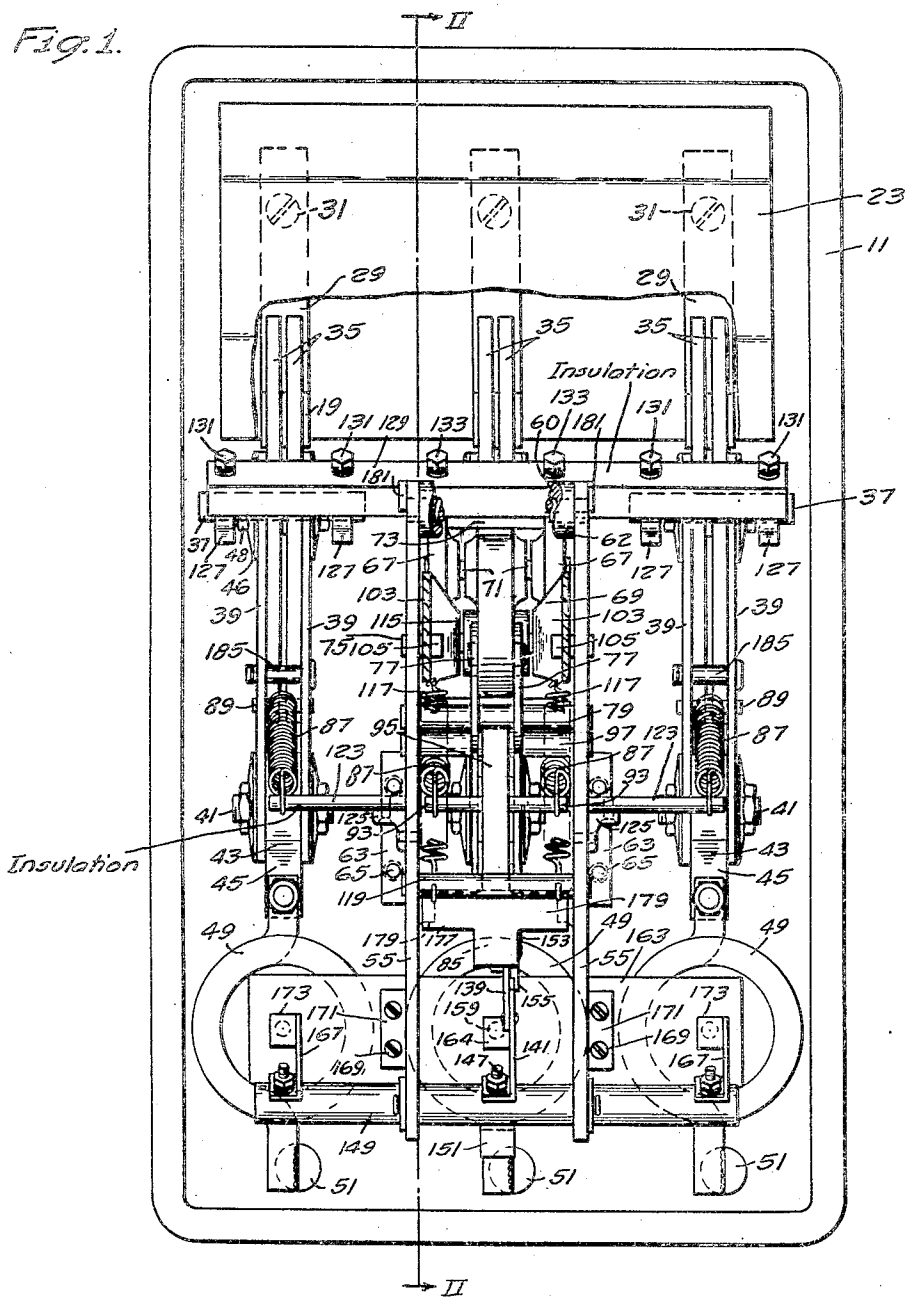
May 23, 1944. T. LINDSTROM ET AL 2,349,631

CIRCUIT BREAKER

Filed Nov. 11, 1942 4 Sheets-Sheet 1

Fig. 1.



WITNESSES:

E. A. McCloskey.

Paul Harlow.

INVENTORS

Paul O. Longguth

and Ture Lindstrom.

BY

F. W. Lyle.

ATTORNEY

May 23, 1944. T. LINDSTROM ET AL 2,349,631

CIRCUIT BREAKER

Filed Nov. 11, 1942 4 Sheets-Sheet 2

Fig. 2.

