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W. H. WOODS

2,352,928

CIRCUIT BREAKER

Filed Feb. 1, 1943

3 Sheets-Sheet 1

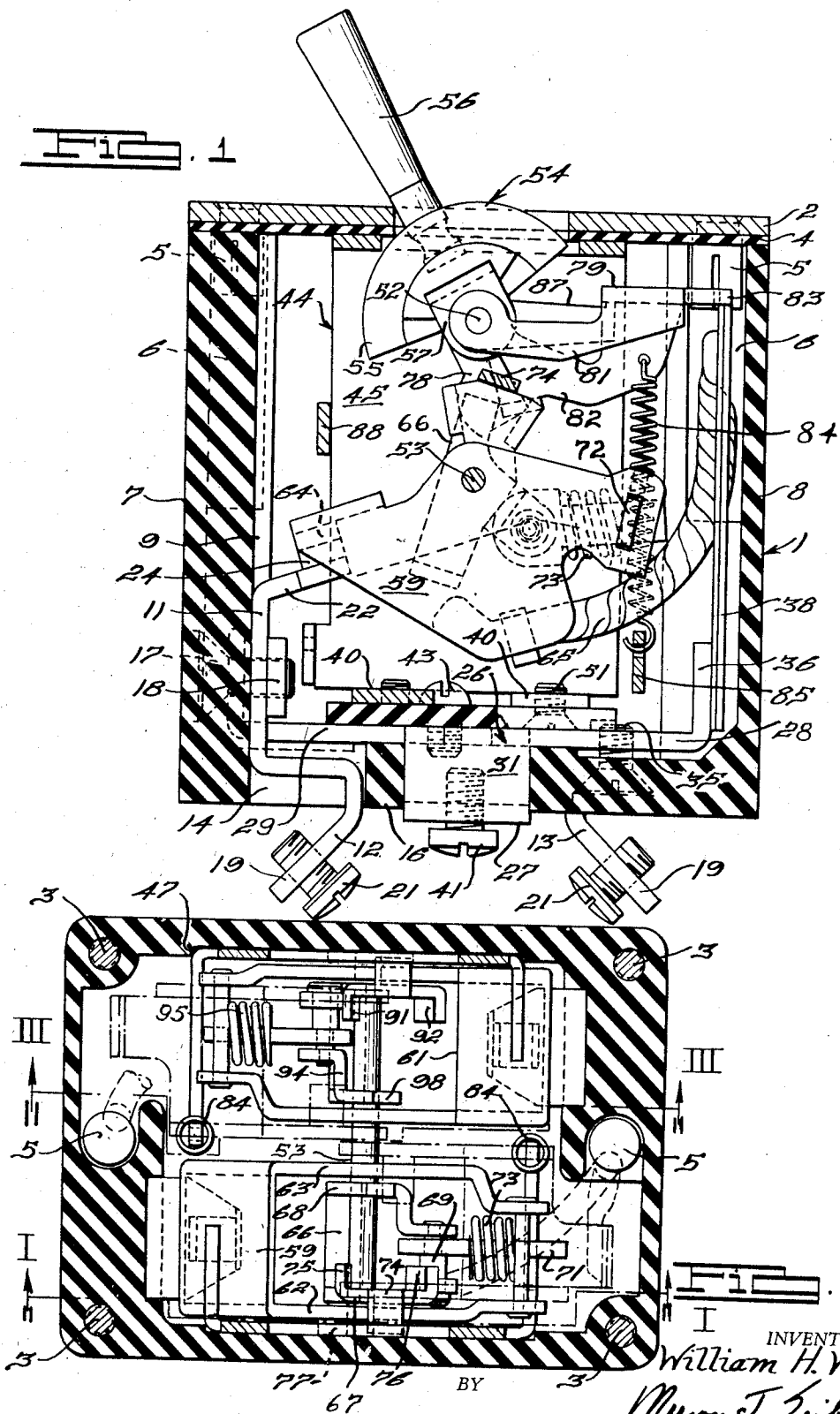


FIG. 2.

