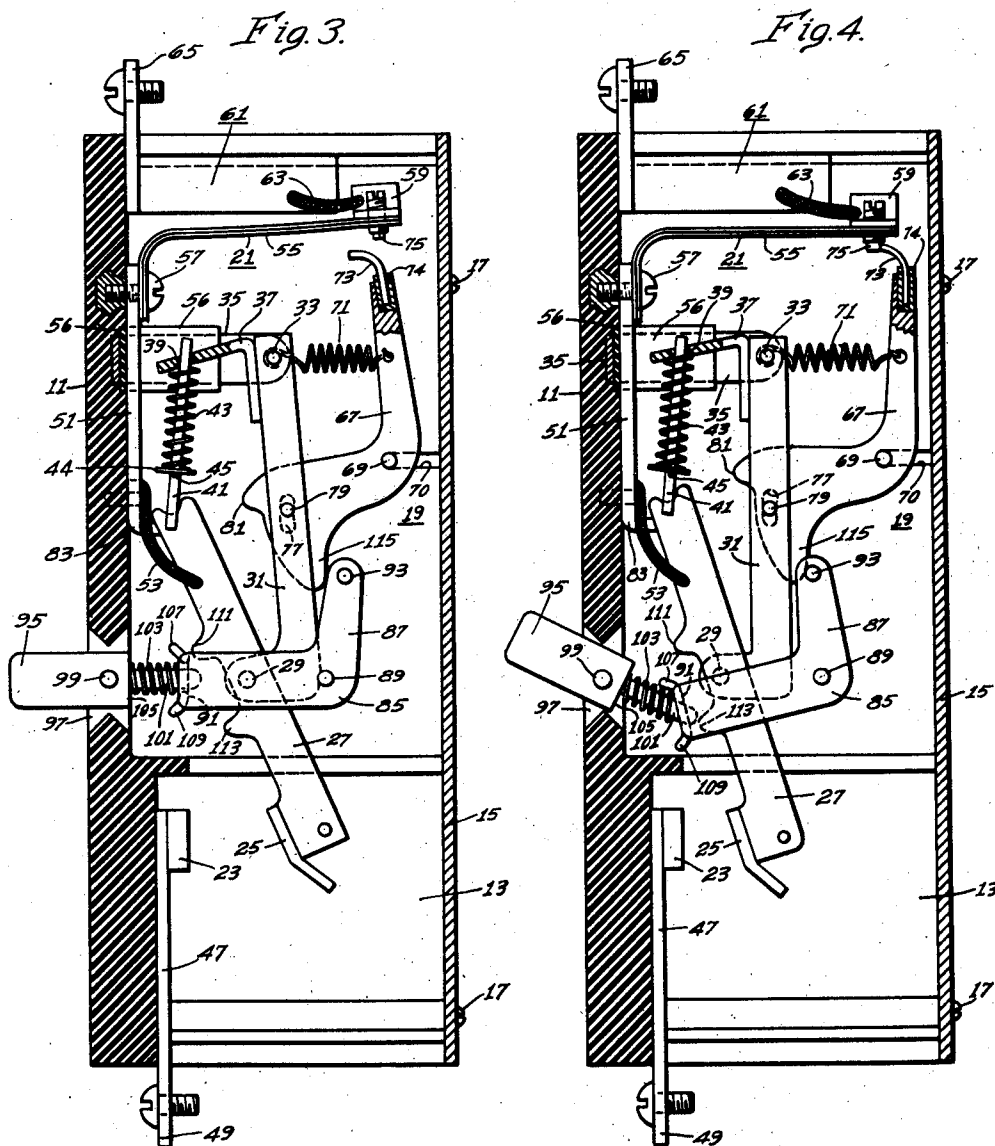
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CIRCUIT BREAKER

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14 Claims. (Cl. 200—116)

This invention relates to circuit breakers and more particularly to circuit breakers of the type which are manually operated, and also automatically operated in response to predetermined overload conditions in the circuit.

One object of the invention is to provide an improved circuit breaker of simple, compact and relatively inexpensive construction, and which is dependable in operation.

Another object of the invention is to provide an improved circuit breaker having a compact operating mechanism automatically operable to cause the contacts to open a relatively large distance.

Another object of the invention is to provide a circuit breaker with improved and simplified mechanism for causing the contacts to close with a snap action and to apply pressure to the contacts after they are closed.

Another object of the invention is to provide an improved circuit breaker having a switch member operable in response to predetermined circuit conditions to move a contact member to open the circuit and manual means to move the contact member to open the circuit independently of the movement of the switch member.