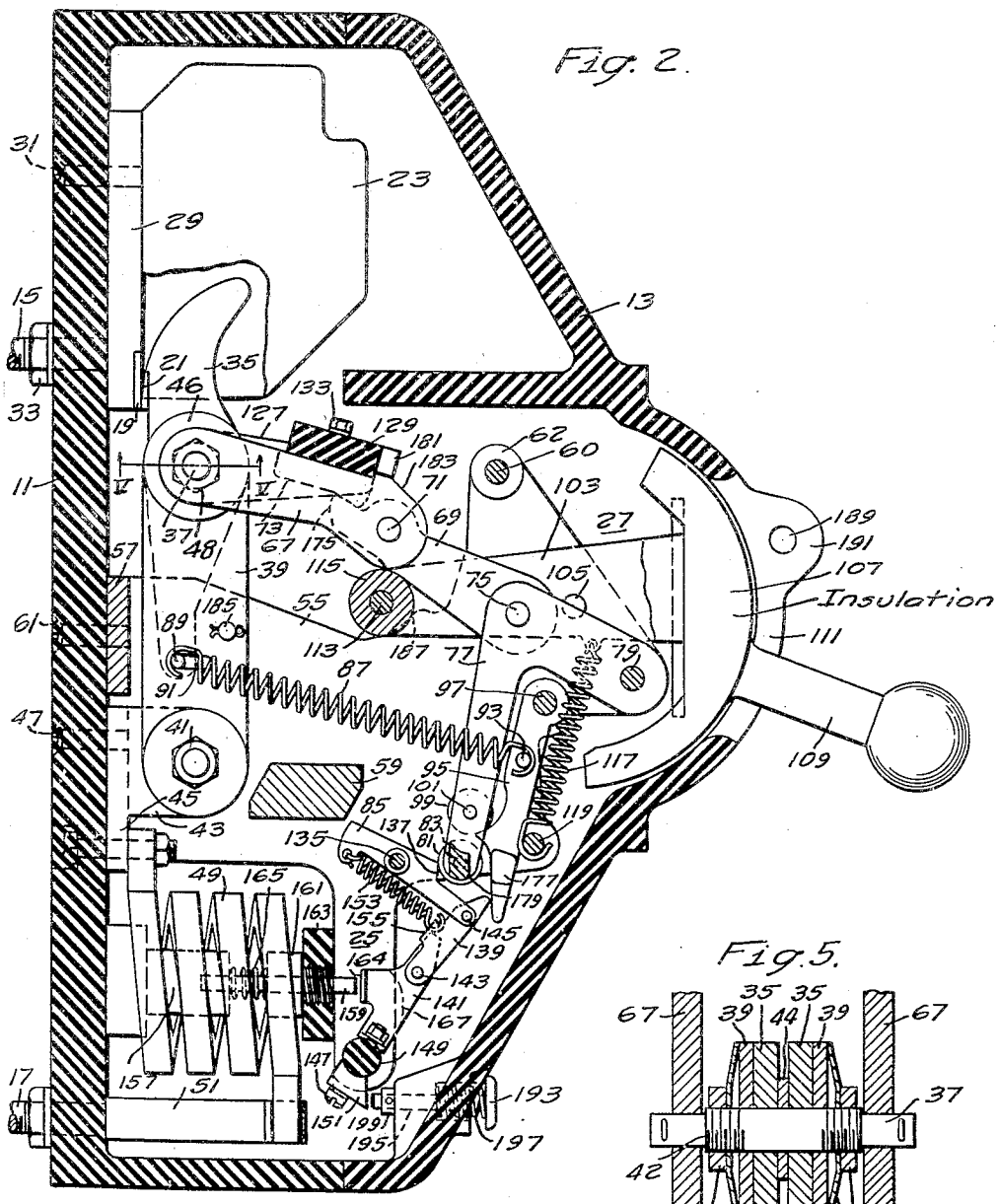


Fig. 5.

WITNESSES:

E. A. McCloskey.

Paul H. Harlin

INVENTORS

Paul O. Longguth

and Ture Lindstrom.

