March 23, 1954 R. N. ROWE ET AL 2,673,267

ELECTRIC CIRCUIT BREAKER

Filed Jan. 16, 1953 2 Sheets-Sheet 1

Fig. 1.

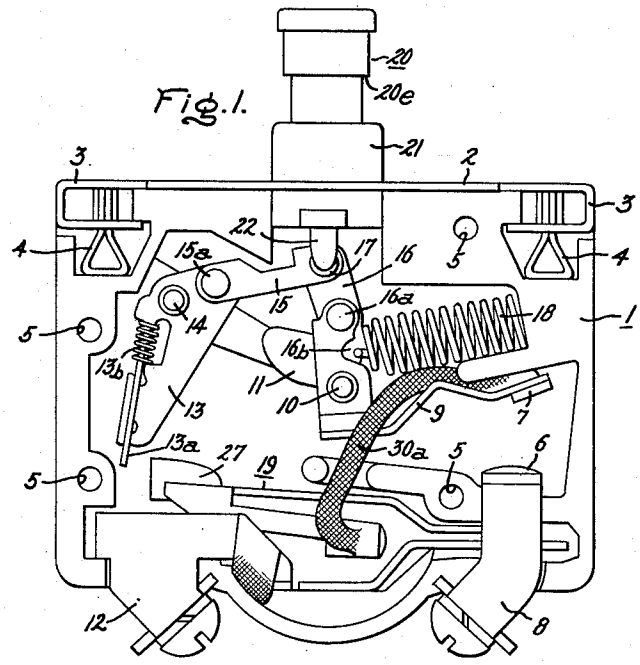
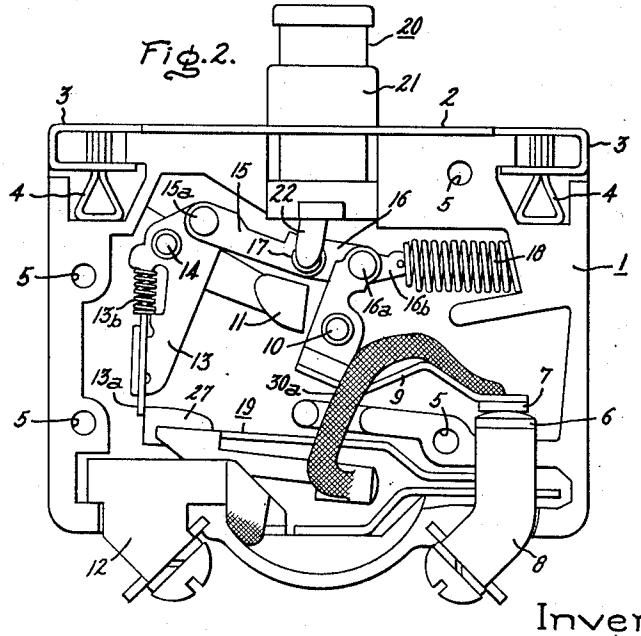


Fig. 2.



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Fig. 3.

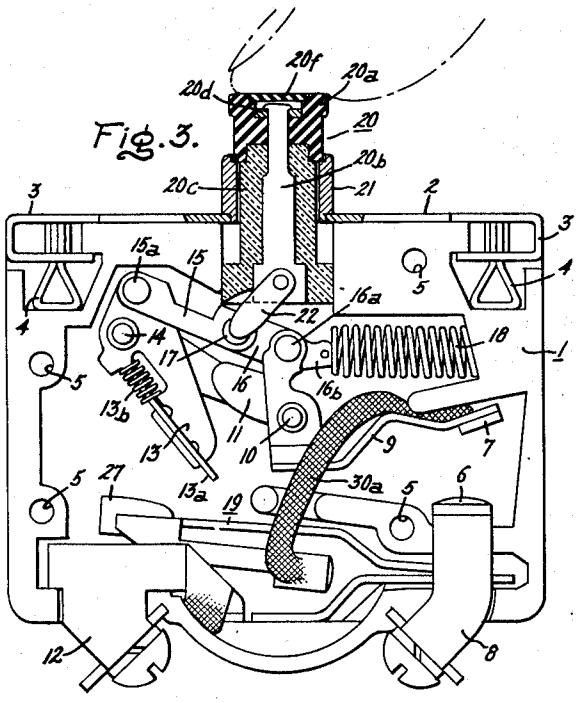


Fig. 5.

