Oct. 26, 1954 L. W. COLE 2,692,926

MULTIPOLE CIRCUIT BREAKER

Original Filed Sept. 21, 1950

2 Sheets-Sheet 1

Fig. 1

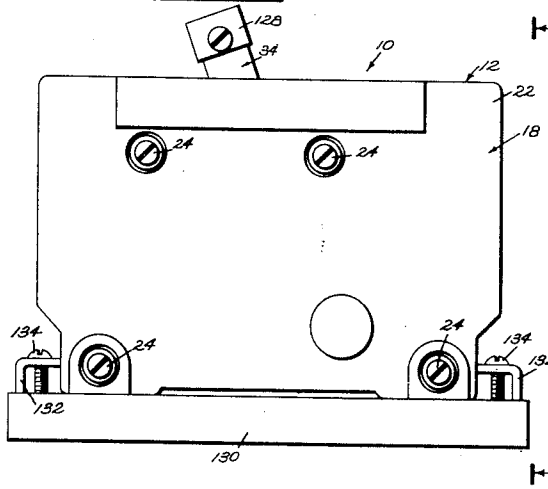


Fig. 2

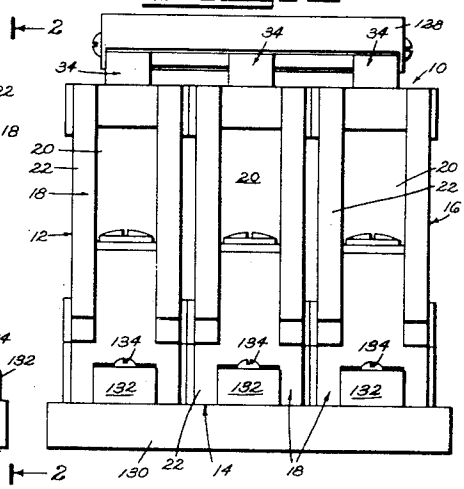


Fig. 3

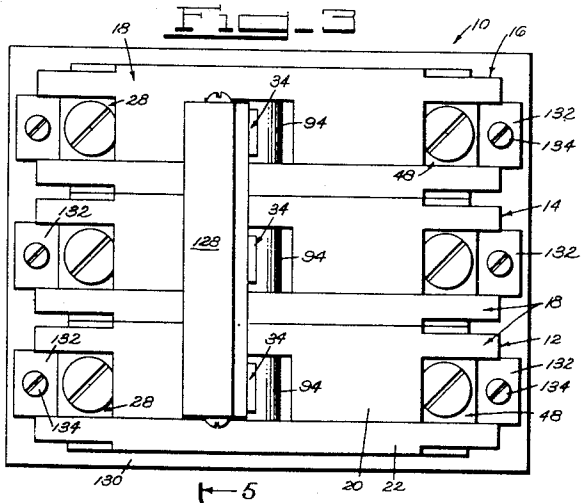
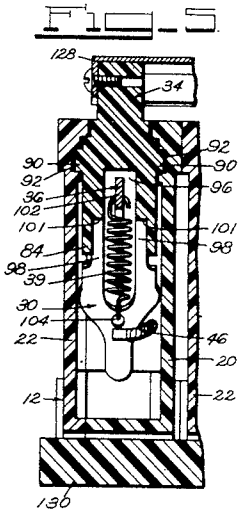