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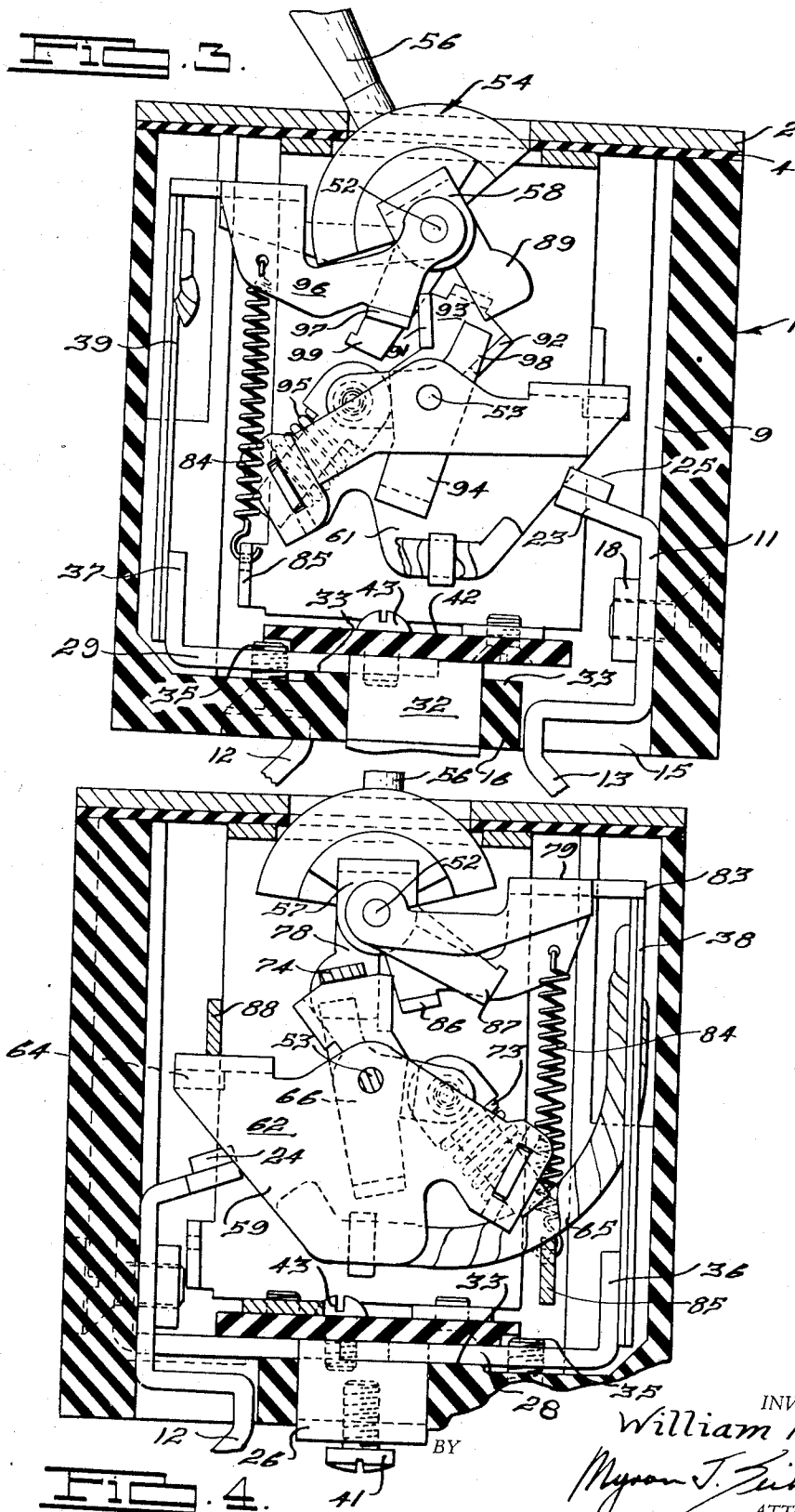
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3 Sheets-Sheet 2