Another object of the invention is to provide an improved circuit breaker with a switch member having open and closed positions and having a contact arm thereon movable therewith to open and close the circuit, wherein the contact arm is movable to open and close the circuit without displacing the switch member from its closed 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 one embodiment thereof when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of a circuit breaker constructed in accordance with the invention, the section being taken substantially on line I—I, of Fig. 2, and the breaker being shown in the closed circuit position;

Fig. 2 is a rear elevational view of the circuit breaker with the cover plate removed to show some of the parts;

Fig. 3 is a vertical sectional view similar to Fig. 1 but showing the circuit breaker in the tripped open position; and

Fig. 4 is a vertical sectional view similar to

Fig. 1 but showing the breaker mechanism in the manually opened condition.

Referring to Figures 1 and 2 of the drawings the circuit breaker includes a base 11 of molded insulating material having side walls 13 molded integral therewith, a flat cover plate 15 secured to the side walls by means of suitable screws 17, an operating mechanism indicated generally at 19, a trip device indicated at 21, a stationary contact 23, and a movable contact 25.

The movable contact 25 is mounted on a contact lever 27 pivotally supported on a pivot 29 in the free ends of a pair of switch arms 31. The switch arms 31 are rotatably mounted on a pivot 33 supported in the ends of a U-shaped bracket 35 secured to the base 11, the switch arms being joined for movement together by the pivots 29 and 33. Since the switch arms 31 are secured for movement together they will hereinafter be referred to in the description as the switch arm.

An angular bracket 37, secured to the switch arm 31 adjacent the pivoted end, is provided with an aperture 39 through which projects one end of a toggle link 41 the other link of the toggle comprising one arm of the contact lever 27. A compression spring 43 surrounding the link 41 and compressed between the bracket 37 and a washer 44 supported on the link by a pin 45, maintains the notched end of the link in engagement with the notched end of the contact lever 27.

In the closed position the toggle 27—41 is over center to the right of the pivot 29 of the lever 27, as indicated in Fig. 1, in which position the spring 43 serves to apply pressure to the contacts.

The stationary contact 23 is secured to the inner end of a conductor 47 suitably secured to the base 11 and extending outside of the casing to provide a terminal 49. The contact lever 27 is electrically connected to a conductor 51 by means of a flexible shunt conductor 53. A bimetal element 55 is secured to the opposite end of the conductor 51 by a screw 57 which serves to secured both the bimetal element 55 and the conductor 51 to the base 11. A U-shaped piece of insulating material 56 insulates the bracket 35 from the conductor 51. The free end of the bimetal 55 carries an angular connection 59 which is connected to a conductor 61 by a flexible shunt conductor 63. The conductor 61 has a portion projecting outside of the casing to form a terminal 65 which, with the terminal 49, serves to connect the breaker in an electrical circuit.

The electrical circuit through the breaker extends from the terminal 49 through the conductor

47, the stationary contact 23, the movable contact 25, the contact lever 27, the flexible shunt conductor 53, the conductor 51, the bimetal element 55, the flexible shunt conductor 33, and the conductor 61 to the terminal 65.

A releasable operating lever 67 pivotally supported on a pivot pin 69 seated in bearing slots 70 in the side walls 13 of the base 11 is biased in a counterclockwise direction by an operating spring 71 tensioned between said operating lever and the pivot 33 for the switch arm 31. The operating lever 67 is normally restrained in the position in which it is shown in Fig. 1 by a curved latch member 73 mounted in a block 74 of insulating material secured on the upper end of said lever engaging a latch 75 on the free end of the bimetal element 59. The latch 75 is in the form of a screw which serves also as a convenient means for adjusting the tripping point of the breaker. The other end of the lever 67 is provided with a cam slot 77 operatively engaging a pin 79 carried by the switch arms 31.

When the bimetal element 55 is heated a predetermined amount in response to overload current flowing through the circuit of the breaker, it flexes in a direction to unlatch the operating lever 67 whereupon the spring 71 rocks said lever counterclockwise about its pivot 69. The configuration of the cam slot 77 of the lever 67 is such that, acting through the pin 79, it rocks the switch arm 31 in a counterclockwise direction about the pivot 33 to separate the contacts 25—23. During this movement a shoulder 81 on the lever 67 strikes the end of the contact lever 27 opposite the contact 25. Continued counterclockwise movement of the lever 67 cams the toggle 27—41 over center in a direction to cause the contacts to open with a snap action and to cause greater separation of the contacts. The movement of the contact lever 27 in the direction to open the contacts is limited by said lever striking the formed over end 83 of the conductor 51. The parts are shown in their tripped open positions in Fig. 3.

After the breaker has been operated in response to an overload current it is necessary to relatch the operating lever 67 before the circuit breaker can be closed. For this purpose a manual operating member 85 is provided. The lever 85 comprises a pair of bell cranks 87 pivoted on a pivot pin 89 supported in the side walls 13 of the casing. The bell cranks 87 straddle the switch arm 31 and the contact lever 27 and are connected by a yoke 91 at their ends adjacent the contact lever. The other arms of the bell cranks are joined by a stud 93.