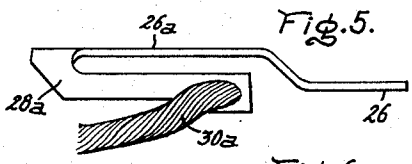


Fig. 6.

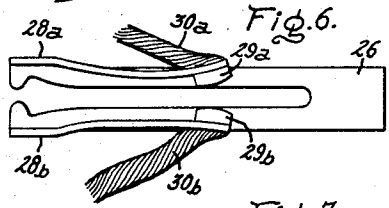


Fig. 7.

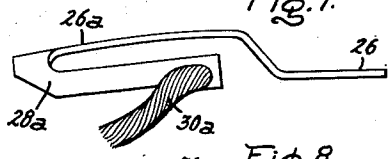


Fig. 8.

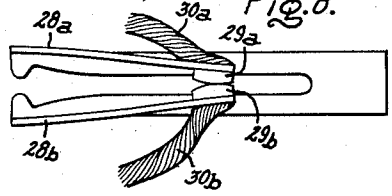


Fig. 9.

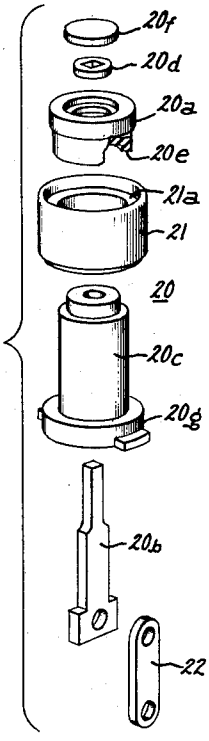
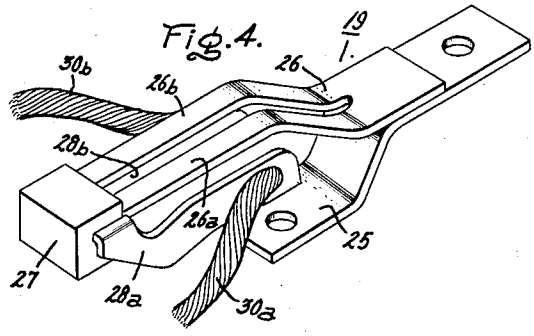


Fig. 4.



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Patented Mar. 23, 1954 2,673,267

UNITED STATES PATENT OFFICE

2,673,267

ELECTRIC CIRCUIT BREAKER

Raymond N. Rowe and Eric A. Ericson, Plainville, Conn., assignors to General Electric Company, a corporation of New York

Application January 16, 1953, Serial No. 331,558

12 Claims. (Cl. 200—116)

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Our invention relates to electric circuit breakers, and more particularly to manually operable current responsively tripped electric circuit breakers of the automatic reset type.

In small air circuit breakers it is a constant effort to provide the necessary manual opening and closing operation and automatic tripping and reset functions with a minimum number of parts, both for ease and reliability of operation and economy of manufacture.

It is therefore a general object of our invention to provide an electric air circuit breaker of the manually operable, automatically current responsively tripped automatic reset type which is inexpensive and readily assembled, while dependable and effective in operation.

It is still another object of our invention to provide a manually operable electric circuit breaker wherein the casing is automatically sealed in the "on" position of the breaker.

It is a more specific object of our invention to provide an operating mechanism for a manually operable current responsively tripped electric circuit breaker, in which a single actuating spring is utilized to hold the mechanism in both its open and closed circuit position, and also to automatically trip and automatically reset the mechanism after tripping.

It is still another object of the invention to utilize the same single spring of combined function to also seal the breaker casing when the breaker is closed.

