

May 5, 1942.

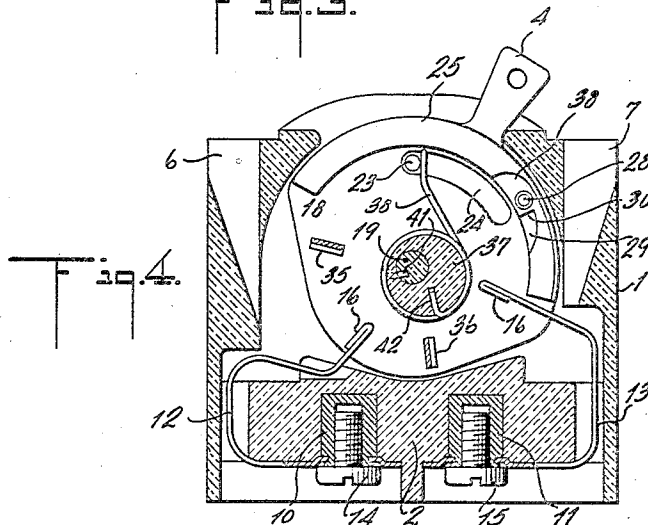
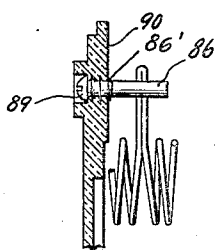
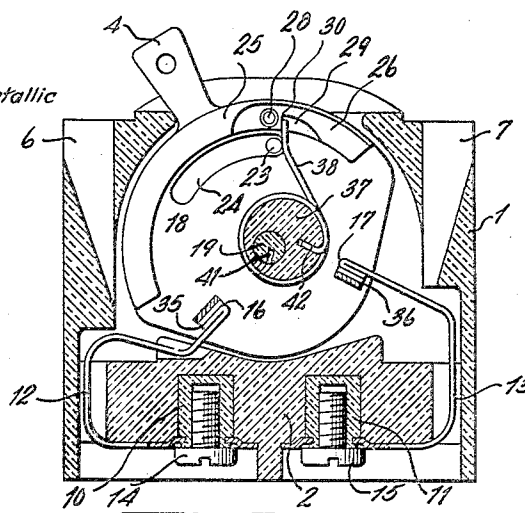
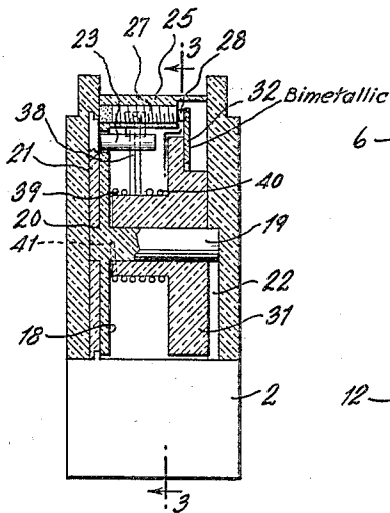
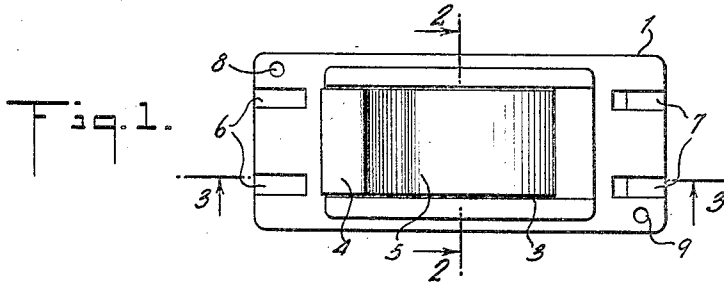
A. B. RYPINSKI