A manual operating handle 95 extending through an opening 97 in the base 11 is pivotally mounted on a pivot 99 supported in the base. A projection 101 integral with the handle 95 extends through an opening in the yoke 91 and a spring 103 is compressed between a shoulder 105 on the handle 95 and the yoke 91. The yoke 91 is provided with a pair of ears 107 and 109 adapted to cooperate respectively with projections 111 and 113 on the contact lever 27.

In order to relatch the operating lever 67 the handle 95 is manually rocked in a clockwise direction about its pivot 99 to the "off" position. Due to the cooperation of the projection 101 with the yoke 91 this movement of the handle 95 rocks the manual lever 85 in a counterclockwise direction. At this movement of the lever 85 the stud 93 engages a projection 115 on the operating lever 67 and rocks said lever clockwise slightly beyond its latching position. The

cam slot 77 acting on the pin 79 rocks the switch arm 31 clockwise about the pivot 33 to its normal position. The parts are now in substantially the position indicated in Fig. 4, with the contact lever 27 in its manually opened position and the operating lever 67 in latched position.

The circuit breaker may now be manually closed by rotating the handle 95 in a counterclockwise direction from its "off" (Fig. 4) position toward its "on" position rocking the lever 85 in a clockwise direction, during which movement the ear 107 on the yoke 91 strikes the projection 111 on the contact lever 27 and rocks the contact lever clockwise about its pivot 29. This moves the toggle 27—41 over center in a direction to cause the spring 43 to close the contacts with a snap action.

The contacts may be opened manually by movement of the handle 95 in a clockwise direction to its "off" position, which rocks the lever 85 counterclockwise. This movement of the lever 85 brings the ear 109 into contact with the projection 113 and starts the contact lever 27 in a counterclockwise direction about the pivot 29, moving the toggle 27—41 over center to the left of the pivot 29, causing the contacts to open with a snap action. The mechanism is shown in the manually opened position in Fig. 4.

The contacts are closed manually from their manually opened position (Fig. 4) by rotating the handle 95 counterclockwise toward the "on" position, which movement rocks the lever 85 clockwise about its pivot 89. This causes the ear 107 to engage the projection 111 and move the toggle 27—41 overcenter toward the right of the pivot 29, whereupon the spring 43 rocks the contact lever 27 to close the contacts with a snap action.

Having described the preferred embodiment of 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 disclosed without departing from some of the essential features of the invention. It is therefore, desired that the invention be interpreted as broadly as the prior art permits, and that it be limited only by what is expressly stated in the following claims.

I claim as my invention:

1. In a circuit breaker, relatively movable contacts, a switch arm movable to open and closed positions, a contact lever pivotally supported on the switch arm, releasable actuating means biased to move the switch arm to open position, an overcenter spring means cooperating with the contact lever to form a toggle, means on the releasable actuating means for engaging and moving the toggle over center in a direction to rotate the contact lever in opening direction, and manually operable means operable to move the toggle over center to close the contacts.

2. In a circuit breaker, relatively movable contacts, a switch arm movable to open and closed positions, a contact actuating lever pivotally supported on the switch arm, releasable actuating means for the switch arm, a spring biasing said actuating means to open position, an overcenter spring cooperating with the contact lever to form a toggle, means on the releasable actuating means engageable with the toggle to move said toggle over center in a direction to rotate the contact lever about its pivot on the switch arm in a direction to open the contact, and manually operable means engageable with the contact lever when the switch arm is in closed position.

and operable to move said toggle over center in a direction to close the contacts.

3. In a circuit breaker, relatively movable contacts, a pivoted switch member operable to cause opening of the contacts, a contact actuating lever pivotally mounted on said switch member, releasable actuating means for operating the switch member to cause opening of said contacts, current responsive means for releasing said actuating means, an overcenter spring cooperating with the contact actuating lever to form a toggle, and means movable in response to operation of the actuating means and engageable with said toggle when said actuating means is released to move the toggle over center in a direction to rotate the contact lever about its pivot in a direction to open the contacts.

4. In a circuit breaker, relatively movable contacts, a switch arm operable to cause opening of said contacts, a contact actuating lever pivotally supported on the switch arm, spring biased actuating means releasable to operate the switch arm to cause opening of the contacts, a toggle including one arm of the contact actuating lever as an element thereof, and means on the actuating means for causing the toggle to rotate the contact actuating lever about its pivot to open the contacts when said actuating means moves to operate the switch arm.

5. In a circuit breaker, relatively movable contacts, a switch arm operable to cause opening of the contacts, a releasable actuating member having a cam thereon for operating said switch arm, a contact actuating lever pivotally mounted on the switch arm, an overcenter spring cooperating with the contact actuating lever to form a toggle disposed for movement with the switch arm, and means on the actuating member for causing said toggle to rotate the contact actuating lever on its pivot to open the contacts upon movement of the switch arm in an opening direction.