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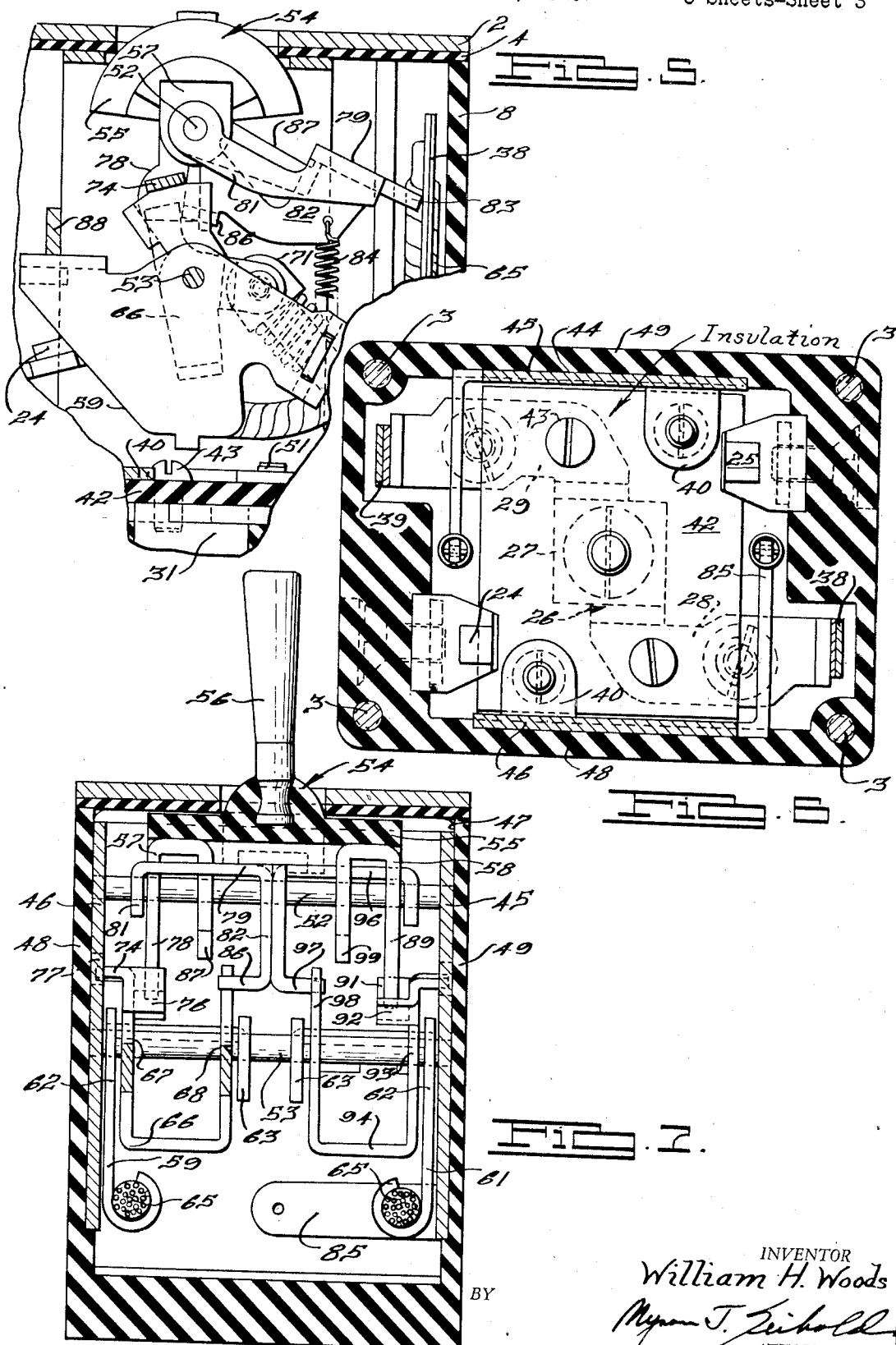
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CIRCUIT BREAKER

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3 Sheets-Sheet 3



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CIRCUIT BREAKER

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8 Claims. (Cl. 200—116)

This invention relates to devices for making and breaking electrical circuits and more particularly to automatic electric circuit breakers.