2,281,950

CIRCUIT BREAKER

Filed May 16, 1940

2 Sheets-Sheet 1



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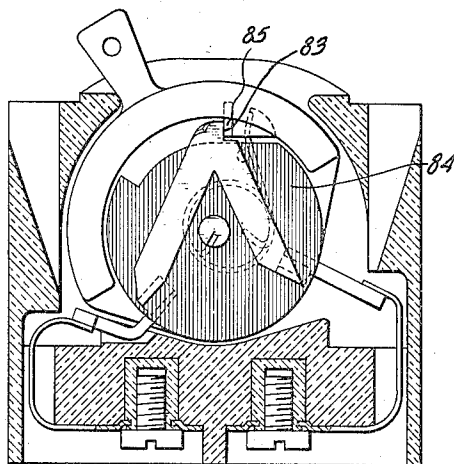
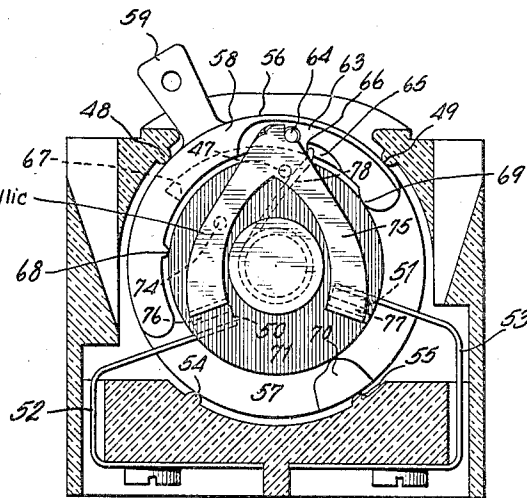
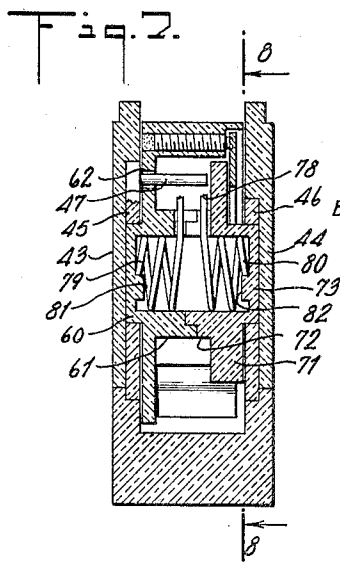
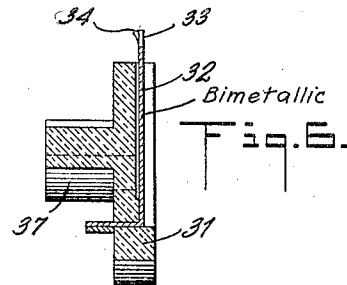
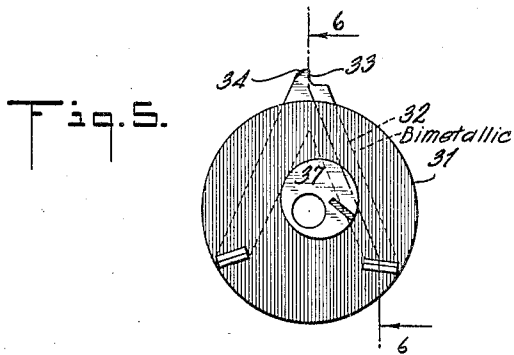
A. B. RYPINSKI

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CIRCUIT BREAKER

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2 Sheets-Sheet 2



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2,281,950

CIRCUIT BREAKER

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Application May 16, 1940, Serial No. 335,487

16 Claims. (Cl. 200—116)

The invention herein disclosed relates to a circuit breaker of the kind that automatically opens the circuit upon a short circuit or overload, and more particularly to a circuit breaker of the kind disclosed in my co-pending applications Serial Numbers 309,521 and 321,022, filed December 16, 1939, and February 27, 1940.

These circuit breakers primarily include two movable elements, a handle that is provided with a finger piece for the manual operation of the breaker, and a switch element having contact blocks thereon through which the circuit is closed or opened. The elements are movable between "on" or closed-circuit and "off" or open-circuit positions and they are resiliently urged toward "off" position. The handle is normally maintained in "on" position through a releasable latching arrangement that includes a pin, a latching lever pivotally mounted on the pin and a spring pressing on the lever. In the specific circuit breakers disclosed in the aforementioned applications, the handle and switch element are rotatably mounted on a shaft and the switch element is normally latched to the handle through current-releasable latching means. This current releasable latching means includes a bi-metal element mounted on the switch element and secured and connected to the contacts.