In carrying out our invention in one form we provide a toggle link type of operating mechanism in which one end of an overcenter toggle linkage is pivoted upon a movable carrier member which is normally latched and retained in fixed position by an overcurrent responsive device. The opposite end of the toggle linkage bears against a compression spring, the other end of which is fixedly seated in the casing, the spring being disposed to bias the linkage for longitudinal movement toward that end pivoted on the carrier member when the linkage is in its extended position. A movable switch member is pivotally connected to the toggle linkage adjacent to but spaced from the spring seated end of the linkage, and a fixed stop is provided for limiting movement of the switch member in the circuit opening direction when the toggle is collapsed. A rectilinear actuating rod is connected to the knee pivot of the linkage to move the knee pivot overcenter for manual opening and closing movement. This same actuating rod limits overcenter movement of the toggle in circuit closing operation by seating against the casing, and in so doing seals the casing against entrance of explosive gases and the like. To permit automatic tripping operation the knee pivot is connected to the actuating rod by means of a swinging link, and this link so controls the position of the knee pivot upon tripping that the extending spring engaging end of the toggle rotates the toggle link connected to the movable switch member after engagement of the switch member with its stop, thereby to automatically collapse the toggle and restore the carrier member to a reset position.

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Our invention itself will be more fully understood and its various objects and advantages further appreciated by referring now to the following detailed specification taken in conjunction with the accompanying drawing, in which Fig. 1 is a side elevational view, with the cover removed, of a manually operable current responsively tripped electric circuit breaker embodying our invention and shown in the "open" or "off" position; Fig. 2 is a similar view of the same circuit breaker shown in the "closed" or "on" position; Fig. 3 is a similar view of the same circuit breaker shown in the "trip free" position; Fig. 4 is a perspective view of the bimetallic latching detent included in the circuit breaker of Figs. 1, 2 and 3; Figs. 5 and 6 are side elevational and plan views, respectively, of the bimetallic member of Fig. 4 showing the member in its no load condition; Figs. 7 and 8 are similar side elevational and plan views, respectively, of the bimetallic member of Fig. 4 shown in its short circuit condition; and Fig. 9 is an exploded perspective view of the manual actuating button for the breaker shown at Figs. 1, 2 and 3.

Referring now to the drawings, and particularly to Figs. 1, 2 and 3, we have shown our invention embodied in an air circuit breaker comprising an open-sided housing 1 formed of suitable molded plastic insulating material and having recesses therein for the reception and retention of an operating mechanism. The housing is provided with a metal top plate 2 having return bent end portions 3 which seat in slots (not shown) in the housing. Within the return bent end portions 3 are disposed threaded nuts 4 adapted to receive bolts (not shown) for mounting the circuit breaker upon a panel or the like. The operating mechanism is adapted to be held in place in the housing 1 by a side cover plate (not shown), which is adapted to be connected to the housing by means of rivets passing through holes 5 in the housing 1. The mounting nuts 4 are disclosed and claimed in a copending application of Eric A. Ericson, Serial No. 342,633, filed

March 16, 1953, and assigned to the same assignee as the instant application.

Within the molded casing 1 is disposed a manual and automatic operating mechanism for a pair of cooperating switch contacts 6 and 7. The contact 6 is stationary and is mounted upon a terminal member 8 projecting from the bottom of the casing 1. The movable contact member 7 is mounted upon a movable switch member, shown as an L-shaped contact arm 9 pivotally mounted at a point intermediate its ends upon a fixed pivot pin 10 carried by the casing 1. The contact arm 9 is movable between an open circuit position, shown at Fig. 1, where it engages a fixed stop 11 formed on the casing, and a closed circuit position, shown at Fig. 2, where the contacts 6 and 7 are in engagement. A second terminal member 12 is seated in suitable positioning recesses in the housing 1 and projects from the bottom of the housing opposite the terminal member 8.

The L-shaped movable contact arm 9 is manually and automatically movable between open and closed circuit positions by means of an automatically releasable toggle mechanism shown in the drawings in open, closed and tripped positions. The actuating mechanism, shown at Fig. 1 in its manual open position, comprises a releasable carrier member 13 pivotally mounted upon a fixed pivot 14 fixed in the casing 1, and a pair of toggle links 15 and 16 pivotally connected, respectively, to the upper ends of the carrier member 13 and the contact arm 9 by means of movable pivot pins 15*a* and 16*a*, respectively. The adjacent ends of the toggle links are pivoted together at their knee by means of a movable pivot pin 17. The toggle link 16 is connected intermediate its ends to the pivot pin 16*a*, and thus includes a portion 16*b* extending beyond the pin 16*a* and engaging a compression spring 18, the other end of which is fixedly seated in a suitable recess in the casing 1.

