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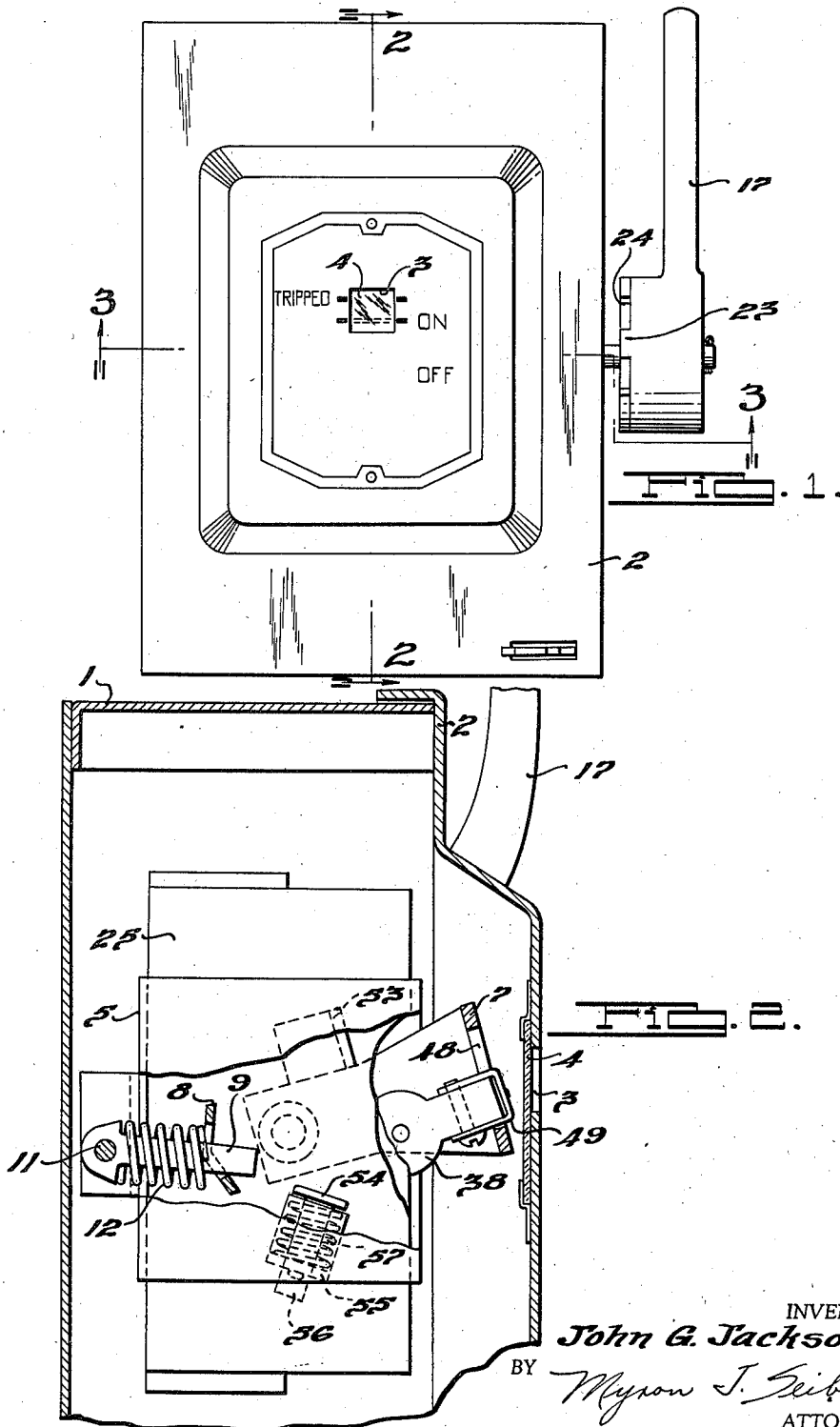
J. G. JACKSON