Fig. 5



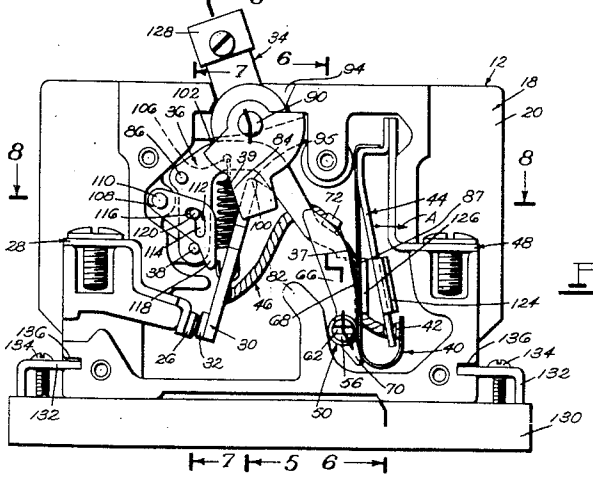


Fig. 4

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Fig. 6

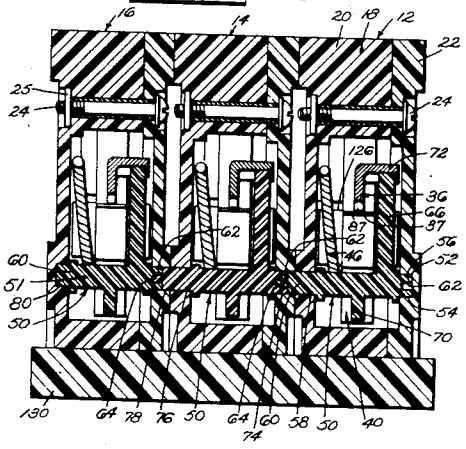
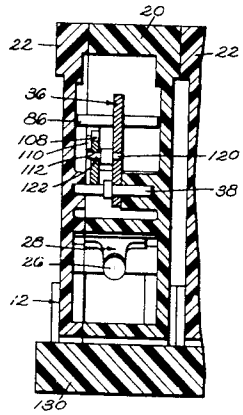


Fig. 7



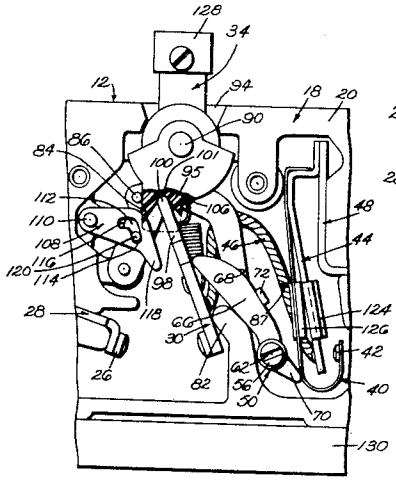


Fig. 9

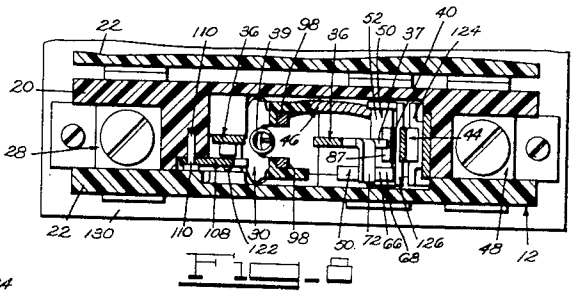


Fig. 8

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UNITED STATES PATENT OFFICE

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MULTIPOLE CIRCUIT BREAKER

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Continuation of application Serial No. 186,013, September 21, 1950. This application September 6, 1952, Serial No. 308,235

22 Claims. (Cl. 200—88)

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The present invention relates to multi-pole circuit breakers and to tripping devices therefor. More particularly, the invention is concerned with a multi-pole circuit breaker which can be manually opened and closed and which is also opened automatically at all of the poles upon the occurrence of an overload in the circuit at any one of the poles.

The primary object of the present invention is the provision of a multi-pole circuit breaker formed of a plurality of single pole circuit breakers of standard construction and provided with a tripping device of novel construction for tripping all of the poles thereof upon the occurrence of an overload or other abnormal condition in the circuit of one of the poles thereof.

The above and other objects, features and advantages of the present invention will be more fully understood from the following description considered in connection with the accompanying illustrative drawings.

In the drawings:

Fig. 1 is a side view of a multi-pole circuit breaker according to the present invention;

Fig. 2 is an end view of the circuit breaker as seen from the line 2—2 of Fig. 1;

Fig. 3 is a top view of the circuit breaker;

Fig. 4 is a view similar to Fig. 1 with the cover removed showing the circuit breaker in the closed condition thereof;

Fig. 5 is a partial sectional view taken on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 4;

Fig. 7 is a partial sectional view taken on the line 7—7 of Fig. 4;

Fig. 8 is a partial sectional view taken on the line 8—8 of Fig. 4; and

Fig. 9 is a fragmentary view similar to Fig. 4 showing the circuit breaker in the tripped condition thereof.

Referring now to the drawings in detail, the multi-pole circuit breaker 10 of the present invention is here shown as comprising the companion single-pole circuit breakers 12, 14 and 16. The circuit breaker mechanism for each of said single pole circuit breakers is contained within a casing or housing 18 formed by a body part 20 and a cover or closure part 22 therefor. Each of said parts is formed, preferably by a molding operation, from a suitable insulating material such as, for example, "Bakelite." The housing parts are secured together in any suitable manner, such as by means of the screws 24 and the nuts 25.