An object of the present invention is to provide a more simplified construction for such circuit breakers. Another object of the invention is to provide a circuit breaker of this kind that has a minimum number of bearings all of which are of non-corrosive material. Other objects of the invention are to provide such a circuitbreaker that is comparatively inexpensive to manufacture, that is readily and easily assembled, that is made up of a minimum number of parts, and that is reliable in operation. A more specific object of the invention is to accomplish the same operation in circuit breakers of the kind disclosed in the aforesaid applications with less parts.

The foregoing objects and certain advantages that will hereinafter appear are attained in accordance with the invention by a construction of a circuit breaker of the kind referred to in which (1) the latching lever for the handle, (2) the contact blocks on the switch element, and (3) the shaft, on which the handle and switch elements rotate, may be dispensed with. Three forms of a circuit breaker constituting examples of embodiments of the invention and in which these and other elements are omitted are disclosed in the accompanying drawings in which:

Fig. 1 is a plan of a circuit breaker embodying the invention;

Fig. 2 is a transverse section of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a side sectional elevation of the same taken on the line 3—3 of Fig. 2;

Fig. 4 is a section similar to Fig. 3 with the parts in a different position;

Fig. 5 is a side elevation of the rotor;

Fig. 6 is a transverse section of the same taken along the line 6—6 of Fig. 5;

Fig. 7 is a transverse section of another form of the circuit breaker;

Fig. 8 is a sectional side elevation of the same taken along the line 8—8 of Fig. 7;

Fig. 9 is a sectional side elevation of another modified form of the circuit breaker; and

Fig. 10 is a fragmentary section of a side wall of a circuit breaker case.

The several circuit breakers illustrated in the drawings essentially include a case and operating parts that are housed within the case. The case is open at the bottom and has an opening through the top for a finger piece by means of which the circuit breaker may be manually actuated. A base serves as a closure for the bottom of the case and as a support for stationary contacts and associated connecting terminals.

The operating mechanism in general includes two movable elements, a manually operative element or handle and a switch element or rotor. These elements are resiliently urged toward open-circuit position. The handle in the "on" position is releasably latched in closed-circuit position and under normal conditions the switch element is releasably latched to the handle for movement towards and retention in closed-circuit position. The latching relation between the handle and the switch element is automatically released upon the flow of excess current either by virtue of an overload or a short circuit. In the first instance, the release is delayed, in the second, it is rapid. Upon release, the switch element moves to open-circuit position and is followed to this position by the handle.

All of the parts of these circuit breakers, with the exception of the current carrying parts, the resilient element and the fastening screws, are molded from "Bakelite" or some equally strong and good electrical insulating material. In consequence, all of the bearing surfaces of the movable parts are made of non-corrosive material.

The circuit breaker illustrated in Figs. 1 to 6 includes a case 1 open at its lower end to receive a removable base 2, the case and base forming

a complete enclosure for the circuit breaker except for an opening 3 in the top through which the finger piece 4 of an operating handle 5 extends and vents 6 and 7 to permit gases generated by arcs within the case to pass to the outer air. Base 2 and case 1 are fastened together in operating relationship in any suitable manner, as by screws or rivets 8 and 9 passing through aligned holes in the case and the base. Secured to the base by any suitable means such as the inserts 10 and 11 molded in the base are two resilient contact strips 12 and 13, with terminal screws 14 and 15 at one end and accessible from without the case, the strips passing through suitable recesses in the case and base and terminating in contact strips 16 and 17. The terminal strips are reduced in width where necessary to allow the arc gases to pass out through their respective vents.

The handle of the circuit breaker includes a disk-like end wall 18 from one side of which, substantially centrally thereof, a shaft 19 extends. On the other side of the wall 18 a short stud shaft 20 extends from the wall axially aligned with the shaft 19. The stud shaft 20 is received and journaled in a bearing opening in a slide 21 which in turn is received in a groove in the inner surface of the side wall of the case. The end of the shaft 19 is received in a groove 22 extending from the bottom of the case in the inner surface of the opposite side wall of the case. This groove 22 is rounded at its upper end and so forms a bearing on three sides for the end of the shaft 19. The handle is thus journaled in the case for rotation about the axis of the shafts 19 and 20. Above the bearing opening through the slide 21 in which the shaft 20 is received, a pin 23 extends from the slide 21 and through an arcuate slot 24 formed in the wall 18.