The object of the present invention is to provide an improved form of double throw quick make and break automatic electric circuit breaker of simple and economical construction.

Other objects and features of this invention will be readily apparent to those skilled in the art from the specification and appended drawings illustrating certain preferred embodiments in which:

Figure 1 is a sectional view taken on the line I—I of Figure 2 and showing a switching member in contacts engaged position.

Figure 2 is a front elevational view of the circuit breaker, according to the present invention, with the cover and handle removed and with the trip lever shown in phantom to thereby illustrate in clearer detail the interior of the device.

Figure 3 is a sectional view taken on the line III—III of Figure 2 and showing a switching member in contacts disengaged position.

Figure 4 is a view similar to Figure 1 but showing the parts in contacts disengaged position.

Figure 5 is a view similar to Figure 1 but showing the parts in automatic tripped position.

Figure 6 is a sectional view omitting the operating mechanism and showing the base assembly.

Figure 7 is a sectional end elevational view showing only certain of the details.

The circuit breaker according to the present invention embodies a generally cup-shaped insulating enclosing member 1 having a metallic cover 2 sealably secured thereto by studs 3 and with an insulating sheet 4 disposed back of the cover 2. A pair of locking bushings 5 are carried by the cover 2 and extend downwardly into recesses 6 provided in side walls 7 and 8 of the enclosing member 1 and are adapted to receive mounting studs, not shown, to secure the circuit breaker at a desired location.

Each of the opposite side walls 7 and 8 of the enclosing member 1 are slotted as at 9 to receive portions 11 of a pair of generally S-shaped conducting connectors 12 and 13; which connectors are adapted to extend through openings 14 and 15 provided in base 16 of the enclosing member 1 to the exterior. The slots 9 are so located within walls 7 and 8 that the connectors 12 and 13 when fitted therein are positioned within the enclosing member diagonally across from one another. Studs 17 and their cooperating nuts 18 secure the connectors 12 and 13 to walls 7 and 8. At the exteriorly disposed ends 19 of each of the connectors 12 and 13, terminal studs 21 are carried for securing cable leads to the circuit breaker; and, upon the interior ends 22 and 23 of the con-

nectors, stationary contact surfaces 24 and 25 are mounted.

A connector or conducting member 26 having a U-shaped central portion 27 and arms 28 and 29 extending from and at right angles to legs 31 and 32 thereof is disposed within the enclosing member 1 and lies upon ledge portions 33 provided on the base of member 1, and is secured in place by studs 35. The ends of arms 28 and 29 are upturned as at 36 and 37, and to these upturned portions are welded the bimetallic members 38 and 39. The U-shaped central portion 27 of the connector 26 provides a common terminal and carries a terminal stud 41. A member 42 comprised of insulating material is disposed over the conducting member 26 and covers a substantial portion of the bottom of the base. Studs 43 threaded into arms 28 and 29 of connector member 26 hold the insulating member 42 in position.

A metallic supporting or mounting member 44 is provided within the enclosing member 1 and comprises a pair of opposed legs 45 and 46, which legs are closely fitted into slots 47 provided in walls 48 and 49 of the enclosing member 1. Mounting flanges 40 are bent from legs 45 and 46 and rest upon the insulating member 42. Studs 51 threaded into the flanges 40 secure them to the insulating member 42 to thereby retain the supporting member 44 within the enclosing member 1. A pair of pins 52 and 53 are carried by legs 45 and 46, one above the other. A manual operator 54 is provided at the top of the breaker and includes a body portion 55 of molded insulation and a handle portion 56 which extends through openings in the supporting member 44, the insulating sheet 4 and the cover 2 to the exterior. The body portion 55 carries a pair of generally U-shaped members 57 and 58, the legs of which are used for a purpose to be hereinafter described. The pin 52 passes through openings in the legs of members 57 and 58 to thereby provide a pivotal mounting for the manual operator 54. The manual operator 54, through members 57 and 58, operates a pair of actuating systems, to be further described, to effect movement of a pair of contact members 59 and 61 to control electric circuits. Each of the contact or switch members 59 and 61 and the actuating means for effecting movement thereof are identical and, therefore, but one of these switching assemblies, and that the one including contact member 59, will be described in detail.