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Contained within each housing 18 is a stationary contact 26 carried by a terminal member 28, and a movable contact member 30 provided with a contact 32 engageable and disengageable with said stationary contact. Said movable contact member is mounted for pivotal movement in a manually operable member, here shown as the insulated handle 34. A generally U-shaped actuating member 36 is mounted at one end thereof, for pivotal movement on the pivot pin 38, a spring 39 being connected between said movable member 30 and said member 36 to form a toggle arrangement therewith, as is hereinafter described in detail, said actuating member and spring constituting an operating mechanism for the movable contact member. At its free end said actuator 36 is provided with a portion 37 in normally latched engagement with a flexable latch member 40, preferably formed of spring metal and provided at one end thereof with a part 42. Said member 40, at the other end thereof, is bodily carried by and is secured in any suitable manner to a thermostat element 44, here shown as a flexible bi-metallic strip. Latch member 40 and element 44 together constitute a trip device, as hereinafter described. Said member 44 is electrically connected to the movable contact member 30 by the flexible conductor 46, one end of said bi-metallic strip being mounted on the terminal member 48 and the free end thereof abutting said part 42.

Pursuant to the present invention, provision is made for tripping all of the poles of the circuit breaker 10 upon the tripping of any one pole thereof. In this connection, it will be understood that upon the passage of a predetermined current through the thermostat 44, said thermostat will flex in the direction of the arrow A in Fig. 4 to move part 42 in said direction. Said movement will carry the flexible member 40 in the direction of the arrow for unlatching the latter from member 36. Upon said unlatching, the actuator 36, under the tension of the aforementioned toggle, which is overcentered, as illustrated in Fig. 4, pivots in a clockwise direction, viewing Fig. 4, to reverse the toggle whereupon the movable contact member 30 is pivoted in a counter-clockwise direction for disengaging contact 32 from contact 26, the circuit breaker mechanism assuming the tripped position illustrated in Fig. 9.

In order to provide for the tripping of all of the poles of the circuit breaker 10 upon the tripping of one of the poles thereof, there is provided, for each pole of the circuit breaker 10, a

tripping element 50. As here shown, the tripping element 50 is preferably formed of a suitable insulating material and comprises a generally cylindrical body portion 52 (Fig. 8) which is mounted for rotation in the casing 18. Referring now specifically to the casing of the single pole circuit breaker 12, it will be seen that the cover 22 thereof is provided with a bearing recess 54 (Fig. 6) for the end 56 of the tripping element 50. The companion casing part 20 is provided with a bearing aperture 58 in registry with said bearing recess 54, and the end 60 of the tripping element extends through said aperture. It will be noted that the end 56 is provided with a slotted portion 62 and that the end 60 is provided with an axially extending portion 64, the purpose of which is hereinafter described. The tripping element 50 is also provided, adjacent the end 56 thereof, with an integral upwardly extending portion 66 provided with the cam forming marginal edge 68 and with the dependent intermediate finger portion 70.

As illustrated in Fig. 4, in the circuit closed condition of the circuit breaker the tripping element 50 is in set position wherein the finger portion 70 is inclined forwardly of the axis of body portion 52 to abut the lower end of the flexible latch member 40, and the upwardly extending portion 66 is inclined rearwardly of said axis. The aforementioned pivotally mounted actuator 36 is provided with a laterally offset portion 72 (Figs. 6 and 8) in engagement with the cam surface portion 68 of said portion 66. Upon the tripping of one of the circuit breaker mechanisms, as previously described, the actuator 36 is pivoted in a clockwise direction from the retracted latched disposition thereof and the portion 72 thereof moves downwardly along the cam surface 68 to rotate the tripping element 50 in a counterclockwise direction from its set position, viewing Fig. 4, whereupon the depending portion 70 is rotated in a direction forwardly and upwardly from its set position. As illustrated in Fig. 6, the individual tripping element 50 in each of the circuit breakers 12, 14, and 16, respectively, are joined for unitary operation and together comprise the tripping member 51. More specifically, it will be noted that the extending portion 64 of the tripping element in circuit breaker 12 extends into the casing of circuit breaker 14 and is positioned in the slot 62 of the tripping element 50 in said circuit breaker 14. It will be noted that said circuit breaker 14 is provided with aligned apertures 74 and 76 in the cover and body portions, respectively thereof, the slotted portion 62 of its tripping element extending into aperture 74 and the end portion 60 thereof extending through said bearing aperture 76 into the bearing aperture 78 provided in the cover of circuit breaker 16, the extending portion 64 of the latter portion 60 being positioned in the slot 62 of the tripping element 50 in the circuit breaker 16. The other end of said latter tripping element is mounted for rotation in the bearing recess 80 provided in the body portion of circuit breaker 16 in registry with the bearing aperture 78 thereof. From the above, it will be apparent that all three tripping elements 50 are mounted for conjoint and simultaneous rotation, together constituting said tripping member 51.