At the outer end, the handle is provided with an arcuate, axial flange 25 that is concentric with the axis of rotation of the handle. From the outer surface of this flange the finger piece 4 extends radially and has the usual sealing opening therethrough. This finger piece extends through the opening 3 in the top of the case and the flange 25 serves as a closure for the opening 3 in all positions of the handle.

In the edge of the flange opposite to the end wall 18, there is provided a recess 26 of the shape and size illustrated in Figs. 3 and 4. Extending axially through the flange is a threaded hole in which is received a set screw 27 having a reduced end section 28 shaped as shown and commonly known as a dog-point hardened set screw. The shaped end 28 of the set screw serves as a detent, part of the current releasable latching means of the circuit breaker, and it may be adjusted for a purpose that will hereinafter appear. When the screw is adjusted to the proper position, for the rated capacity of the circuit breaker, it is sealed with cement. The end wall of the recess 26 is undercut at 29 to form a shoulder 30 which constitutes a latch-engaging surface.

The switch element 31 is rotatably mounted on the shaft 19 for rotation about the axis of the shafts 19 and 20. The switch element carries a substantially inverted V-shaped bimetal element 32. This bimetal element is mounted on one face of the rotor within a V-shaped recess provided therefor. The upper or apex end of the bimetal element 32 is cut and shaped as illustrated in Fig. 5 and includes an edge 33 that normally

engages the end 28 of the set screw 27. The edge 34, opposite the edge 33, of the bimetal element is bent outwardly as indicated to form a lead-in for re-engagement with the detent 28 after the circuit breaker has tripped and the bimetal cooled prior to movement of the handle to open-circuit position. Each end of the bimetal strip is bent and extends through the switch element. On one of the bent ends there is secured a contact piece 35 and on the other a contact piece 36. These contacts co-operate with the contacts 16 and 17 respectively. The bent end sections which extend through the rotor or switch element are molded in the switch element. From the inner surface of the rotor there extends an eccentric boss 37 the end of which is adjacent the disk 18 of the handle. This eccentric boss constitutes a carrier for a spring element.

This spring element serves several functions. It effects the automatic and independent operation of the switch element and handle from closed-circuit to open-circuit position; it effects a bias of the switch element towards open-circuit position with respect to the handle and so serves, under normal conditions, to maintain the bimetal element 32 in engagement with the detent 28; it serves as a part of a latching arrangement that maintains the handle in closed-circuit position; it serves to effect a bias on the handle with respect to the case; and it serves to maintain the latching relation of the handle for holding the handle in closed-circuit position. The spring element includes a central spring loop 38 and a torsional spring section on each side of the loop that is wound from the central loop outwardly. Both torsional sections 39 and 40 are wound in the same direction. The end of the spring section 39 is bent at a sharp angle to form an inwardly extending key 41 and the end of the section 40 is bent to form a key 42. The key 41 is received in a keyway extending longitudinally of the shaft 19 and the key 42 is received in a keyway formed in the boss 37 on the rotor and extending longitudinally thereof. The spring is arranged and wound so that winding it up causes an expansion of the torsional spring sections. The central loop 38 is at all times restrained against circumferential movement, counter-clockwise as seen in Fig. 3, by the pin 23 and it extends, in the "on" position of the circuit breaker into the undercut 29 and engages the latching surface 30 in the handle. With the central loop 38 fixed or restrained in this manner, the two sections of the spring may be wound in the same direction against the loop to provide bias. One section of the spring acts upon the handle and the other section of the spring acts upon the switch element. Thus, bias, in the same direction, on the operative parts of the circuit breaker is attained with a single spring. The same spring also serves as a releasable latch to hold the handle in "on" circuit position by engagement of the loop 38 with the latching surface 30. Winding the spring up a partial revolution will provide a bias suitable for effecting dependable operation of the circuit breaker.

The operative parts of the circuit breaker are first assembled as a unit and then inserted into the case through the bottom of the case. The base is then placed in position on the case and the whole secured by two bolts or rivets 8 and 9 extending through the base and the case.