Contact member 59 includes a pair of legs 62 and 63 through which pin 53 is passed to pivotally mount the contact member. A contact surface 64 is provided at one end of the contact member 59 for cooperation with stationary contact 24 to complete a circuit therethrough. A flexible lead 65 interconnects the bimetallic member 38

and the contact member 59 to place the bimetallic member in series circuit with the contacts. A portion of the flexible lead 65 lies within recess 6 so that the lead does not interfere with the operation of the actuating parts. A generally U-shaped member 66 is disposed upon pin 53 and between legs 62 and 63 of contact member 59. Legs 67 and 68 of the U-shaped member 66 carry pin 69 which pivotally mounts one end of a spring guide 71. The switch member 59 supports a cross piece 72 between its legs 62 and 63, which cross piece is provided with a slot there-through to receive the free end of the guide 71. A compression spring 73 is disposed about guide 71 and is interposed between shoulder formations on the guide and the cross piece 72 for a purpose to be described. Leg 67 of member 66 has an end thereof bent outwardly to effect a flange portion 74 and has portions bent inwardly from its lateral edges to provide the flanges 75 and 76. Flange 74 extends into an opening 77 in leg 48 of the supporting member 44 and engages the defining edges thereof to limit the extent of movement of the member 66. To provide for the actuation of member 66, leg 78 of member 57 carried by the manual operator 54 is extended into the space between flanges 75 and 76 on member 66 and is engageable with one or the other, dependent on the direction of movement of the manual operator, and movement of the engaged flange by leg 78 will effect pivotal movement of the member 66.

A trip member 79 comprising a pair of legs 81 and 82 and a latching tip 83 is pivotally mounted on pin 82, the pin passing through openings in the legs 81 and 82. A spring 84 has one end secured to the leg 82 of the trip member 79 and the other end fastened to an extended arm 85 provided by the support 44, and exerts its bias on the trip member 79 to continually bias it for movement in one direction. The latching tip 83 of trip member 79 engages the free end of the bimetallic element 38 and normally maintains the trip member in engaged position against the bias of spring 84. A flange 86 is provided on leg 82 of the trip member and is adapted to engage leg 68 of member 66 when the trip member is released by the bimetal 38 on current overload to effect movement of the member 66 to bring about automatic separation of the contacts as will be further described.

The second leg 87 of member 57 serves as a resetting member for positively returning the trip member 79 into engagement with the bimetal 38 after having been released on current overload.

A flange 88 is bent from leg 45 of the supporting member 44 and extends into the path of movement of the contact member 59 to provide a stop therefor to limit the extent of movement thereof, in clockwise direction, to contacts open position.

The actuating means for contact member 61, as was stated above, is similar to that for contact member 59 and embodies the arm 89 on member 58 which extends between flanges 91 and 92 carried by arm 93 of a pivotal member 94 similar to member 66, and is actuable to move member 94 to effect a change of direction of the line of force of overcenter spring 95 operative on contact member 61 to effect snap movement of this contact member. A trip member 96 is associated with this switching unit and is released by bimetal 38 on current overload, and through flange 97 provided thereon engages and

moves arm 98 on member 94 to move this member for actuation of the overcenter spring 95 to effect automatic movement of the contact member 61. A resetting arm 99 is provided on member 58 for returning trip member 96 into engagement with its associated bimetallic member 38.