BY

F. W. Lyle.

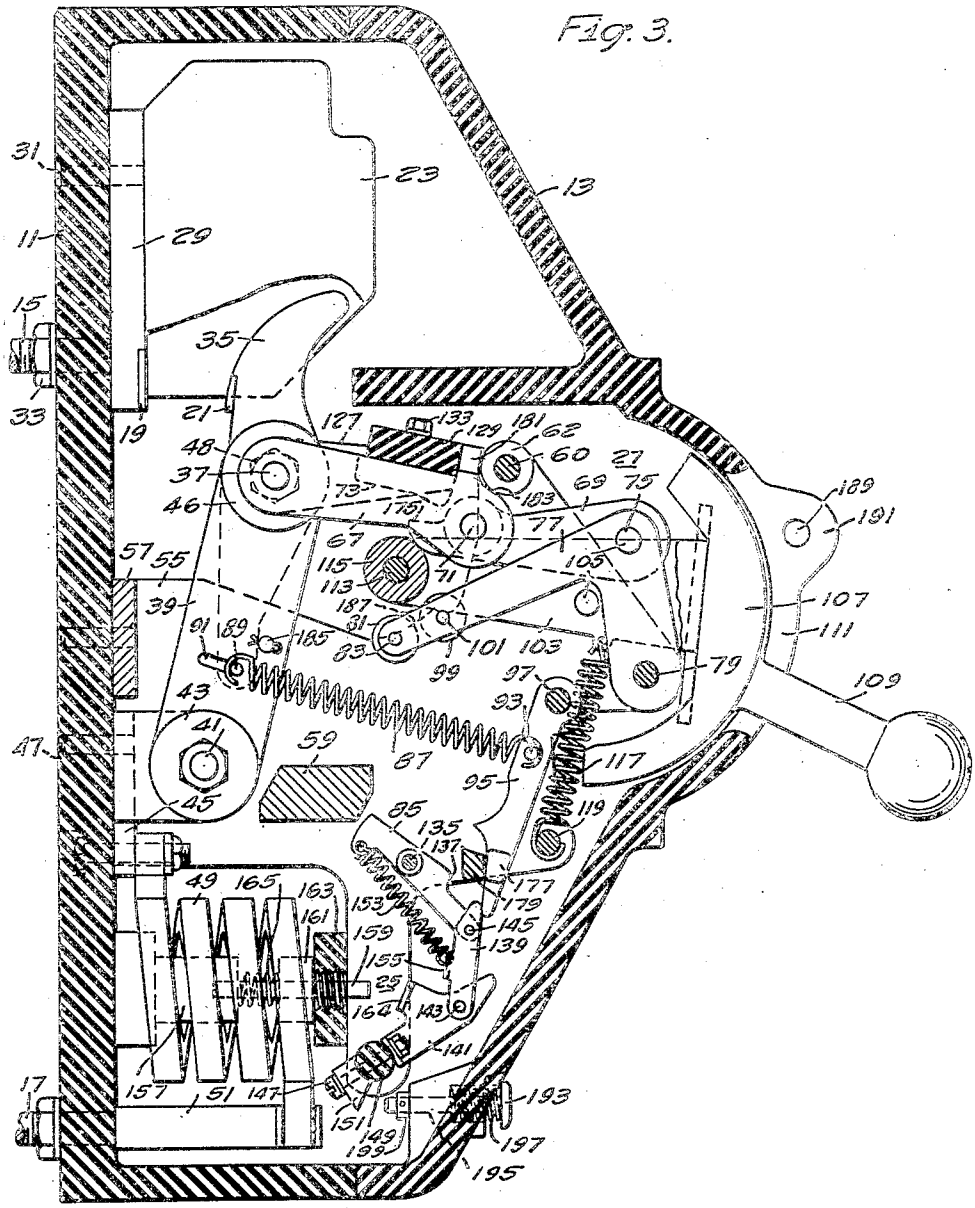
ATTORNEY

May 23, 1944. T. LINDSTROM ET AL 2,349,631

CIRCUIT BREAKER

Filed Nov. 11, 1942 4 Sheets-Sheet 3

Fig. 3.



WITNESSES:

E. A. McCloskey.

Paul Harkins.

INVENTORS

Paul O. Langguth

and Ture Lindstrom.

BY

F. M. Lyle.

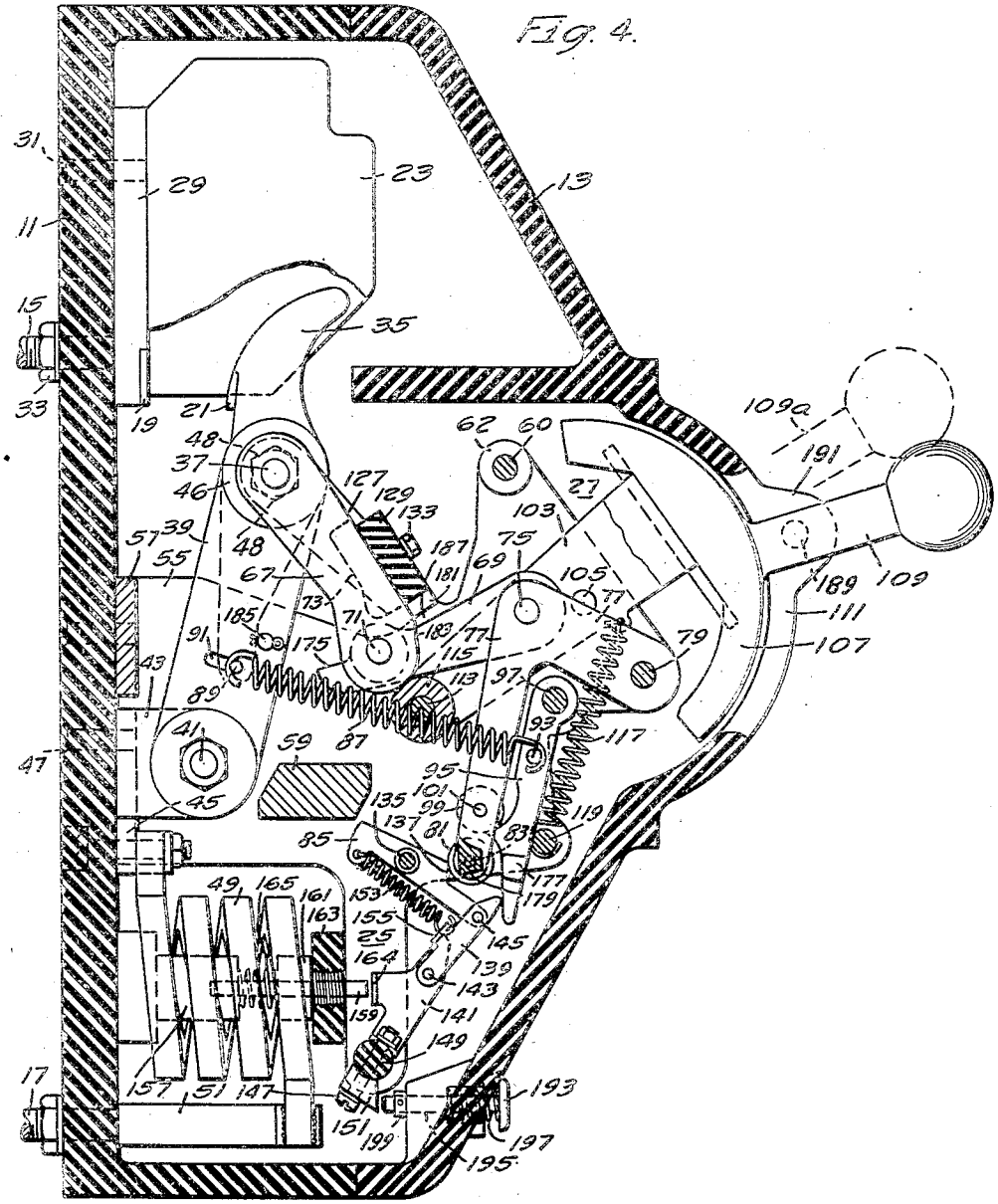
ATTORNEY

May 23, 1944. T. LINDSTROM ET AL 2,349,631

CIRCUIT BREAKER

Filed Nov. 11, 1942 4 Sheets-Sheet 4

Fig. 4.



WITNESSES:

E. A. McCloskey.

Paul Harlow

INVENTORS

Paul O. Langguth
and Ture Lindstrom.

BY

F. H. Lyle.

ATTORNEY

Patented May 23, 1944

2,349,631

UNITED STATES PATENT OFFICE

2,349,631

CIRCUIT BREAKER

Ture Lindstrom, Edgewood, and Paul O. Langguth, Wilkinsburg, Pa., assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application November 11, 1942, Serial No. 465,242

16 Claims. (Cl. 200—89)

This invention relates to circuit breakers and more particularly to circuit breakers of the type which are closed manually and opened by tripping the breaker either manually or automatically in response to predetermined abnormal conditions such as overloads.