Upon the tripping of any one pole of the circuit breaker 10 upon the occurrence of a predetermined current in the circuit of said pole, the portion 66 of the companion tripping element 50 is rotated rearwardly of the position illustrated in Fig. 4 by portion 72 of the companion actuator 36 whereby to rotate said tripping member 51 in a counter-clockwise direction. As a result of said rotation, the portion 70, in the untripped circuit breakers, move from the position illustrated in Fig. 4 to the position illustrated in Fig. 9 whereby to move the companion latch members 40 to said latter position for disengaging said latch members from the companion latching portions 37 for actuating the toggles of said untripped circuit breakers, respectively, to disengage the companion movable contacts from the stationary contacts thereof.

It will be noted that, in said tripped condition, the portions 72 of members 36 prevent the companion tripping devices 50 from rotating in a clockwise direction, the portions 66 thereof being in abutment with raised detent portions 82, respectively, of the casings. It will also be noted that the depending portions 70 have moved the companion flexible members 40 sufficiently to disengage the respective parts 42 from the companion thermostat element 44.

In order to reset the circuit breaker 10, after the tripping thereof, the handle 34 in each casing 18 is rotated in a clockwise direction, from the position illustrated in Fig. 9, whereupon a depending portion 84 thereof, which abuts a laterally extending pin 86 provided in actuator 36, moves said pin for pivoting the actuator in a counter-clockwise direction about its pivot 38, until the latching portion 37 reengages the latch member 40. It will be noted that said latch member is provided with a latch part 87, which cooperates with said portion 37 to latch the actuator. Upon said rotation of member 36, the part 72 thereof releases the portion 66 of the tripping element 50 which is freed for rotation in a clockwise direction, viewing Fig. 9, the flexible member 40 pressing against the depending portion 70 to effect said rotation. Since all of the handles are mounted for conjoint movement, as described below, all of the tripping elements are returned simultaneously to the position thereof illustrated in Fig. 4. The handles are then moved to the position illustrated in Fig. 4 to reengage the movable contacts and the stationary contacts, as hereinafter described.

Referring now to the individual circuit breaker mechanisms in greater detail, it will be noted that each handle 34 is provided with the pivot portions 90 (Fig. 5) mounted in the aligned bearing recesses 92 provided in the companion casing, said handle extending through the opening 94 provided therefor in said casing. The handle 34 is provided with the aforementioned spaced depending portions 84, each provided with a bearing portion 95 (Fig. 9), and being spaced thereabove as at 96 (Fig. 5). The movable contact member 30 is provided with the bifurcations 98 which are mounted for pivotal movement in said portions 95, respectively, the free ends 100 of said bifurcations abutting the apex 101 (Fig. 9) formed in said bearing portions 95, respectively, whereby the member 30 is mounted for pivotal movement in said handle. The bight 102 of the U-shaped actuator 36 extends into the space 96 between the handle portions 84, the previously mentioned coil spring 39 having one end thereof secured in the movable contact member as at 104, the other end thereof being secured in said portion 102 as at 106. It will be noted that said spring is disposed for movement between the portions 98 of the movable contact member and forms a toggle therewith, said spring ends consti-

tuting the outer centers of said toggle and the ends 100 of the movable contact member constituting the intermediate center of said toggle. As illustrated in Fig. 4, the toggle is over-centered in the closed condition of the circuit breaker in a direction for biasing the actuator 36 for clockwise rotation, said toggle also biasing the movable contact member 30 into firm engagement with the stationary contact 26. Upon the previously described movement of flexible latch member 40 for moving latch portion 87 thereof out of engagement with the actuator, the toggle is effective to rotate the actuator in a clockwise direction whereupon the toggle center, constituted by the end 106 of spring 39 secured in said actuator, is carried beyond the intermediate toggle center and the latter is thereupon carried into the position illustrated in Fig. 9 for overcentering the toggle in the opposite direction, with a snap action, for disengaging the contact 32 from the contact 26.