The releasable carrier member 13 has mounted thereon at its lower end a slidable latch member 13*a*, biased to latching position by a spring 13*b* disposed between the latch member 13*a* and a portion of the carrier member 13. The latch member 13*a* normally engages a thermo-responsive latching detent shown as a thermo-deformable bimetallic member 19 mounted in a recess in the lower part of casing 1. As shown at Fig. 1, the latch 13*a* is withdrawn from the bimetallic member 19 in the manual open position of the breaker by reason of a resetting bias exerted upon the toggle mechanism by the spring 18, as will be more fully explained hereinafter. At Fig. 2, however, it will be observed that when the mechanism is in its manual on or closed position, the latch 13*a* is in engagement with the bimetallic member 19, thereby normally to retain the carrier member 13 in fixed position. As will be more fully explained hereinafter, the bimetallic latching detent 19 is connected in series circuit relation between the circuit breaker terminals 8 and 12 and carries the current passing through the breaker contacts 6 and 7. When sufficiently heated by this current, the detent 19 deforms downwardly thereby to disengage the latch 13*a* and release the carrier member 13 for movement to its tripped position, shown at Fig. 3.

For manual opening and closing operation, the circuit breaker is provided with a reciprocable actuating rod 20 supported for rectilinear movement in a collar 21 carried by the top plate 2 and having a stop shoulder 20*e* which acts also as a dust seal when engaging the collar 21. At its lower end the rod 20 carries a swingable connecting link 22 which is connected to the knee pivot pin 17 of the toggle mechanism.

As shown in greater detail at Fig. 9, the actuating rod 20 is formed as an insulating button 20*a* having connected thereto a metallic rod 20*b* to which the link 22 is swingably attached. The rod 20*b* is encased for a part of its length in an insulating sleeve 20*c* and extends into the button 20*a* to which it is attached by peening over a metal washer 20*d*. The sleeve 20*c* is of smaller diameter than the button 20*a* and when assembled the lower end of the button 20*a* forms a stop shoulder 20*e*. The button 20*a* is provided with an insulating cap 20*f*. The entire actuating assembly comprising the rod 20*b*, button 20*a* and sleeve 20*c* is slidable within the sleeve 21, being limited in its upward movement by an integral annular collar 20*g* on the sleeve 20*c* and in its downward movement by the seating of the shoulder 20*c* in an annular recess 21*a* of the sleeve 21. The sleeve 21 is fixed to the casing. As will be more evident hereinafter the seating of the button 20*a* in the recessed sleeve 21 serves to limit overcenter movement of the toggle mechanism in one direction and hold the mechanism in its "on" position. Thus, the overcenter spring force of the toggle itself serves to hold the actuating rod in sealing position.

The operation of the foregoing circuit breaker mechanism may now be observed in detail before proceeding with a further description of our new and improved bimetallic latching detent. In the manual open position of the breaker, as shown at Fig. 1, the toggle formed by the links 15 and 16 is broken by movement of the actuating rod 20 to its upper or withdrawn position. The toggle being broken, the compression spring 18 holds the contact arm 9 against the stop 11, and, because of the toggle link extension 16*b*, biases the link 16 clockwise about the pivot pin 16*a*, as shown in the drawing. With the contact arm 9 engaging the fixed stop, the pivot pin 16*a* is held in position so that clockwise rotation of the link 16 about the pin 16*a* (within the limit of movement permitted by the swinging link 22) draws the toggle link 15 slightly to the right as shown in the drawing, and rotates the carrier member 13 to a slightly withdrawn or "reset" position, as shown at Fig. 1.