6. In a circuit breaker, relatively movable contacts, a switch arm having a normal position and movable to a second position to cause opening of said contacts, a releasable actuating member having a cam slot therein engaging a member on the switch arm to operate said switch arm to said second position, a contact actuating arm pivotally mounted on the switch arm, an overcenter spring cooperating with the contact actuating arm to form a toggle, current responsive means operable to release the actuating member, means on the actuating member to operate said toggle in a direction to open the contacts, and manually operable means engageable with said toggle to operate said toggle in a direction to close the contacts when said switch arm is in said normal position.

7. In a circuit breaker, relatively movable contacts, a switch arm operable to open and closed positions, a releasable actuating member for operating said switch arm, current responsive means operable to release said actuating member, a contact actuating lever pivoted on the switch arm, an overcenter spring cooperating with the contact lever to form a toggle, means on the actuating member separately engageable with the toggle to operate the toggle in one direction to cause opening of the contacts upon movement of the switch arm to open position, and manually operable means for operating the toggle to open or to close the contacts while said switch arm is in closed position, said man-

ually operable means also being operable to restore the actuating member to operating condition.

8. In a circuit breaker, relatively movable contacts, a switch arm operable to cause opening of the contacts, spring biased actuating means releasable to operate the switch arm, a bimetal element responsive to abnormal circuit conditions to release said actuating means, a contact actuating member pivoted on the switch arm, an overcenter spring cooperating with the contact actuating member to form a toggle, said toggle being movable with the switch arm for operating the contact actuating member to open the contacts, and manually operable means operable to reset the spring biased actuating means and also operable to cause the toggle to close the contacts.

9. In a circuit breaker, relatively movable contacts, a switch member operable to cause opening of the contacts, releasable means operable on the occurrence of an overload to operate the switch member to open the contacts, a contact actuating member pivotally carried by the switch member, said contact actuating member having a plurality of projections thereon, a snap acting device comprising an overcenter spring movable with the switch member, a manually operable member, means on said manually operable member for engaging one of the projections to cause the snap acting device to move over center in a direction to open the contacts, and other means on said manually operable member for engaging another of said projections to cause the snap acting device to move over center in a direction to close the contacts.

10. In a circuit breaker, relatively movable contacts, a switch member movable from a normal to a second position to cause opening of said contacts, releasable actuating means for moving said switch member to open position to cause opening of the contacts, a contact actuating lever pivotally supported on the switch member, means supported on the switch member and operatively connected to the contact actuating lever for causing said lever to open and close the contacts with a snap action, and manually operable means separably engageable with the contact actuating lever and operable to cause opening and closing of the contacts with a snap action when said switch member is in normal position.

11. In a circuit breaker, relatively movable contacts, a switch member operable from a normal position to a second position to cause opening of said contacts, actuating means biased to move said switch member to open position to cause opening of the contacts, a contact actuating lever mounted on the switch member, means comprising an overcenter spring mounted on the switch member and movable relative thereto for causing said actuating lever to open and close the contacts with a snap action, and manually operable means operable when the switch member is in normal position to cause opening and closing of the contacts.

12. In a circuit breaker, a pair of contacts one of which is movable to open and close the circuit of the breaker, a switch member having a contact actuating lever pivotally supported thereon, said switch member being movable from a normal position to a second position to cause opening of said contacts, manually operable means comprising a toggle separably engageable with the contact actuating lever when the switch member is in normal position to cause opening and closing movement of the contact actuating

lever, means including an overcenter spring on the switch member to cause the contact actuating lever to open and close the contacts with a snap action, and means operable in response to predetermined conditions to cause movement of the switch member to said second position.

13. A circuit breaker comprising relatively movable contacts, a switch member having a normal position, a contact actuating arm pivotally mounted on said switch member, an overcenter spring carried by said switch member and engageable with said contact actuating arm for opening or closing the contacts with a snap action, manually operable means separably engageable with said contact arm and operable when said switch member is in said normal position to cause said overcenter spring to open and close said contacts, said switch member being movable to a second position to cause opening of said contacts independently of said manually operable means, and means operable in response to

predetermined conditions to cause movement of said switch member to said second position, said manually operable means being operable to reset said switch member to its normal position.

5 14. In a circuit breaker, relatively movable contacts, a switch member having a normal position and movable to an open position to cause opening of the contacts, a spring biased actuating member for operating the switch member to open
10 position in response to predetermined abnormal circuit conditions, a contact arm pivotally supported on the switch member, means including an overcenter spring carried by the switch member for operating the contact arm to open
15 and close the contacts with a snap action and operable by the spring biased member to cause opening of the contacts, and manually operable means operable to cause the overcenter spring to open and close the contacts with a snap action.

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