The assembly of the operating parts of the circuit breaker may be accomplished as follows:

The bearing slide 21 is laid down. The handle is laid over the bearing slide so that the pin 23 extends through the arcuate slot 24 and the shaft 20 is received in the bearing opening in the slide. Next, the spring element is placed on the handle with its key 41 in the keyway in the shaft. The loop 38 of the spring is then pulled back to a point at which it snaps in place behind the pin 23. The rotor, with the bimetal element thereon is dropped in place over the spring, the shaft 19 being received in the opening provided therefor in the rotor and the key 42 is received in the keyway in the boss 37. The rotor is then turned about the shaft to wind up the spring. After the rotor has been turned sufficiently, it may be pressed into place, sliding along the shaft. The spring now holds the bimetal 32 with its edge engaging against the detent 28 and by its tension on the parts serves to retain the several parts together in their assembled relation. It is now only necessary to pick up the assembled circuit breaker unit and place it in the case. This is done by aligning the slide 21 with the groove provided therefor in the side wall of the case and the end of the shaft 19 with the groove 22 and pushing the unit into the case.

The operation of the assembled circuit breaker will now be described. If the handle is moved to the closed or "on" position, a circuit is established, Fig. 3, from terminal 14 through contact 16, contact 35, bimetal 32, contact 36, contact 17 and terminal 15. In this position, the stationary contact strips 12 and 13 are under tension by reason of the engagement of the switch element contacts with the stationary contacts and the contact strips exert a force on the rotor in a direction to urge the rotor to "off" position. This force increases the speed with which the rotor operates when the breaker trips.

The circuit breaker may be manually operated to open or close the circuit. The relation of the engaging surface 30 of the handle and the loop 38 of the spring is such that while providing a secure latch, it releases upon exerting a force upon the finger piece 4 in a direction to move the handle to open-circuit position. Thus, since the rotor, under normal conditions, is latched to and follows the handle by spring action, as explained above, the circuit breaker may be actuated manually in the manner of an ordinary switch.

When the circuit breaker is in the "on" position and excessive current passes through it, the bimetal becomes heated, warps in a manner well known and usual with a bimetal, and becomes disengaged from the detent 28. The warping or bending of the bimetal may be rapid in the case of a heavy flow of current due to a short circuit or it may be slow or delayed where there is but a slight overload. In either event, when the bimetal becomes released from the detent, the rotor is moved by the spring to the open-circuit position as illustrated in Fig. 4. When the rotor moves towards open-circuit position, the eccentric boss or spring carrier 37 moves radially in a direction away from the undercut 29, and in so doing pulls the spring and its loop 38 bodily in that direction so that, as the rotor nears the end of its movement the spring loop escapes from the latching surface 30 in the handle. When this occurs, the handle is released and under the action of its end of the spring moves to open-circuit position. In so doing the detent 28 passes the bimetal. When the bimetal cools and returns to its normal position it again aligns with

the detent. If it be cooled before the handle arrives at the "off" position, the lead-in on the bimetal permits the detent to pass the bimetal. The rotor is thus again latched with the handle for movement to the "on" position. It will be apparent that while there is an overload or a short circuit, the breaker can not be held in closed-circuit position because the contact carrying rotor is only latched to the handle by means of the bimetal, and holding the handle will not prevent the bimetal from releasing and the rotor moving to "off" position.

When the handle, with the rotor latched thereto, is again moved to "on" position, the eccentric spring carrier effects a radially outward movement of the spring. In this way, when the handle with the rotor latched thereto arrives at "on" position, the spring loop 38 is in position to again engage the latching surface 30.

In Figs. 7 and 8, a modified form of the same circuit breaker has been disclosed. In this form of the circuit breaker the shaft is eliminated. This circuit breaker is essentially the same as that described above. The case of the circuit breaker has side walls 43 and 44 each of which are recessed on the inner surface to receive slide bearing plates 45 and 46 respectively. The recess or slot in the side wall 43 is longer than that in the side wall 44. Both recesses, however, extend inwardly from the open end or bottom of the case. The slide 45 is provided with a pin 47 adjacent the upper end thereof and a bearing opening intermediate its ends. The slide 46 is provided with a bearing opening. On each side of the opening through the top of the case there are formed line contact bearing lugs 48 and 49 which serve to center the handle in the case and form line bearing contacts therefor.