When the actuating rod 20 is depressed, as shown at Fig. 2, until its stop shoulder 20*e* engages the collar 21, the knee pivot pin 17 is moved downwardly, thereby to extend the toggle links 15 and 16 and move the knee pivot 17 across the line of action of the spring 18 to a slightly overset position, as shown at Fig. 2. Further movement of the knee pivot pin 17 is prevented by engagement of the actuating rod shoulder 20*e* with the collar 21. In this position the shoulder 20*e* acts as a dust seal for the casing 1 the shoulder being held in sealed position by the toggle spring force. In this straightening movement the toggle links 15 and 16 force the pivot pins 15*a* and 16*a* apart. Movement of the pivot pin 15*a* is limited by engagement of the latch member 13*a* with the bimetallic latching detent 19, so that the pivot pin 15*a* in the normal unreleased position of the carrier member 13 acts substantially as a fixed pivot. Thus the straightening of the toggle links 15 and 16 serves principally to move the pivot pin 16*a* to the right, thereby to rotate the contact arm 9 clockwise about its fixed pivot pin 10 and bring the contact 6

and 7 into engagement. In this position of the mechanism the knee pivot pin 17 is slightly below the line of action of the spring 18, so that the pressure of the spring 18 retains the toggle in its overset position. In this position the spring 18 also tends to move the entire toggle mechanism to the left, as shown in the drawing, and longitudinally of the extended toggle links. Rectilinear movement of the entire toggle mechanism to the left is restrained, however, by latching of the carrier member 13, and thus retention of the pivot pin 15a in a normal fixed position.

It will now be understod that reverse manual movement of the actuating rod 20, by withdrawing it from the position of Fig. 2 to the position of Fig. 1, moves the knee pivot pin 17 about the line of action of the spring 18, so that the spring collapses the toggle links 15 and 16 and restores the mechanism to the open position of Fig. 1.

If, with the circuit breaker in the "on" position shown at Fig. 2, an overload current passes through the breaker sufficient to deform the bimetallic strip 19 downwardly and release the latch 13a, the pressure of the spring 18 upon the extended toggle links 15 and 16 moves the links longitudinally to the left as viewed in the drawing, and rotates the carrier member 13 counterclockwise to the tripped position shown at Fig. 3. Such rectilinear movement of the entire toggle mechanism moves the pivot pin 16a to the left and rotates the contact arm 9 counterclockwise, thereby to separate the contacts 6 and 7 even though the toggle links 15 and 16 are maintained in their extended position by holding the actuating rod 20 depressed, as shown at Fig. 3. This renders the breaker "trip free" in operation, in that the contacts are automatically separated by release of the carrier member 13, even though the actuating rod is manually held in its on position.

It may now be observed, however, that in moving to the tripped position shown at Fig. 3, the knee pivot pin 17, being carried by the swinging link 22, has swung upward and to the left. By this action the knee pivot is raised above the line of action of the spring 18. At the same time the link extension 16b, being rotated slightly clockwise by the foregoing movement, has lowered the line of action of the spring slightly. The spring 18, therefore, now tends to collapse the toggle links 15 and 16. In addition, the contact arm 9 now being against the stop 11 to hold the pivot pin 16a against movement, the link extension 16b converts the pressure of spring 18 to a torque tending to rotate the link 16 clockwise about the pin 16a. Thus, if the actuating button 20 is released from the position shown at Fig. 3, the compression spring 18 will break the toggle and move the actuating rod 20 upwardly to its open position by rotating the link 16 clockwise about the pivot pin 16a. In so rotating, the link 16 draws the link 15 to the right, and by this action rotates the carrier 13 clockwise about its pivot pin 14 to reset the mechanism. If the bimetal 19 has cooled before resetting movement of the carrier 13, the slidable latch 13a permits resetting movement.

Referring now more particularly to the bimetallic latching detent 19, we have shown at Fig. 4 a perspective view of this detent mounted upon an offset metal base member 25 fixed in the casing 1.