An object of the invention is the provision of an improved circuit breaker in which the contacts are trip free of the closing lever in the closed position of the lever and the breaker is of shockproof construction so that it will not be falsely tripped or opened by jars or shocks.

Another object of the invention is the provision of an improved shockproof circuit breaker which is trip free of the operating lever during closing movement of the lever and in the closed position of the lever, and in which the breaker can be locked in closed position to prevent opening thereof in response to overloads by locking the operating lever in a predetermined position other than the closed position.

Another object of the invention is the provision of an improved circuit breaker having an operating spring which provides the tripping force for opening the breaker, supplies the contact pressure in the closed position and also holds the breaker latch in released position until the mechanism is reset to permit resetting of the mechanism.

Another object of the invention is the provision of an improved circuit breaker embodying a toggle linkage for holding the breaker in closed position and an operating spring connected at one end to a lever having limited movement and at its other end to the contact means whereby the spring acts through the lever to initiate collapse of the toggle upon release of the breaker latch and then provides the opening force for completing the opening movement of the breaker.

Another object of the invention is to provide an improved circuit breaker wherein one end of the operating spring acts with a comparatively large moment arm on one end of an operating toggle to start the toggle overcenter in a direction to cause opening of the contacts, the spring acting on the other end of the toggle to complete the opening movement of the toggle.

Another object of the invention is to provide an improved circuit breaker in which the operating spring applies a force at a plurality of points of an operating toggle to start the toggle overcenter in a direction to cause opening of the contacts and applies a force at a single point of the toggle to complete the opening movement.

Another object of the invention is to provide an improved circuit breaker in which one end of the operating spring is attached to a member which cooperates with this operating mechanism to start the opening movement of the breaker and the other end of the spring is attached to the contact structure to complete the opening movement.

Another object of the invention is the provision of a circuit breaker having an improved operating mechanism wherein an operating spring operates an actuating member to move the operating mechanism a predetermined distance in opening direction, and applies a force to the contact structure to complete the opening movement, the spring also acting, when the breaker is closed, to provide contact pressure.

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

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 a single embodiment thereof when read in conjunction with the accompanying drawings, in which:

Figure 1 is a front elevational view of a three-pole circuit breaker embodying the principles of the invention, with the cover removed and the operating member broken away.

Fig. 2 is a vertical sectional view taken substantially on line II—II of Fig. 1 and showing the circuit breaker operating mechanism in the closed position.

Fig. 3 is a vertical sectional view similar to Fig. 2, but showing the mechanism in the tripped open position and before the trip mechanism has been reset.

Fig. 4 is a vertical sectional view similar to Fig. 2, but showing the mechanism reset and before the contacts are closed.

Fig. 5 is a fragmentary sectional view taken on line V—V of Fig. 2 and showing the pressure connection between the contact levers and the contact arms.

Referring to the drawings, the circuit breaker includes a base 11 of molded insulating material upon which the several elements of the breaker mechanism are mounted, and a cover 13 also of molded insulating material. The circuit breaker itself comprises three separate poles, each of which is provided with upper and lower terminals 15 and 17 for connecting said poles in electrical

circuits, a stationary contact 19, a pair of movable contacts 21, an arc extinguishing device 23, and a trip device indicated generally at 25. A common operating mechanism, indicated generally at 27, is provided for simultaneously operating the contacts for all of the poles of the breaker.

The stationary contact 19 for each pole is mounted on a conductor 29 secured to the base 11 by means of a bolt 31 and a nut 33 threadedly engaging the terminal 15. The movable contacts 21 are mounted on contact levers 35, there being two contact levers 35 (Fig. 1) and two contacts 21 provided for each pole of the breaker. The contact levers are pivotally mounted on a pivot pin 37 supported in a contact arm comprising a pair of spaced parallel arms 39. The contact arms 39 are mounted on a pivot pin 41 supported in an ear 43 formed outwardly from the upper end of a conductor 45, secured to the base 11 by means of a bolt 47. The conductor 45 is electrically connected to one end of a trip coil 49 of the trip device 25, and the other end of the trip coil is connected to the lower terminal 17 by means of a conductor 51. The electrical circuits for the three poles are essentially the same, therefore only the circuit for the center pole will be traced. This circuit extends from the terminal 15 through the conductors 29, the stationary and movable contacts 19—21, the contact levers 35, through a pressure connection to the contact arms 39, the ear 43 of the conductor 45, conductor 45, trip coil 49 and the conductor 51 to the terminal 17.

Referring to Fig. 5, the pressure contact forming the electrical connection between the contact levers 35 and the contact arms 39 comprises a sleeve 42 rotatably supported on the pivot pin 37. The contact levers 35 are mounted on the sleeve 42 and are spaced apart by a spacer 44. The sleeve 42 also projects through openings in the contact arms 39 which are brought into pressure contact with the contact levers 35 by means of spring washers 46 which are tensioned against the sides of the contact arms 39 by means of nuts 48 threadedly engaging the threaded ends of the sleeve 42. A similar connecting means (not shown) is provided for forming an improved electrical contact between the contact arms 39 and the ear 43 (Fig. 2) of the conductor 45. This structure eliminates the use of the usual flexible shunt conductors.

The operating mechanism 27 is mounted in a main frame comprising spaced parallel frame members 55 (Figs. 1 and 2) rigidly connected by cross bars 57 and 59 and by a rod 60 upon which is mounted a spacer 62. The main frame is secured to the central portion of the base 11 by means of bolts 61 (only one being shown) extending through the base and threadedly engaging the cross bar 57. Mounting feet 63 (Fig. 1) are also provided on the frame members 55 and are secured to the base by means of bolts 65.