The base of this circuit breaker is essentially the same as that of the circuit breaker above described. This base constitutes a closure for the open end of the case and a support for the stationary contacts 50 and 51 on the end of contact strips 52 and 53. The central portion of the inner surface of this base is concaved as illustrated and adjacent one end of the concaved section there is provided a line contact bearing lug 54. A similar line contact bearing lug 55 is provided adjacent the other end of the concaved section of the base. These contact lugs 54 and 55 serve with the lugs 48 and 49 to center and journal the handle in the case.

The handle 56 has a circular disk-like wall 57 from which an axial flange 58 extends. A finger piece 59 extends radially from the flange and through the opening in the top of the case. The flange 58 forms a closure for the top of the case in all positions of the handle and it engages in line contact the bearing lugs 48 and 49. These bearing lugs serve with the lugs 54 and 55 to center and journal the handle. In addition, the lugs 48 and 49 serve as barriers which prevent the passage of gas between the handle and the wall of the case and out through the opening in the top of the case. The wall 57 engages and bears on the lugs 54 and 55 and in the base.

On one side of the wall 57 a boss 60 is formed. Co-axially with this boss a cylindrical wall 61 extends from the opposite side of the wall 57 and forms part of a housing for the spring element of the circuit breaker. The end of this wall is shaped to form an overlap joint with a similar wall on the switch element of the circuit breaker as will hereinafter appear. The portion 60 is journaled in the bearing opening of the slide 45. The pin

47, on the slide 45, extends through an arcuate slot 62 in the wall 57 of the handle.

On the face of the flange 58, there is formed a recess 63 having the shape illustrated. A dog-point, hardened set screw 64 threaded through an opening through the flange forms a detent within the recess 63. The end wall of the recess is undercut at 65 to form a latch-engaging surface 66. Aligned with this recess, there is formed in the under surface of the flange an eccentric recess 67 which terminates at the latch engaging surface 66. At one point, on the inner surface of the flange, there is formed a bearing lug 68 and adjacent the end of the flange there is formed another bearing lug 69. Intermediate these two bearing lugs a bearing lug 70 is formed on the wall 57, the lug 70 extending axially of the wall. These three bearing lugs serve to center and journal the rotor within the handle.

The rotor of the circuit breaker consists of a disk-like wall 71 from one side of which there extends axially a cylindrical wall 72 and from the other side of which there extends a boss 73. The boss 73 is received and journaled in the bearing opening in the slide 46 and the wall 72 forms a partial spring housing. The end of this wall is formed with an overlap to engage the wall 61 of the handle in overlapping relation, each forming a bearing for the other. A pin 74 extends from the switch element. A bimetal element 75 of a shape of an inverted V is secured to the face of the rotor. The ends of this bimetal element extend through and are molded in the rotor. Contact blocks 76 and 77 are secured to the extending ends of the bimetal on the inside of the wall 71. A radial slot is provided in the wall 61 of the handle and the wall 72 of the rotor through which the loop 78 of a spring element extends. The walls 61 of the handle and the wall 72 of the rotor form a housing for the spring element.

The spring element is the same as that previously described and includes the loop 78 and two torsional spring sections 79 and 80, one on each side of the loop 78. In the spring cavity in the handle there is formed a lug 81 which engages a key formed on the end of the torsional section 79. A similar lug 82 is formed in the spring cavity of the rotor and engages a key formed on the end of the spring section 80. The loop 78 of the spring, in the "on" position of the circuit breaker, illustrated in Fig. 8, engages the latch-engaging surface 66 of the handle and serves to retain the handle against the action of the spring section 79. The bimetal element engages the detent 64 and so, under normal conditions, serves to retain the rotor or switch element against movement relative to the handle towards the "off" position under action of the torsional section 80 of the spring.

In operation, when the bimetal warps and becomes released from the detent, in the manner explained above, the switch element under the action of the spring section 80 moves to the "off" position. As the switch element arrives near the "off" position the pin 74 strikes the spring loop 78 and disengages the end of the loop from the latch-engaging surface 66. The handle then under the action of the spring section 79 moves to "off" position. When the handle moves to "off" position, the end of the spring loop 78 is received in the eccentric recess 67.