The operation of the circuit breaker will now be described:

10 Movement of the manual operator 54 effects movements of the contact members 59 and 61 to their "on" and "off" positions. However, but one of the contact members is adapted to be in contacts engaged position at one time although both may simultaneously be in the contacts disengaged or "off" position, this latter condition being effected when the manual operator 54 occupies its center position. Figure 1 shows contact member 59 in the "on" position, effected by moving the handle 56 from its center position to the left hand position shown. When contact member 59 is in "on" position, contact member 61 will occupy its "off" position, as is seen in Figure 3. Upon clockwise movement of the handle 56 from its left hand position to the center position of Figure 4, arm 78, carried by the manual operator, will transmit force to flange 75 to rotate member 66 to move pin 69 to compress spring 73 and move one end thereof until the line of force of this spring is carried through pivot 53 of the contact member 59 whereupon the energy in the spring becomes active to move the contact member 59 with a snap, in a clockwise direction, to disengage the contacts. The contact member 59 will rotate until it engages the limiting stop 88 as shown in Figure 4; and member 66 will be moved by the released spring force until flange 74 strikes the edge of slot 77. This movement of the manual operator 54 from its left hand position to the center position has no effect on contact member 61 and it remains in "off" position. Arm 89 of member 58 will, however, be moved, on this movement of the operator 54, from the position shown in Figure 3 to a position adjacent flange 91. Movement of the handle 56 clockwise from its center position to its right hand position will cause arm 89 to apply force to flange 91 to rotate member 94 and effect a compression of spring 95 until the line of force of this spring is carried through pivot 53 of the contact member 61 to thereby move the contact member 61 with a snap to contacts "on" position.

This movement of the handle 56 from its center position to the right to effect actuation of the contact member 61 to "on" position has no effect on contact member 59 and it remains in the "off" position of Figure 4. Arm 78, however, will be carried by the manual operator away from its associated flanges 75 and 76 and to a position relative thereto similar to the position that arm 89 in Figure 3 bears to its associated flanges 91 and 92.

Return movement of handle 56 counter-clockwise, from its right hand position to its center position will cause arm 89 to apply force to flange 92 to effect a reverse action of contact member 61 to contacts "off" position. This movement will carry arm 78 to a position adjacent flange 76 so that a continued counter-clockwise movement of handle 56 from center position to the left hand position of Figure 1 will cause a pivotal movement of the actuating member 66 and effect snap movement of the contact member 59 into con-

tacts "on" position (Figure 1) while maintaining contact member 61 in its "off" position.

Thus, each side of the breaker controls a circuit without interference from the switching system on the opposite side. Movement of the handle 56 from the left hand position of Figure 1 to the center position of Figure 4 and back to the left hand position will effect a cycle of movement of the contact member 59 only, while contact member 61 is maintained in its "off" position. Movement of the handle from center position to right hand position and return to center position will effect movement of contact member 61 from "off" to "on" and back to "off" and contact member 59 will remain in "off" position during these movements.

Thus, in the center position of handle 56 both the contact members 59 and 61 will be in "off" position; and movement of the handle 56 from center position to the left or to the right will effect movement of but one of the contact members, to the left it is contact member 59 that is actuated; and to the right, movement of contact member 61 is effected.

In the automatic operation of the parts, assuming the circuit through contacts 24 and 64 to be closed as in Figure 1, the occurrence of an overload current heats the bimetallic element 38 to bend it clockwise to move it out of engagement with tip 83 of the trip member 79, whereupon the trip member 79 will move clockwise under the bias of spring 84 and flange 86 thereon engages and positively moves leg 66 of member 66 to move the line of force of spring 73 through the pivot of contact member 59 to effect a snap movement of the contact member to contacts "off" position; at the same time flange 76 on member 66 engages and positively moves arm 78 to thereby carry the manual operator 54 to its center position. To reset the trip member 79, the manual operator 54 is moved counter-clockwise from its center position to the position of Figure 1 and the depending arm 87 engages and positively returns the trip member 79 to a position where the latching tip 83 will re-engage bimetal 38, if the bimetal has cooled sufficiently to return to its initial position. This resetting movement of the manual operator also simultaneously effects a snap movement of the contact member 59 into "on" position for arm 78 will move member 66 to effect a change in the direction of the line of force of spring 73 from one side to the other of the pivot of contact member 59. If the condition of overload still exists and the manual operator 54 is released, the parts will promptly move to contacts "off" position for the bimetal 38 will act to release trip member 79.