The bimetallic member 19 comprises a bifurcated bimetallic actuating arm 26 including two spaced apart coplanar actuating fingers 26a and 26b and mounted at its bight upon the supporting member 25, as by welding. The free ends of the actuating fingers 26a and 26b are connected together by a detent tip 27 of insulating material, the tip 27 being engaged in operation by the latch member 13a, as shown at Fig. 2. The actuating fingers 26a and 26b are each laterally and reversely bent at their ends to form a pair of bimetallic protective arms 28a and 28b. While, these protective arms may be separate pieces fixed to the actuating fingers, they are preferably formed, as shown, as integral reversely directed extensions of the actuating fingers 26a and 26b, and are turned over laterally so that they lie in planes perpendicular to the plane of the actuating arm and in parallel spaced relation with each other. The protective bimetallic arms 28a and 28b are arranged to be deformed toward the engagement with each other when heated. The movable ends of the protective arms 28a and 28b are provided with contact tips 29a and 29b respectively, which are sufficiently spaced apart so that they do not come into engagement with each other, except upon the occurrence of predetermined excessive overload currents.

To connect the bimetallic device 19 in series circuit relation between the circuit breaker terminals 8 and 12, the contact carrying ends of the protective arms 28a and 28b are provided with flexible electric conductors or pigtails 30a and 30b respectively, between which the actuating fingers 26a and 26b and the protective arms 28a and 28b are connected in series circuit relation. As shown at Fig. 1, the pigtail 30a is connected to the movable contact arm 9, while the pigtail 30b (not shown) is connected to the terminal member 12. The normal current path through the device 19 is thus from the pigtail 30a, through the arm 28a, the finger 26a, the finger 26b, the arm 28b to the pigtail 30b, or the reverse.

The bimetallic member of Fig. 4 is shown in plan and elevational view in its no load condition at Figs. 5 and 6, the detent tip 27 and the mounting base 25 being omitted.

Referring now again to Figs. 1, 2 and 3, it will be observed that the bimetallic member 19 is so mounted in the casing 1 that, when heated, the actuating arm, consisting of the fingers 26a and 26b and the detent tip 27, moves downwardly as viewed in the drawing, to release the carrier member 13. For normal overloads of the order of several times up to ten or twenty times normal current, deformation of the protective arm 28a and 28b is insufficient to bring the contact 29a and 29b into engagement.

It will now be evident that, upon occurrence of a predetermined excessive overload current traversing the protective bimetallic arms 28a and 28b and the actuating fingers 26a and 26b in series circuit relation, the protective arms are sufficiently deflected toward each other so that the contacts 29a and 29b come into engagement, thus providing a short circuit path between the pigtails 30a and 30b and shunting the entire bimetallic member 19 out of the circuit. The device 19 is shown in this condition at Figs. 7 and 8. It will of course be evident that, in operation, the actuating fingers 26a and 26b are sufficiently deformed to release the latched carrier member 13 before the protective arms come into engagement. In practice it has been found that the carrier member 13 is released and the pro-

tective arms engaged before the short circuit current through the circuit breaker contacts 6 and 7 attains its maximum value. In this way, the bimetallic member is protected against the carrying of excessive short circuit currents.

The self-protecting bimetal overload device, described above, is described and claimed in a copending application Serial No. 334,581 filed February 2, 1953, by Eric A. Ericson, and assigned to the same assignee as the instant application.

It will now be evident to those skilled in the art that we have provided a simplified and improved mechanism, wherein the single operating spring 18 selectably retains the toggle linkage either extended or collapsed when the carrier member 13 is latched in its normal operating position. The same spring moves the toggle linkage longitudinally to trip the breaker upon release of the carrier member, collapses the toggle linkage after tripping by reason of the controlled movement of the knee pivot of the toggle, and by reason of the extended end of the toggle link to which the spring is connected, exerts upon this link a torque through which the carrier member is automatically returned to its reset position. Finally, the same spring serves to bias the actuating button to a stopped position wherein the casing is sealed when the breaker is closed.