The operating mechanism includes a main operating toggle comprising toggle links 67 and 69 (Fig. 2) pivotally connected by a knee pivot pin 71. The toggle link 67 comprises a pair of spaced parallel links, rigidly connected by means of a cross bar 73. The pivot pin 37 for the contact levers 35 extends beyond the sleeve 42 (Fig. 5) and the ends of the pin engage openings in the left-hand end (Fig. 2) of the toggle links 67 to pivotally connect the movable contact structure to the operating toggle. The outer end of the toggle link 69 is pivotally connected by means of a pivot pin 75 to a bell crank lever 77 comprising a pair of spaced parallel levers pivotally mounted on a pivot pin 79 supported in the main frame. The levers 77 are disposed on opposite sides of the toggle link 69 and at their free ends carry a latch roller 81 rotatably mounted on a pivot pin 83 supported in the levers 77. The latch roller 81 is adapted to cooperate with a latch lever 85, which forms a part of the trip device 25, to restrain the operating mechanism in closed position (Fig. 2) against the tension of operating springs 87, there being two springs 87 provided for the center pole (Fig. 1) and one for each of the outer poles. The inner ends of the springs 87 for the center pole (Fig. 2) are hooked over a pin 89 secured in the lower ends of the contact levers 35 and the pin 89 projects through slots 91 in the contact arms 39. The outer ends of the springs 87 for the center pole are hooked over the ends of a pin 93 which is mounted in and projects from each side of a lever 95. The lever 95 is pivotally supported on a pivot pin 97 mounted in the main frame 55 and is biased against a roller 99 rotatably mounted on a pin 101 carried by the lever 77.

Also forming a part of the operating mechanism is a manually operable U-shaped lever 103 (Fig. 2), the two legs of which are pivoted intermediate their ends on pivot pins 105 extending inwardly from the frame members 55 (see Fig. 1). The transverse portion of the operating lever 103 is molded integral with an arcuate shield 107 (Fig. 2) of molded insulating material. A manual operating handle 109 projects outwardly from the shield 107 through an opening 111 in the cover 13, the shield 107 serving as a projecting closure for the opening. The inner ends of the legs of the operating lever 103 carry a rod 113 upon which is rotatably mounted a roller 115 adapted to be operated by manual operation of the handle 109 and the lever 103 in one direction to reset the trip device and in the opposite direction close the contacts following an opening operation of the breaker. The lever 103, together with the handle 109 and the roller 115, is biased by means of springs 117 in a clockwise direction to the position shown in Fig. 2, wherein the roller 115 rests against the under side of the toggle link 69. Each of the springs 117 has one end hooked into a hole in one leg of the lever 103 and the other end is hooked over a rod 119 supported in and extending between the members of the main frame 55.

The movable contact structures for the two outer poles of the breaker are substantially the same as the previously described structure for the center pole. Each of the outer poles includes a pair of contact levers 35 pivotally connected to a pair of contact arms 39 by means of a pivot pin 37, and electrically connected to the contact arms 39 by means of a pressure contact arrangement such as is illustrated in Fig. 5. Also the contact arms 39 for the two outer poles are similarly mechanically and electrically connected to the ear of a conductor 45. Each of the operating springs 87 for the outer poles has its inner end hooked over a pin 89 (Fig. 1) which is supported in and extends between the lower ends of the contact levers 35. The outer ends of the springs 87 for the outer poles are anchored to bars 123 of insulating material secured by means of angle brackets 125 to the frame members 55.

The movable contact structures for the outer poles are each connected by means of a pair of links 127 (Fig. 1), which engage the ends of the pivot pins 37, to a tie bar 129 of insulating material. The links 127 are secured to the tie bar 129 by means of bolts 131, and the tie bar is secured to the toggle links 67 by means of bolts

133. In this manner the movable contact structures for all three poles of the breaker are connected together so that they operate as a unit.

It was previously stated that the operating mechanism including the movable contact structure, is restrained in closed position (Fig. 2) by means of the latch roller 81 on the free end of the bell crank 77 engaging the latch lever 85. The latch lever 85 is pivoted on a pivot pin 135 supported in the frame members 55 and is provided with a shoulder 137 to receive and restrain the latch roller 81. The latch lever 85 is normally restrained in latching position by a tripping toggle comprising toggle links 139 and 141. The toggle links 139 and 141 are pivotally connected by a knee pivot pin 143 and the toggle link 139 is pivotally connected to one arm of the latch lever 85 by means of a pivot pin 145. The lower end of the toggle link 141 is formed over at right angles and is rigidly secured by means of a bolt 147, to a trip bar 149 of insulating material pivotally supported in the main frame 55. The bolt 147 also serves to secure a counterbalance 151 to the trip bar 149 opposite to the tripping toggle 139—141.

The tripping toggle 139—141 is biased overcenter to the left of a line drawn through the centers of the trip bar 149 and the pivot pin 145 by means of a spring 153 having one end anchored to the left-hand end of the latch lever 85 and the other end anchored to an ear 155 formed at right angles to the toggle link 139. The ear 155 extends across the plane of the toggle link 141 and the upper end of the toggle link 141 engages the ear to limit the overcenter movement of the tripping toggle.

The tripping toggle 139—141 is adapted to be operated overcenter in a direction to cause its collapse to effect tripping of the breaker by means of a tripping electromagnet including the coil 49 and a movable core member or armature 157. The armature 157 is secured on the end of a trip rod 159 which is slidably mounted in an opening in a stationary core 161 threadedly engaging a cross bar 163 of insulating material. The toggle link 141 is provided with an ear 164 with which the trip rod is adapted to cooperate to trip the breaker. The armature 157 is biased to its unattracted position by a spring 165 surrounding the trip rod 159 and compressed between the stationary core 161 and the armature 157.