If the circuit should be through the second set of contacts 25, 64 and an overload current were impressed thereon trip member 86 would be released by bimetal 39 to effect a snap movement of contact member 61 to "off" position, and handle 56 will move from its right hand position to the center position.

While certain preferred embodiments of the invention have been specifically disclosed, it is understood that the invention is not limited thereto, as many variations will be readily apparent to those skilled in the art and the invention is to be given its broadest possible interpretation within the terms of the following claims.

What is claimed is:

1. In a double throw automatic electric circuit breaker, a pair of stationary contacts, a pair of movable contacts, a pair of switch members for

moving said movable contacts into and out of engagement with said stationary contacts, snap acting means operatively connected to each of said switch members for effecting a quick movement of each into and out of contacts engaged position, means associated with said switch members whereby but one of said switch members is adapted to be in contacts engaged position at a time, a manual member for actuating said snap acting means, said manual member being operative to alternately move said switch members into contacts engaged position, and current responsive means operative on each of said switch members to effect automatic movement thereof to contacts disengaged position on the occurrence of a current overload.

2. In a double throw automatic electric circuit breaker, a pair of pivotal switch members, movable contacts carried thereby, stationary contacts adapted to be engaged by said movable contacts, snap acting means operatively associated with each of said switch members, manual means actuatable on said snap acting means and adapted to occupy a plurality of positions of rest, said manual means when moved in either direction from a central position of rest operating to effect snap movement of one of said switch members to contacts engaged position, while maintaining the other of said switch members in contacts disengaged position, and current responsive means actuatable on the occurrence of a current overload to effect automatic movement of a switch member from contacts engaged to contacts disengaged position.

3. In an automatic electric circuit breaker, a stationary contact, a movable contact, a switch member movable to move said movable contact to engage and disengage with said stationary contact, a pivotal member, overcenter spring means interconnecting said switch member and said pivotal member, a pair of flange portions provided on said pivotal member and spaced from each other, a manual member, means carried by said manual member and extending between said flange portions, said means on oscillation of said manual member to and from a given position of rest acting alternately on said flange portions to move said pivotal member in opposite directions to actuate said overcenter spring means and effect snap movement of said switch member to and from contacts engaged position, and current responsive means operative, on the occurrence of an overload current, to move said pivotal member to effect snap movement of said switch member to contacts disengaged position.

4. In an automatic electric circuit breaker, a stationary contact, a movable contact, a switch member movable to effect movement of said movable contact for engagement with said stationary contact, a pivotal member provided with a pair of leg portions, overcenter spring means interconnecting said switch member and said pivotal member, spaced means carried by one of said leg portions, a manual member, a member carried by said manual member and extending between said spaced means, said member on movement of said manual member being adapted to alternately apply force to said spaced means to effect movement of said pivotal member in alternate directions to actuate said overcenter spring means and effect snap movements of said switch member to and from contacts engaged position, and a pivotal trip member movable on the occurrence of an overload current to engage the other leg portion of said pivotal member to move said

pivotal member to effect snap movement of said switch member to contacts disengaged position.

5. In an automatic electric circuit breaker, a stationary contact, a movable contact, a pivotal switch member movable to move said movable contact for engagement and disengagement with said stationary contact to make and break an electrical circuit therethrough, a pivotal element provided with a pair of leg members, overcenter spring means interconnecting said switch member and said pivotal element, spaced flange portions provided on one of said leg members, a manual operator, an arm carried by said manual operator and extending between said spaced flanges, said arm on movement of said manual operator being adapted to alternately apply force to said spaced flanges to effect movement of said pivotal element in alternate directions to actuate said overcenter spring means and effect snap movements of said pivotal switch member to and from contacts engaged position, a pivotal trip member, spring means continually biasing said trip member for movement in one direction, and a bimetallic element restraining said trip member from movement, said bimetallic element releasing said trip member for movement on the occurrence of a current overload.