While we have described by way of illustration only a preferred embodiment of our invention, many modifications will occur to those skilled in the art, and we therefore wish to have it understood that we intend in the appended claims to cover all such modifications as fall within the true spirit and scope of our invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member connected to control said contacts, a pair of toggle links having adjacent ends connected together at a knee pivot, latch means for releasably retaining the remote end of one said link at a normally fixed point, means connecting said switch member for actuation to the other said toggle ling, a spring engaging the remote end of said other link to bias said links lengthwise of their extended position toward said normally fixed point, manually operable means for moving said knee pivot across the line of action of said spring means to extend and collapse said toggle links, said contacts being closed when said toggle links are extended and said spring means retaining said toggle links in either extended or collapsed position, and means operable upon release of said latch means with said toggle links extended for moving said knee pivot across the line of action of said spring.

2. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member connected to control said contacts, a movable carrier member spaced from said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, a spring engaging the switch member end of said links to bias the ends of said links together, manually operable means to move said knee pivot overcenter with respect to the line of action of said spring to extend and collapse said toggle links, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier when released permitting lengthwise movement of the extended links thereby to open said contacts, and means for controlling the movement of said knee pivot upon release to move said knee pivot across the line of action of said spring.

3. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member connected to control said contacts, a movable carrier member spaced from said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier member in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, a spring engaging the switch member end of said links to bias the ends of said links together, manually operable means to move said knee pivot overcenter with respect to the line of action of said spring to extend and collapse said toggle links, stop means limiting movement of said knee pivot in one direction to maintain said links extended, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier member when released permitting lengthwise movement of the extended links thereby to open said contacts, and means including said spring for applying to the engaged toggle link after release of said carrier a torque in a direction to collapse said links and reset said carrier.

4. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member connected to control said contacts, a movable carrier member spaced from said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier member in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, one said toggle link being pivotally connected to said switch member at an intermediate portion of the link and having an extending end portion beyond the pivotal connection, a spring engaging said overhanging end portion to bias the ends of said links together, manually operable means for moving said knee pivot over center with respect to the line of action of said spring to extend and collapse said toggle links, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier member when released permitting lengthwise movement of the extended links thereby to open said contacts, stop means engaging said switch member to limit releasing movement of said links, and means for controlling movement of said one link upon release so that said spring applies to said one link a torque rotating said one link about its pivotal connection with said switch member thereby to reset said carrier member.

5. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a

movable switch member connected to control said contacts, a movable carrier member spaced from said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier member in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, a spring engaging the end of said links opposite said carrier member to bias the ends of said links together, manually operable means to move said knee pivot overcenter with respect to the line of action of said spring to extend and collapse said toggle links, stop means limiting overcenter movement of said knee pivot in one direction to maintain said links extended, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier member when released permitting lengthwise movement of the extended links thereby to open said contacts, fixed stop means limiting circuit opening movement of said switch member, and means including said spring for rotating the link connected to said switch member about said switch member when said stop is engaged to reset said carrier member.

6. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member pivotally mounted to control said contacts, a movable carrier member spaced from said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier member in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, one said link being pivotally connected to said switch member at a point intermediate its ends and having an overhanging end portion, a spring engaging said overhanging end portion to bias the ends of said links together, manually operable means to move said knee pivot overcenter with respect to the line of action of said spring to extend and collapse said toggle links, stop means limiting movement of said knee pivot in one direction to retain said links extended, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier when released permitting lengthwise movement of the extended links thereby to open said contacts, means operable upon release of said carrier to control movement of said knee pivot so that said overhanging end portion of said one link shifts the line of action of said spring across said knee pivot, and stop means limiting circuit opening movement of said switch member, said spring rotating said one link about said switch member upon engagement of said stop means thereby to reset said carrier member.

7. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member pivotally mounted to control said contacts, a movable carrier member pivotally mounted in spaced relation with said switch member, means responsive to current traversing said contacts for normally restraining movement of said carrier member and releasing said carrier member in response to a predetermined excessive current, a pair of toggle links connected between said carrier member and said switch member and having a knee pivot, one said link being pivotally connected at an intermediate point to said switch member and having an overhanging end portion, a spring engaging said overhanging end portion to bias the ends of said links together, manually operable means swingably connected to said knee pivot and operable to move said pivot overcenter with respect to the line of action of said spring to extend and collapse said toggle links, stop means limiting movement of said knee pivot overcenter in one direction to maintain said links extended, said links when extended moving said switch member to close said contacts and said spring retaining said links either extended or collapsed, said carrier when released permitting lengthwise movement of the extended links thereby to open said contacts, said knee pivot swinging about said manually operable means in releasing movement thereby to move said knee pivot across the line of action of said spring, and stop means engaging said switch member to limit said releasing movement, said spring acting upon said overhanging end of said one link upon stopping engagement of said switch member to rotate said one link about said switch member and reset said carrier member.

8. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member pivotally mounted to control said contacts, stop means for limiting contact opening movement of said switch member, a pair of toggle links having their adjacent ends connected together at a knee pivot, latch means for releasably retaining the remote end of one said toggle link in a normal fixed position, a pivot pin connecting said switch member for actuation to an intermediate point of the other said toggle link, a spring engaging the remote end of said other link to bias said pivot pin toward said normally fixed position and said switch member against said stop means, manually operable means for moving said knee pivot across the line of action of said spring to extend and collapse said toggle links, said contacts being closed when said links are extended and said spring retaining said toggle links either extended or collapsed by overcenter action, and means operable upon release of said latch means with said toggle links extended for controlling the movement of said knee pivot to reverse the spring bias on said toggle links and collapse said toggle, the spring engaging end of said other toggle link beyond said pivot pin acting upon reversal of said bias to rotate said other link about said pivot pin thereby to collapse said toggle and reset said latch means.

9. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a movable switch member pivotally mounted to control said contacts, stop means for limiting contact opening movement of said switch member, a pair of toggle links having their adjacent ends connected together at a knee pivot, latch means for releasably retaining the remote end of one said toggle link in a normal fixed position, a pivot pin connecting said switch member for actuation to an intermediate point of the other said toggle link, a spring engaging the remote end of said other link to bias said links along their lengths when extended toward said normally fixed position and to bias said switch member against said stop means, manually oper-

able means movable transversely of the line of action of said spring and connected by a swingable link to said knee pivot for moving said knee pivot across the line of action of said spring to extend and collapse said toggle links, second stop means limiting over center movement of said knee pivot in one direction to retain said links extended and said contacts closed, and means responsive to the current traversing said contacts for releasing said latch means, said latch means when released permitting lengthwise movement of said toggle links when extended thereby to open said contacts, said swingable link moving said knee pivot across the line of action of said spring to collapse said toggle and said spring rotating said other link about said pivot pin to reset said latch means.

10. In a manually operable current responsively tripped electric circuit breaker having a pair of relatively movable cooperating switch contacts, a pair of fixed pivots disposed in parallel spaced relation, a switch member mounted upon one said pivot to control said contacts, a fixed stop limiting contact opening movement of said switch member, a carrier member mounted on the other said pivot, a first toggle link pivotally connected at one end to said carrier member at a point spaced from said other pivot, a second toggle link having one end connected to the other end of said first toggle link by a knee pivot, pivotal means connecting said switch member to an intermediate point of said second toggle link, a spring having one end fixed and engaging the other end of said second toggle link to bias the ends of said toggle links toward each other, means normally restraining movement of said carrier member and responsive to the current traversing said contacts to release said carrier member, manually operable means movable transversely of the direction of extension of said toggle links, a swingable link

connecting said knee pivot to said manually operable means, and second fixed stop means limiting movement of said manually operable means in one direction.

11. In an electric circuit breaker, an enclosing casing having an aperture therein, an actuating mechanism mounted in said casing and including a pair of toggle links having a knee pivot, spring means biasing said links to collapsed position, a manual actuating rod connected to said knee pivot and extending through said aperture, and a cap on said rod positioned to engage said casing upon depression of said rod thereby to limit overcenter movement of said toggle links in one direction and simultaneously to seal said aperture.

12. In an electric circuit breaker, an enclosing casing having an aperture therein, a pair of cooperating switch contacts in said casing an overcenter actuating mechanism in said casing connected to control said contacts, spring means for biasing said mechanism to oppositely overset positions, a reciprocable member extending through said aperture and connected to reverse the position of said mechanism, and stop means mounted on said reciprocable member and engageable with said casing to limit overcenter movement of said actuating mechanism in one direction and simultaneously to seal said aperture.

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