Provision is made for commencing the disengagement of said contacts before said snap action of the toggle. In this connection, there is provided a pivoted cam member 108 which is pivotally mounted on a pin 110 secured in the casing. Member 108 is provided with an interior groove 112 having the groove portion 114 and the groove portion 116 laterally offset therefrom. In addition, said member 108 is provided with the depending portion 118. Member 36 is provided, adjacent the pivoted end thereof, with the shouldered pin 120 (Fig. 7), the free end 122 thereof extending into groove portion 116 in the circuit closed condition, as in Fig. 4. Upon the tripping of the circuit breaker mechanism and the resultant clockwise rotation of actuator 36, as previously described, end portion 122 is carried thereby out of groove portion 116 and into groove portion 114 for pivotally moving member 108, in a counter-clockwise direction, the depending portion 118 thereof being moved against the movable contact member 30 and moving the latter out of engagement with the contact 26 before the collapse of the toggle, as previously described.

The thermal current responsive member 44 is operable not only in response to the heating effect of the current passing therethrough, but is operable also under the control of electro-magnetic means for effecting disengagement of the latch member 40 carried thereby from the actuator member 36, and the arrangement is preferably such that, as here shown, the electro-magnetic means is energized by the current which passes through the thermal current responsive member 44. For this purpose, an electro-magnetic member 124 is mounted on member 44 near the free end thereof and a companion armature 126 is mounted on the flexible member 40 being disposed in spaced confronting relation to electro-magnetic member 124. It will be noted that upon the occurrence of an overload in excess of that for which the circuit breaker is designed to open under the control of the thermal member 44, by the flexing of the latter in response to the heating thereof whereby to carry latch member 40 out of engagement with actuator 36, the electro-magnetic device is operable instantaneously to effect disengagement of portion 87 of member 40 from latching portion 37. It will be understood that upon the occurrence of such excess overload, the magnetic attraction between members 124 and 126 results in the deflection of latch member 40 for disengaging the latter from the companion portion 37 of member 36, and in this

connection it will be understood that since member 40 is flexible to a much greater extent than member 44 which carries member 124, member 126 is movable by magnetic attraction toward member 124, thus deflecting or unlatching member 40 from the companion member 36.

To provide for simultaneously resetting of all the poles of the circuit breaker 10, the handles 34 thereof are interconnected by the channel bridging member 128. Upon the tripping of the circuit breaker 10, the bridging member 128 and the handles 34 thereof assume the position indicated in Fig. 9. By moving the bridging member forwardly thereof, the previously described depending portions 84 move the aforementioned pins 86 for rotating the members 36 from the position illustrated in Fig. 9 to the position illustrated in Fig. 4 wherein they are in engagement with the companion flexible members 40, as previously described. The bridging member 128 is then moved rearwardly to the position indicated in Fig. 4 for oversetting the toggle mechanisms and for engaging the movable contacts 32 with the stationary contacts 26, respectively.

As here shown, the circuit breakers are mounted in laterally disposed relation upon the insulated mounting plate 130. Said plate is provided at the opposing ends thereof with the aligned hook elements 132, the elements at one end of the mounting plate being in registry with the companion elements 132, respectively, at the other end thereof. Each hooked element is removably secured to the plate by a screw 134. The housing 18 of each of the circuit breakers is provided, at each end thereof, with a recessed portion 136, respectively, for receiving a hooked element 132 for releasably mounting the circuit breakers on plate 130.

This application is a continuation of my abandoned application, Serial Number 186,013 filed September 21, 1950.

While I have shown and described the preferred embodiment of my invention, it will be understood that various changes may be made in the present invention without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit and a tripping element associated with said mechanism, said circuit breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said tripping element being mounted independently of said operating mechanism and trip device, said element having means operable upon the tripping of its associated circuit-breaker mechanism to operate the tripping element at another pole to trip the circuit breaker mechanism thereof, and said tripping element at said other pole having means operable upon the tripping of its associated circuit breaker mechanism to trip the circuit breaker mechanism of said first mentioned element, each of said tripping elements being disposed for operation by the operating mechanism of its associated circuit breaker mechanism, re-

spectively, when said associated operating mechanism, respectively, is unlatched from the trip device thereof whereby to effect the operation of said other tripping element.

2. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit and a tripping element associated with said mechanism, said circuit breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said tripping element being mounted independently of said operating mechanism and trip device, said element having means operable upon the tripping of its associated circuit-breaker mechanism to operate the tripping elements at the other poles to trip the circuit breaker mechanisms associated therewith, respectively, and said latter tripping elements each having means operable, upon the tripping of the circuit-breaker mechanism associated therewith, respectively, to operate the tripping elements at the other poles, to trip the circuit breaker mechanisms of said other poles, each of said tripping elements being disposed in the path of movement of its associated operating mcehanism for movement thereby when said associated operating mechanism is unlatched from the trip device thereof whereby to effect the operation of said other tripping elements.

3. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit and a tripping element associated with said mechanism, said circuit breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurence, said tripping element being mounted independently of said operating mechanism and trip device, said element having means operable upon the tripping of its associated circuit breaker mechanism to operate the tripping elements at the other poles to trip the circuit breaker mechanisms associated therewith, respectively, and said latter tripping elements each having means operable, upon the tripping of the circuit breaker mechanism associated therewith, respectively, to operate the tripping elements at the other poles, to trip the circuit breaker mechanisms of said other poles, each of said tripping elements being disposed for operation by the operating mechanism of its associated circuit breaker mechanism when said associated operating mechanism is unlatched from the trip device thereof whereby to effect the operation of said other tripping elements, and said means being rotary means extending between said poles and provided with said tripping elements each in juxtaposition to its associated operating mechanism.

4. In a multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, said circuit breaker mechanism comprising a movable contact member, actuating means therefor and a trip device operable to latch said actuating means in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence; the combination with said actuating means and trip device of a tripping element disposed in the path of movement of said actuating means for operation thereby upon the unlatching thereof, said tripping element having means to operate a similar element in a circuit breaker at a companion pole to trip the circuit-breaker mechanism of the latter in response to the tripping of circuit breaker mechanism associated with said first mentioned element.

5. In a multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, said circuit breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence; the combination with said operating mechanism and trip device of a tripping element mounted independently thereof and disposed in the path of movement of the operating mechanism for operation thereby upon the unlatching thereof, said tripping element having means to operate a similar element in a circuit breaker at a companion pole to trip the circuit-breaker mechanism of the latter in response to the tripping of circuit breaker mechanism associated with said first mentioned element, said tripping element being provided with angularly related parts, one of said parts being engaged by said operating mechanism to rotate said tripping element, and the other of said parts engaging said trip device for moving the latter in a direction to unlatch said operating mechanism.

6. In a multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, said circuit breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence; the combination with said operating mechanism and trip device of a tripping element mounted independently thereof and disposed in the path of movement of the operating mechanism for operation thereby upon the unlatching thereof, said tripping element having means to operate a similar element in a circuit breaker at a companion pole to trip the circuit-breaker mechanism of the latter in response to the tripping of circuit breaker mechanism associated with said first mentioned element, said tripping element having provision for the releasable securement thereof to said similar element for effecting said operation of the latter.

7. A single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single-pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device

operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said single-pole circuit breaker being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means to operate a similar element in the companion circuit breaker to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element, and said means providing for operation of its associated tripping element by said similar element, upon the tripping of the circuit-breaker mechanism of the latter, to trip the circuit-breaker mechanism of said single-pole circuit breaker.

8. A single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single-pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said single-pole circuit breaker being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means to releasably unite said element with a similar element in the other single-pole circuit breaker for operating said similar element to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element, and said means providing for operation of its associated tripping element by said similar element, upon the tripping of the circuit-breaker mechanism of the latter, to trip the circuit-breaker mechanism of said single-pole circuit breaker.

9. A multi-pole circuit breaker comprising at least a pair of single-pole circuit breakers each of which is a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, each of said units being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means operable, upon the tripping of the circuit-breaker mechanism thereof, to operate the tripping element in the companion unit to trip the circuit-breaker mechanism of the latter, and said tripping element of the companion unit having means operable, upon the tripping of the circuit breaker mechanism of the latter, to operate said first mentioned element to trip the circuit breaker mechanism thereof.