When the bimetal has cooled and has again become engaged with the detent 64, the circuit breaker may be placed in "on" position by moving the finger piece 53 counter-clockwise as viewed in

Fig. 8. As the handle and switch element move to the closed-circuit position, the eccentric wall of the cavity 67 presses inwardly on the end of the spring loop in a direction to effect a movement of this spring loop inwardly. This action continues until the handle is in the "on" position at which time, the spring loop snaps into the undercut 65 and in position to engage the latch-engaging surface 66 of the handle. The pin 47 prevents the spring loop 78 from moving counter-clockwise as viewed in Fig. 8 and so unwinding the spring.

The form of the circuit breaker illustrated in Fig. 9 differs from that illustrated in Figs. 1 to 6 in the manner in which the bimetal engages the handle. In this construction, the latching of the handle in "on" position and its release therefrom is similar to the construction illustrated in Figs. 2 and 3. On the flange of the handle, there is formed a lug 83 which constitutes a detent and engages the bimetal element on the rotor 84. The lug may be provided with a metal insert 85, or if the material from which the handle is made has suitable mechanical properties, it may be formed of this material without a metal insert. In this construction no provision is made for adjustment of the extent of engagement of the bimetal element with the detent. The parts can be made with sufficient accuracy and within tolerances that make adjustment unnecessary.

In Fig. 10 there is illustrated an arrangement for a fixed pin such as the fixed pins 23 (Figs. 2 and 3) and 47 (Figs. 7 and 8). In this construction a metal pin 86 is provided with a slotted head 89 and a self-tapping threaded section 86'. The side wall 90 of the case is provided with an opening to receive the pin which is driven there-through and forms threads therein for engagement with the thread 86'. This provides a very inexpensive arrangement. In constructions where the spring retaining pin shown in Fig. 10 is secured to the case the slide or slides illustrated in the drawings may be omitted and the moving parts journaled in rounded end grooves in the case.

From the foregoing description of the circuit breaker disclosed in the drawings, it will be seen that by this invention, there is provided a circuit breaker construction in which there are a minimum number of moving parts. All of the parts of the circuit breaker with the exception of the spring, the adjusting detent screw, the bimetal elements, the contacts and their associated parts, are made of "Bakelite" or some other equally strong and good electrical insulating material. Thus all of the bearings for the moving parts are made of non-corrosive material. The circuit breaker is comparatively inexpensive to manufacture, readily assembled and reliable in service.

It will be obvious that various changes may be made by those skilled in the art in the details of the embodiments of the invention illustrated in the drawings and described above within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, a switch element within the case, said elements being movable between open and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element acting on said manually operative and switch elements arranged to effect movement thereof independ-

ently toward open-circuit position, said spring element including means for retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

2. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, a switch element within the case, said elements being movable between open and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element acting on said manually operative and switch elements arranged to effect movement thereof independently toward open-circuit position, latching means including said spring element for retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

3. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, a switch element within the case, said elements being movable between open and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element acting on said manually operative and switch elements arranged to effect movement thereof independently toward open-circuit position, interengaging latching means including said spring element and means associated with the handle for retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

4. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, a switch element within the case, said elements being mounted for movement between closed-circuit and open-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element acting on said manually operative and switch elements to effect movement thereof to open-circuit position including a section acting on the manually operative element, a section acting on the switch element and another section arranged to releasably retain the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

5. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element rotatably mounted within the case, a switch element rotatably mounted within the case, said elements being rotatable between open-circuit and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element comprising two coils and a loop, one of said coils acting

upon said manually operative element and the other acting upon the switch element and effective to effect movement of the elements from closed-circuit to open-circuit position, and latching means including the spring loop for retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

6. In a circuit breaker of the kind described, the combination comprising a case, a circular manually operable rotatable element mounted within the case, the case forming a journal for the manually operative element, a circular switch element extending into the manually operative element and rotatable therein, the manually operable and switch elements being mounted for movement between the closed-circuit and open-circuit positions and independent movement from closed-circuit to open-circuit position, resilient means acting upon said elements arranged to effect movement thereof from closed-circuit to open-circuit position, means for releasably retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