The trip bar 149 extends across all of the poles of the breaker, and each of the outer poles is provided with a trip magnet identical with the previously described trip magnet 49—157 for the center pole. The cross bar 163 extends across all of the poles and is supported by means of bolts 169 (Fig. 1) on ears 171 projecting from the frame members 55. The trip rods 159 for the outer poles are slidably supported in stationary cores (not shown) mounted in the cross bar 163, but which cores are identical with the stationary core 161 for the center pole trip rod. The trip rods 159 for the outer poles are adapted to cooperate with ears 173 (Fig. 1) on the arms 167 in order to operate the trip bar 149 to effect tripping of the breaker.

Normal current flowing through the circuits of the several poles of the breaker will not energize the trip devices 25 sufficiently to overcome the tension of the springs 165 and cause tripping of the breaker. Upon the occurrence of an overload current in the circuit of any one of the poles the trip magnet for the affected pole will attract the armature 157 (Fig. 2) and thrust the trip rod 159 toward the right. At this movement the trip rod engages the ear 164 of the toggle link 141, or the ear 173 of one of the arms 167, depending upon the pole in which the overload occurs, and rotate the trip bar 149 and the toggle link 141 in a clockwise direction to cause collapse of the tripping toggle. As the tripping toggle 139—141 moves overcenter to collapsed position (Fig. 3), it no longer is effective to restrain the latch lever 85 in latching position to thereby restrain the bell crank 77. The springs 87 for the center pole, acting through the lever 95 and the roller 99 thereupon force the latch lever 85 further in unlatching direction to complete the collapse of the tripping toggle. This action of the lever 95 also initiates movement at the bell crank lever 77 in opening direction. The bell crank lever 77 is now free to rotate in a clockwise direction to effect opening of the contacts.

It will be noted that the main operating toggle comprising the links 67 and 69 is overcenter above a line drawn through the centers 37 and 75 and is limited in its overcenter movement in this direction by the end 175 of the toggle link 69 engaging the cross bar 73 of the toggle link 67. The three-link toggle, comprising the toggle links 67, 69 and the bell crank lever 77, is slightly overcenter above a line drawn through the centers 37 and 79. Since the moment arm tending to rotate lever 77 clockwise is small, the friction of the parts alone may be sufficient to prevent collapse of linkage. As soon as the latch lever 85 is operated by the tripping toggle 139—141 to free the bell crank 77, the springs 87 rotate the lever 95 sharply clockwise until it is arrested by projections 177 (Figs. 1 and 2) thereon striking stops 179 projecting inwardly from the frame members 55. This limited movement of the lever 95, however, is sufficient to move the knee 75 of the toggle 67, 69—77 overcenter above the center line 37—79, whereupon the springs 87, acting through the contact levers 35, move the operating mechanism and the movable contact structure to open position illustrated in Fig. 3. The opening movement of the contact arms 39 and of the movable contacts is limited by projections 181 on the toggle links 67 striking the spacer 62 on the rod 60 which connects the frame members 55. During the opening movement and before the projections 181 engage the spacer 62, inclined surfaces 183 on the toggle links 67 adjacent to the projections 181 engage the spacer and cause the toggle 67—69 to move overcenter slightly below the center line 37—75. The toggle 67—69 does not immediately completely collapse due to the springs 117 which bias the manually operable lever 103 clockwise pressing the roller 115 against the left-hand end 175 of the toggle link 69 in a direction and with sufficient force to prevent further collapse of the toggle 67—69 at this time.

Due to the pressure pivot contacts (Fig. 5) with which the contact levers 35 for the several poles are mechanically and electrically connected to the corresponding contact arms 39, and by which the contact arms 39 for the several poles are similarly connected to the ears 43 of the corresponding conductors 45, considerable static friction is present when the breaker stands in the closed position. Additional friction is created at the pressure contact upon the occurrence of a short circuit or a heavy overload due to the parallel flow of current through the contact arms 39 and the contact levers 35 which

results in magnetic attraction of these parts. This tends to increase the pressure of the contact arms 39 on the contact levers 35 and to increase the pressure of the contact levers 35 on the spacer 44 (Fig. 5). This friction is overcome at the beginning of the opening movement of the mechanism by the mechanical advantage of the contact levers 35. Referring to Fig. 2, it can be seen that the moment arm 89—37 of the point of application of the force of the springs 87 to the levers 35 is substantially greater than the moment arm 21—37, that is, from the pivot pin 37 to the point of contact of the movable contact 21 with the stationary contact 19. After the breaker is tripped and the toggle 67, 69—77 is moved overcenter above the line 37—79, the force of the springs 87 for all of the poles is applied simultaneously to the lower ends of the contact levers 35 for the corresponding poles, and with the point of engagement of the movable contacts 21 with the stationary contacts 19 as a fulcrum, and moves the contacts to open position. During the first part of the opening movement, the contact levers 35 rotate in a counterclockwise direction about their pivots 37 and thus provide a wiping and cleaning action between the movable and stationary contacts.

The counterclockwise movement of the contact levers 35 is limited by engagement of the levers with pins 185 (Figs. 1, 2, 3 and 4) supported in the contact arms 39 and extending therebetween. After the contact levers 35 engage the pins 185, the contact arms 39 and the contact levers 35 for all of the poles move as a unit to the open position (Fig. 3).

After the breaker has been tripped and until the bell crank lever 77 is relatched by the latch lever 85, it is necessary that the tripping toggle 139—141 be held in its operated or ineffective position (Fig. 3) to hold the latch in released position. This is accomplished by movement of the lever 95 to start the toggle 67, 69—77 overcenter. At this time the free end of the lever 95 engages the upper end of the toggle link 139 of the tripping toggle and restrains the tripping toggle in the collapsed position, shown in Fig. 3, until the bell crank 77 is reset.