10. A multi-pole circuit-breaker comprising a plurality of self-contained and independently operable single-pole circuit-breaker units, each unit

being provided with a circuit-breaker mechanism which comprises a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon the occurrence of predetermined current in the circuit thereof, and a tripping element provided in each unit and mounted therein independently of the operating mechanism and trip device thereof, said tripping element having means operable in response to the tripping of its circuit-breaker mechanism to operate the tripping elements in the companion units to trip the circuit-breaker mechanisms of the latter, and said latter tripping elements each having means operable, upon the tripping of its associated circuit breaker mechanism, to operate the tripping elements of the other units to trip the associated circuit breaker mechanism, respectively, thereof.

11. A single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single-pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said single-pole circuit breaker being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means to operate a similar element in the companion circuit breaker to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element, and said means providing for operation of its associated tripping element by said similar element, upon the tripping of the circuit-breaker mechanism of the latter, to trip the circuit-breaker mechanism of said single-pole circuit breaker, said tripping element being disposed in the path of movement of said operating mechanism for movement thereby when said operating mechanism is unlatched from the trip device thereof to effect said operation of said similar element.

12. A multi-pole circuit breaker comprising at least a pair of single-pole circuit breakers each of which is a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, each of said units being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means operable, upon the tripping of the circuit-breaker mechanism thereof, to operate the tripping element in the companion unit to trip the circuit-breaker mechanism of the latter, and said tripping element of the companion unit having means

operable, upon the tripping of the circuit breaker mechanism of the latter, to operate said first mentioned element to trip the circuit breaker mechanism thereof, said tripping elements being releasably united and being mounted for rotation in their respective units, each element having angularly related portions one of which is disposed in the path of movement of the operating mechanism of its unit for movement thereby when said operating mechanism is unlatched by its trip device, the other portion abutting its trip device for moving the latter in a direction to unlatch its operating mechanism, whereby, upon the tripping of one of said circuit-breaker mechanisms, the tripping element thereof will be rotated by the operating mechanism thereof and rotate the tripping element in the other unit so that said other portion in the other unit will effect the unlatching of the operating mechanism thereof.

13. A single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence, said single-pole circuit breaker being provided with a tripping element mounted therein independently of the operating mechanism and trip device thereof, said element having means to operate a similar element in the companion circuit breaker to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element, and said means providing for operation of its associated tripping element by said similar element, upon the tripping of the circuit breaker mechanism of the latter, to trip the circuit breaker mechanism of said single-pole circuit breaker, said tripping element being disposed in the path of movement of said operating mechanism for movement thereby when said operating mechanism is unlatched from the trip device thereof to effect said operation of said similar element, said operating mechanism having a laterally extending part in engagement with said tripping element to effect the movement thereof.

14. In a single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single-pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, and said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence; the combination with said operating mechanism and trip device of a tripping element mounted independently thereof and disposed in the path of movement of the operating mechanism for operation thereby upon the unlatching thereof, said tripping element having means to operate a similar element in the companion circuit breaker to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element.

15. In a single-pole circuit breaker adapted for use with a similar circuit breaker to constitute a multi-pole circuit breaker, each of said single-pole circuit breakers being a self-contained independently operable unit provided with a circuit-breaker mechanism independently trippable upon the occurrence of predetermined current in the circuit thereof, and said circuit-breaker mechanism comprising a movable contact member, an operating mechanism therefor and a trip device operable to latch said operating mechanism in circuit-closed condition and to unlatch the same for operating said movable member to circuit-open condition upon said occurrence; the combination with said operating mechanism and trip device of a tripping element mounted independently thereof and disposed in the path of movement of the operating mechanism upon the unlatching thereof, said tripping element having means to operate a similar element in the companion circuit breaker to trip the circuit-breaker mechanism of the latter in response to the tripping of the circuit breaker mechanism associated with said first mentioned element, said tripping element being provided with angularly related parts, one of said parts being engaged by said operating mechanism to rotate said tripping element, and the other of said parts engaging said trip device for moving the latter in a direction to unlatch said operating mechanism.

16. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, each of said mechanisms comprising a movable contact member, an actuator means operatively connected to said movable contact member and a latching means for latching its associated actuator means in circuit-closed disposition thereof and for releasing the same for operating said movable member to circuit-open condition upon said occurrence, and means operatively common to all poles of said circuit breaker and disposed for operation by a released actuator means upon said occurrence in the associated circuit of said released actuator means for operating the circuit-breaker mechanism at a companion pole to the circuit-open condition thereof.

17. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, each of said mechanisms comprising a movable contact member, an actuator means operatively connected to said movable contact member and a latching means for latching its associated actuator means in circuit-closed disposition thereof and for releasing the same for operating said movable member to circuit-open condition upon said occurrence, said actuator means including a pivotally mounted member releasably restrained by said latching means from movement to circuit-open disposition thereof, and means extending between the poles of said circuit breaker, said latter means being disposed in the path of movement of the pivotally mounted member at each pole for op-

eration by a released member upon said occurrence in the associated circuit for operating the circuit breaker mechanism at a companion pole to the circuit-open condition thereof.

18. A multi-pole circuit breaker having at each pole thereof a circuit breaker mechanism independently operable upon the occurrence of predetermined current in the circuit thereof to open said circuit, each of said mechanisms comprising a movable contact member, an actuator means operatively connected to said movable contact member and a latching means for latching its associated actuator means in circuit-closed disposition thereof and for releasing the same for operating said movable member to circuit-open condition upon said occurrence, said actuator means including a pivotally mounted member releasably restrained by said latching means from movement to circuit-open disposition thereof, and means extending between the poles of said circuit breaker, said latter means being disposed in the path of movement of the pivotally mounted member at each pole for operation by a released member upon said occurrence in the associated circuit for operating the circuit breaker mechanism at a companion pole to the circuit-open condition thereof, said latter means being mounted for rotation and said pivotally mounted member having a predetermined portion engageable with said latter means to effect said rotation thereof.

19. In a multi-pole automatic circuit breaker, a plurality of pairs of separable contacts, releasably restrained circuit breaker mechanism individual to each pair of contacts to effect separation of the corresponding pair of contacts upon release thereof, independently operable latching means for each of said plurality of mechanisms, a current responsive control means for each pair of contacts, each latching means being operable by its associated control means in response to predetermined current through its associated pair of contacts to release its associated mechanism, and means disposed for operation by a released mechanism and operatively common to all poles of the breaker for causing unlatching of the latching means for all other poles in response to operation of the latching means in one pole by said control means of said one pole.

20. In a multi-pole automatic circuit breaker, a plurality of pairs of separable contacts, releasably restrained circuit breaker mechanism individual to each pair of contacts to effect separation of the corresponding pair of contacts upon release thereof, independently operable latching means for each of said plurality of mechanisms, a current responsive control means for each pair of contacts, each latching means being operable by its associated control means in response to predetermined current through its associated pair of contacts to release its associated mechanism, and means mounted for operation independently of the individual latching means and operatively common to all poles of the breaker for causing unlatching of the latching means for all other poles in response to operation of the latching means in one pole by said control means of said one pole.

21. In a multi-pole circuit breaker having at each pole thereof a stationary contact, an operating means, a movable contact member pivoted on said operating means to engage and to disengage the stationary contact for closing and opening the circuit, respectively, an actuator member mounted for movement between circuit-closed and circuit-open positions, respectively, thereof, and an overcentering spring interconnected between said members for effecting opening and closing movements of said movable contact member; means for latching said actuators in the circuit-closed condition thereof, a current responsive control means at each pole operable in response to a predetermined current in the circuit of its associated pole to release one of said actuators for movement to its circuit open position whereby to overcenter the spring associated with the released actuator for opening the circuit at the pole of the released actuator, and means for effecting the movement of each other actuator to the circuit-open position thereof in response to said movement of the released actuator, whereby to overcenter the spring associated with said other actuator for opening the circuit at the pole thereof.

22. In a multi-pole circuit breaker having at each pole thereof a stationary contact, an operating means, a movable contact member pivoted on said operating means to engage and to disengage the stationary contact for closing and opening the circuit, respectively, an actuator member mounted for movement between circuit-closed and circuit-open positions, respectively, thereof, and an overcentering spring interconnected between said members for effecting opening and closing movements of said movable contact member; means for latching said actuators in the circuit-closed condition thereof, a current responsive control means fixedly supported at each pole operable in response to a predetermined current in the circuit of its associated pole to release one of said actuators for movement to its circuit-open position whereby to overcenter the spring associated with the released actuator for opening the circuit at the pole of the released actuator, and means for effecting the movement of each other actuator to the circuit-open position thereof in response to said movement of the released actuator, whereby to overcenter the spring associated with said other actuator for opening the circuit at the pole thereof, said last mentioned means being common to said poles and extending therebetween.

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