7. In a circuit breaker of the kind described, the combination comprising a case, a manually operable element having a circular cavity therein movably mounted within the case, a circular, movable switch element extending into the manually operable element, the manually operative element forming a journal for the switch element and the manually operable and switch elements being mounted for movement between closed-circuit and open-circuit positions, resilient means acting upon said elements arranged to effect movement thereof from closed-circuit to open-circuit position, means for releasably retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

8. In a circuit breaker of the kind described, the combination comprising a case, a circular, manually operable element having a circular cavity rotatably mounted within the case, the case having a circular cavity therein forming a journal for the manually operative element, a circular movable switch element extending into the manually operable element, the manually operable element forming a journal for the switch element and the elements being mounted for movement between closed-circuit and open-circuit positions, resilient means acting upon said elements arranged to effect movement thereof from closed-circuit to open-circuit position, means for releasably retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

9. In a circuit breaker of the kind described, the combination comprising a case, a circular, manually operative element having a cavity therein rotatably mounted within the case, projections within the case angularly spaced about the axis of the manually operative element and forming a journal therefor, a circular switch element extending into the circular cavity in the manually operative element, angularly spaced projections within the cavity forming a journal for the switch element, said elements being mounted for movement between closed-circuit and open-circuit positions, resilient means acting upon said elements arranged to effect movement thereof from closed-circuit to open-circuit position, means for releasably retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

10. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element rotatably mounted within the case, a switch element rotatably mounted within the case, said elements being rotatable between open-circuit and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element comprising two coils and a loop, one of said coils acting upon said manually operative element and the other acting upon the switch element and effective to effect movement of the elements from closed-circuit to open-circuit position, and latching means including the spring loop for retaining the manually operative element in closed-circuit position, a slide mounted in the case, a pin extending from the slide and arranged to retain said spring loop in position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

11. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element rotatably mounted within the case, a switch element rotatably mounted within the case, said elements being rotatable between open-circuit and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element comprising two coils and a loop, one of said coils acting upon said manually operative element and the other acting upon the switch element and effective to effect movement of the elements from closed-circuit to open-circuit position, and latching means including the spring loop for retaining the manually operative element in closed-circuit position, a pin extending from the case and arranged to retain said spring loop in position, current-releasable latching means for retaining the switch element with the handle in closed-circuit position, and means operative on movement of the switch element to open-circuit position for effecting release of the manually operative element.

12. In a circuit breaker of the kind described, the combination comprising separated contacts, a switch element, and a bimetallic strip mounted on the switch element and arranged to bridge the separated contacts, said bimetallic strip including end sections secured to the switch element, arranged to form the contacts of the switch element and positioned to engage the said separated contacts.

13. In a circuit breaker of the kind described, the combination comprising separated stationary contacts, a movably mounted switch element, and a bimetallic strip mounted on the switch element and arranged to bridge the stationary contacts, said bimetallic strip including end sections secured in the switch element, arranged to form the contacts of the switch element and positioned to engage the stationary contacts.

14. In a circuit breaker of the kind described, the combination comprising separated stationary contacts, a movably mounted switch element of electrical insulating material, and a bimetallic strip mounted on one face of the switch element and arranged to bridge the stationary contacts, said bimetallic strip including contact end sections extending at an angle to the plane of the bimetallic strip, through the switch element secured therein and positioned to engage the stationary contacts.

15. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, having a latch engaging surface thereon, a switch element within the case, said elements being movable between open and closed-circuit positions and independently movable from closed-circuit to open-circuit position, a spring element acting on said manually operative and switch elements arranged to effect movement thereof independently toward open-circuit position, a retaining element carried by said switch element for engaging the latch engaging surface of said manually operative element and retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the handle in closed circuit position, and means on the switch element for withdrawing said retaining element from said latch-engaging surface on movement of the switch element to open circuit position.

16. In a circuit breaker of the kind described, the combination comprising a case, a manually operative element within the case, said elements being rotatable between open and closed-circuit positions, a spring element acting on said switch elements arranged to effect movement thereof independently toward open-circuit position, said spring element including retaining means for retaining the manually operative element in closed-circuit position, current-releasable latching means for retaining the switch element with the manually operative element in closed circuit position, and means including an eccentric operative on movement of the switch element to open circuit position for effecting releasing movement of said retaining means.

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