The bell crank 77 is reset by movement of the operating handle 109 from its Fig. 3 position to its extreme counterclockwise position indicated by dotted lines at 109a (Fig. 4). During this movement, the roller 115 on the inner end of the lever 103 engages the bell crank 77 at a point near its free end and rotates the bell crank therewith to the position shown in Fig. 4. Near the end of the counterclockwise movement of the bell crank, the roller 99 thereon engages the lever 95 and carries this lever therewith until the movement is arrested by the lever 95 striking the rod 119. The rod 119 also limits the counterclockwise movement of the bell crank 77 and of the manual lever 103. Upon movement of the lever 95 from its Fig. 3 position to its Fig. 4 position, the free end thereof releases the tripping toggle link 139 whereupon the spring 153 acts to restore the tripping toggle to its overset position wherein the latch lever 85 is effective to restrain the bell crank 77 in its latched position (Figs. 2 and 4).

Counterclockwise movement of the manual lever 103 to reset the mechanism carries the roller 115 therewith away from the toggle 67—69, but since in its Fig. 3 position the toggle is overcenter below the center line through 37—75, the toggle follows to its collapsed position (Fig. 4) where its collapsing movement is arrested by the projections 181 on the toggle links 67 engaging portions 187 of the frame members 55.

After the bell crank 77 has been relatched the contacts are closed by clockwise movement of the manual operating lever 103 from the position 109a (Fig. 4) to the position shown in Fig. 2. During this movement of the lever 103 the roller 115 engages the toggle link 69 to move the operating toggle 67—69 overcenter above the line 37—75. Since, at this time the pivot point 75 is fixed, due to the trip device restraining the bell crank 77, straightening of the toggle 67—69 effects closing of the contacts and tensioning of the spring 87. Continued movement of the toggle 67—69 in contact closing direction after the contacts touch causes the contact levers 35 to rotate in a clockwise direction about the pivots 37 up to dead center toggle and thereafter counterclockwise to fully closed position, thus causing a back and forth wiping action between the contacts 21 and 19 as the contact arms 39 move to fully closed position.

The circuit breaker may be locked in the closed or the open position by moving the manual operating lever 95 to its extreme counterclockwise position 109a (Fig. 4) and inserting a locking device through openings 189 (only one of which is shown) in projections 191 of the cover 13. In this position the roller 115 engages the bell crank 77 and prevents movement thereof in opening direction even though the trip device is operated in response to an overload current to unlatch the roller 81.

The circuit breaker may not be operated to open the contacts by means of the manual operating handle 109, but may be tripped open manually by operation of a manual trip button 193 (Figs. 2, 3 and 4). The trip button 193 is carried on the outer end of a horizontally disposed rod 195 of non-conducting material slidably mounted in the lower part of the cover 13 and is biased to undepressed position by means of a spring 197 seated in a spring seat in the cover 13 and having one end bearing against the button 193. Outward movement of the rod 195 is limited by a collar 199 secured on the inner end of the rod engaging the inner surface of the cover 13. The inner end of the rod 195 lies adjacent the counterweight 151 and, upon depression of the button 193, engages the counterweight and rotates the trip bar 149 and the tripping toggle link 141 in a clockwise direction to effect tripping of the breaker in the manner previously described. The spring 197 restores the trip rod 195 to its undepressed position upon release thereof.

After the breaker is manually tripped open, the mechanism is reset and the contacts closed by manipulation of the manual operating handle 109 in the previously described manner.

It will be seen that the operating spring provides the force for initiating movement of the operating toggle in opening direction, for completing the opening movement of the breaker, and also holds the breaker latch in released position until the mechanism is reset and supplies the contact pressure when the breaker is in the closed position.

While the invention has been disclosed in accordance with the provisions of the patent statutes, it is to be understood that various changes in the structural details thereof may be made without departing from some of the essential features of the invention. It is desired, there-

fore, that the language of the appended claims be given the broadest reasonable interpretation permissible in the light of the prior art.

We claim as our invention:

1. A circuit breaker comprising relatively movable contacts, a switch member movable to open and close said contacts, operating mechanism therefor including a releasable member restraining said switch member in closed position when the circuit breaker is in closed position, said member being movable from one position to a second position to cause opening of said contacts, trip means operable in response to overload circuit conditions to release said releasable member, means cooperating with the releasable member to start movement of said member toward said second position, and resilient means cooperating with the starting means and said switch member to actuate the starting means and move said switch member to open the contacts.

2. A circuit breaker comprising relatively movable contacts, a switch member movable to an open and a closed position to open and close said contacts, operating mechanism therefor including a handle for moving said switch member to closed position, a member for restraining said switch member in closed position independently of said handle, said member being movable from one position to a second position to cause movement of the switch member to open position, trip means operable in response to overload currents to initiate movement of said member to said second position, actuating means cooperating with said movable member to start said member toward said second position, and spring means for operating said actuating means and for moving the switch member to open position.

3. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, operating mechanism for said switch member including an operating handle, a pivoted member for restraining said switch member in closed position independently of said handle and movable from one position to a second position to effect movement of the switch member to open position, restraining means for said pivoted member operable in response to predetermined circuit conditions to release said member, means cooperating with said pivoted member to initiate movement thereof to said second position, and spring means for actuating said pivoted member and for moving the switch member to open position.

4. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, operating mechanism including a toggle for restraining said switch member in closed position and operable to cause movement of said switch member to open position, a trip device for holding the toggle in operative position and operable in response to overload circuit conditions to release said toggle, means operable to start movement of said toggle in a direction to cause opening of the contacts, and spring means for actuating said starting means and for moving the switch member to open position.

5. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, operating mechanism therefor including a toggle for restraining said switch member in closed position and collapsible to cause movement of the switch member to open position, latch means for restraining said toggle against collapse, a trip device operable in response to overload circuit conditions to release said toggle, actuating means supported independently of the toggle and operable to start said toggle in a collapsing direction to cause opening of the contacts, and common means for operating said actuating means and for moving said switch member to open position.

6. A circuit breaker comprising relatively movable contacts, operating mechanism therefor including a member pivotally connected to the movable contact and movable from one position to a second position to cause opening of said contacts, latch means for restraining said member in said one position to hold the contacts closed, electromagnetic means operable in response to overload current conditions to release said movable member, an actuating member operable after said movable member is released to initiate movement of said movable member toward said second position, and a spring for operating said actuating member, said spring being effective to move said movable member to said second position.

7. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, a contact lever pivotally carried on said switch member, operating mechanism for said switch member including a toggle for restraining said switch member in closed position, said toggle being collapsible to cause movement of the switch member to open position, latch means for restraining said toggle against collapse, a trip device operable in response to overload circuit conditions to effect release of the toggle, actuating means operable to initiate collapse of said toggle, and a spring for operating said actuating means, said spring being connected to the contact lever and biasing said contact lever in a direction to apply pressure to said contacts when the switch member is in closed position.

8. A circuit breaker comprising relatively movable contacts, operating mechanism therefor including a releasable member pivotally connected to the movable contact for restraining said contact in closed position and movable from one position to a second position to cause opening of said contacts, latch means for restraining said releasable member in said one position, trip means operable in response to predetermined abnormal circuit conditions to operate said latch means to release said movable member, and an actuating member operable to initiate movement of said releasable member toward said second position, said actuating member when operated engaging the latch means to restrain said latch means in released position until said releasable member is reset to permit relatching of said releasable member.

9. A circuit breaker comprising relatively movable contacts, operating mechanism therefor including a toggle operable from one position to a second position to effect opening of said contacts, a latch for restraining said toggle in said one position and operable to permit movement of said toggle to said second position, trip means operable in response to overload circuit conditions for operating said latch, an actuating lever operable to initiate movement of said toggle toward said second position, and spring means disposed to operate said actuating lever and to move said toggle to open the contacts, said lever having a part engageable with the latch means for re-

straining said latch means in released position to permit relatching of said toggle.

10. A circuit breaker comprising relatively movable contacts, operating mechanism therefor including a member movable from one position to a second position to cause opening of said contacts, said member being resettable to said one position, a latch for normally restraining said member in said one position, a trip device including a tripping toggle operable to release said movable member, an actuating member biased to initiate movement of said movable member toward said second position, and means on said actuating member for engaging said tripping toggle to hold the latch in released position to permit resetting of said movable member.

11. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions for opening and closing said contacts, a contact member pivotally mounted on said switch member and carrying the movable contact, releasable operating mechanism operable to cause automatic opening of said contacts, means for restraining said operating mechanism in operative position, trip means operable in response to overload circuit conditions to actuate said restraining means to release said operating mechanism, actuating means operable upon release of said operating mechanism to operate said operating mechanism a predetermined distance in opening direction, and a spring disposed to operate said actuating means and to move the switch member to open position, said spring moving said contact member to cause a wiping action between said contacts during the first part of the opening movement.

12. A circuit breaker comprising relatively movable contacts, releasable operating mechanism therefor including a toggle operable to cause opening of said contacts, a trip device for restraining said toggle in closed position and operable in response to overload circuit conditions to release said toggle, and resilient means disposed to apply a force to a plurality of points of said toggle to initiate movement of the operating mechanism in opening direction and then to apply a force to a single point of said toggle to complete the opening movement of said operating mechanism, said spring being connected to the movable contact and effective when the mechanism is in closed position to apply pressure to said contacts.

13. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, a contact lever pivotally carried on said switch member, operating mechanism for said switch member including a toggle for restraining said switch member in closed position, said toggle being collapsible to cause movement of the switch member to open position, latch means for restraining said toggle against collapse, a trip device operable in response to overload circuit conditions to effect release of the toggle, actuating means operable to initiate collapse of said toggle, and a spring for operating said actuating means and to then complete the collapse of said toggle and opening of said contacts, said spring having one end attached to the contact lever and biasing the contact lever in a direction to apply contact pressure when the switch member is in closed position.

14. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, operating mechanism for said switch member including a toggle operable from one position to a second position to effect opening movement of said switch member, a latch for restraining said toggle in said one position and operable to permit movement of said toggle to said second position, trip means operable in response to overload circuit conditions for operating said latch, an actuating lever operable to initiate movement of said toggle toward said second position, and spring means connected at one end to said actuating lever and at the other end to the switch member to operate said actuating lever and to move said toggle to effect opening movement of the switch member.

15. A circuit breaker comprising relatively movable contacts, a switch member movable to open and closed positions to open and close said contacts, operating mechanism for said switch member including a toggle operable from one position to a second position to effect opening movement of said switch member, a latch for restraining said toggle in said one position and operable to permit movement of said toggle to said second position, trip means operable in response to overload circuit conditions for operating said latch, an actuating lever having limited movement and operable to initiate movement of said toggle toward said second position, and spring means connected at one end to said actuating lever and at the other end to the switch member to operate said actuating lever and to move said toggle to effect opening movement of the switch member.

16. A circuit breaker comprising relatively movable contacts, operating mechanism therefor including an operating lever movable to close the contacts, a toggle movable from one position to a second position to effect opening of said contacts even though said operating lever is held in closed position, a latch for restraining said toggle in said one position and operable to permit movement of said toggle to said second position, trip means operable in response to overload circuit conditions for operating said latch, an actuating lever operable to initiate movement of said toggle toward said second position, and spring means disposed to operate said actuating lever and to move the toggle to effect opening of the contacts.

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PAUL O. LANGGUTH.