6. In an automatic electric circuit breaker, a stationary contact, a movable contact, a switch member, a pivot therefor, said switch member being movable to move said movable contact for cooperation with said stationary contact to make and break an electrical circuit, a pivotal element mounted on said pivot and comprising a pair of leg members, snap acting means interconnecting said switch member and said pivotal element, spaced flange portions provided on one of said leg members, a manual operator, a second pivot and on which said manual operator is mounted, a member supported by said manual operator and extending therefrom into the space between said flange portions, said member upon movement of said manual operator transmitting force to said flange portions alternately to effect movement of said pivotal element in opposite directions to actuate said snap acting means to effect quick pivotal movements of said switch member to and from contacts engaged position, a trip member also pivotally mounted on said second pivot, spring means continually exerting its bias on said trip member for movement thereof in one direction, a bimetallic element engaging said trip member to hold it restrained against the bias of said spring means, said bimetallic element releasing said trip member for movement on the occurrence of a current overload to engage and move said pivotal element to effect snap movement of said switch member to contacts disengaged position, and a second member supported by said manual operator and adapted to be moved thereby into engagement with said trip member to move said trip member to re-engage said bimetallic member after its release therefrom on current overload.

7. In a double throw automatic electric circuit breaker, an insulating base, a pair of stationary contacts disposed therein, a mounting member carried by said base, a pair of switch members pivotally supported on said mounting member, a movable contact carried by each of said switch members for cooperation with said stationary contacts, a pair of pivotal members supported on said mounting member, snap imparting means interconnecting said switch members and said

pivotal members, each of said pivotal members being provided with spaced flange portions, a manual operator for moving said switch members and having a plurality of positions of rest, said manual operator when in its central position of rest maintaining both of said switch members in contacts disengaged position, a pair of members rigidly supported by said manual operator and extending therefrom into the spaces between said flange portions, movement of said manual operator in a first direction from said central position of rest to a second position of rest causing the first of said extending members to apply force to one of said flange portions on one of said pivotal members for movement thereof to actuate a snap imparting means associated therewith to effect snap movement of the first of said switch members to contacts engaged position, return movement of said manual operator to said central position of rest causing said extending member to apply force to the other of said spaced flange portions to move said pivotal member to effect snap movement of said first switch member to contacts disengaged position, movement of said manual operator from said central position of rest in a second direction to a third position of rest causing the second extending member to apply force to a flange portion on said second pivotal member for movement thereof to actuate a snap imparting means associated therewith to effect snap movement of said second switch member to contacts engaged position, return movement of said manual operator to said central position causing said second extending member to apply force to the other of said spaced flange portions to move said second pivotal member to effect snap movement of said second switch member to contacts disengaged position, and current responsive means operative on current overload to actuate the switch member in contacts engaged position to effect movement thereof to contacts disengaged position.

8. In a double throw automatic electric circuit breaker, a generally cup-shaped insulating base, a pair of stationary contacts disposed therein, a pair of switch members oppositely directed to one another and supporting movable contacts for cooperation with said stationary contacts, a pair of pivotal members, overcenter spring means interconnecting said pivotal members and said switch members, a manual member, means carried thereby and adapted to engage and move said pivotal members alternately to effect snap movements of one of said switch members to and from contacts engaged position while maintaining the other switch member in contacts disengaged position, a connector member disposed adjacent the bottom of said insulating base and extending diagonally thereacross, a pair of bimetallic members secured to said connector, one at each end, flexible leads interconnecting said bimetallic members and said switch members, trip members provided for each switch member, each trip member being spring biased for movement in one direction, said bimetallic members engaging said trip members to restrain them against said spring bias, said bimetallic members being adapted to flex to release said trip members on the occurrence of an overload current, each trip member when released being movable to engage and move a pivotal member to effect snap movement of a switch member to contacts disengaged position.

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