2,231,072

CIRCUIT BREAKER

Filed May 23, 1936

3 Sheets-Sheet 1



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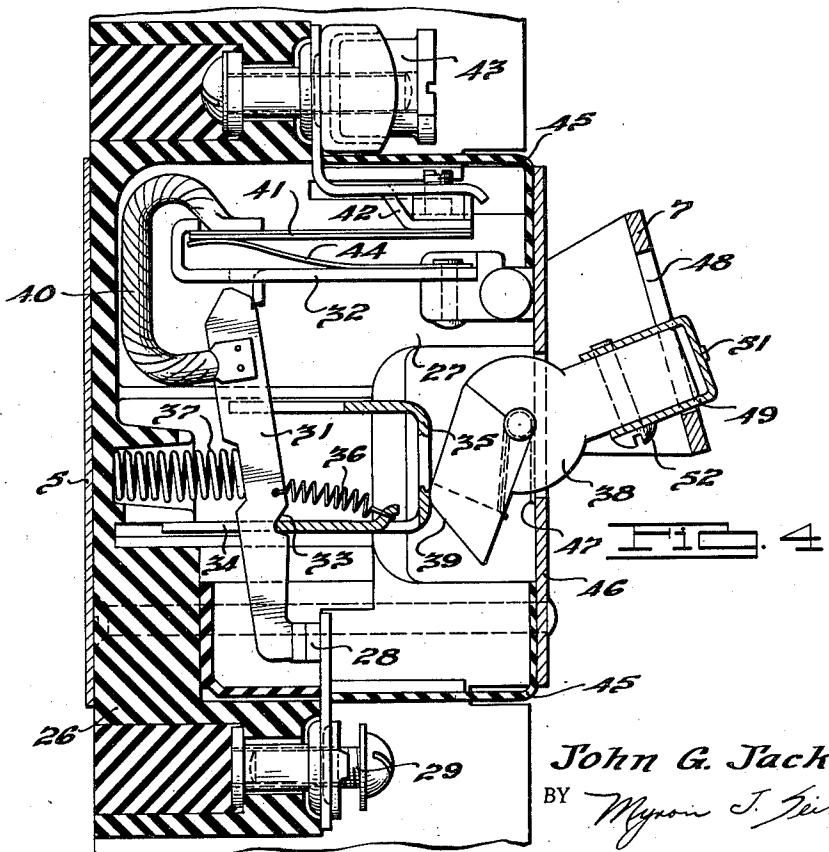
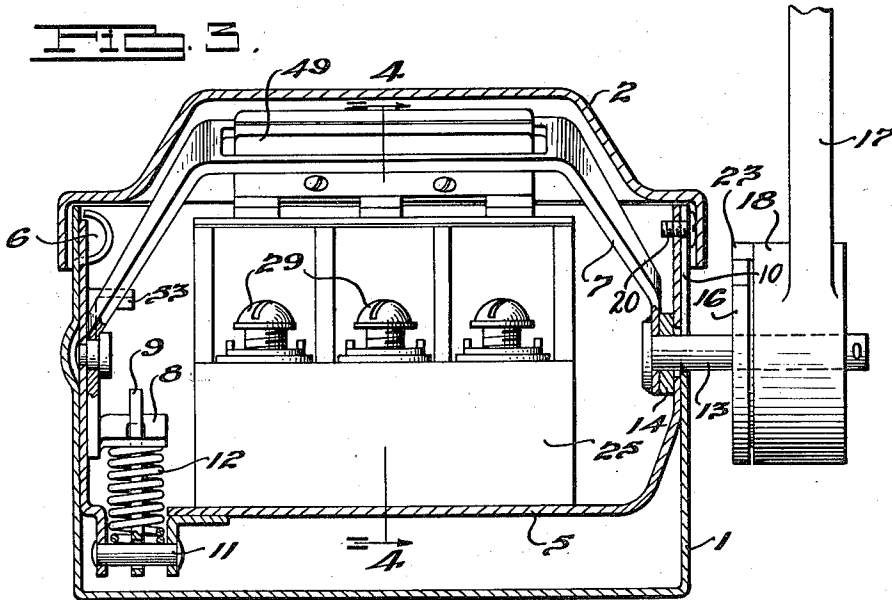
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CIRCUIT BREAKER

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3 Sheets-Sheet 2



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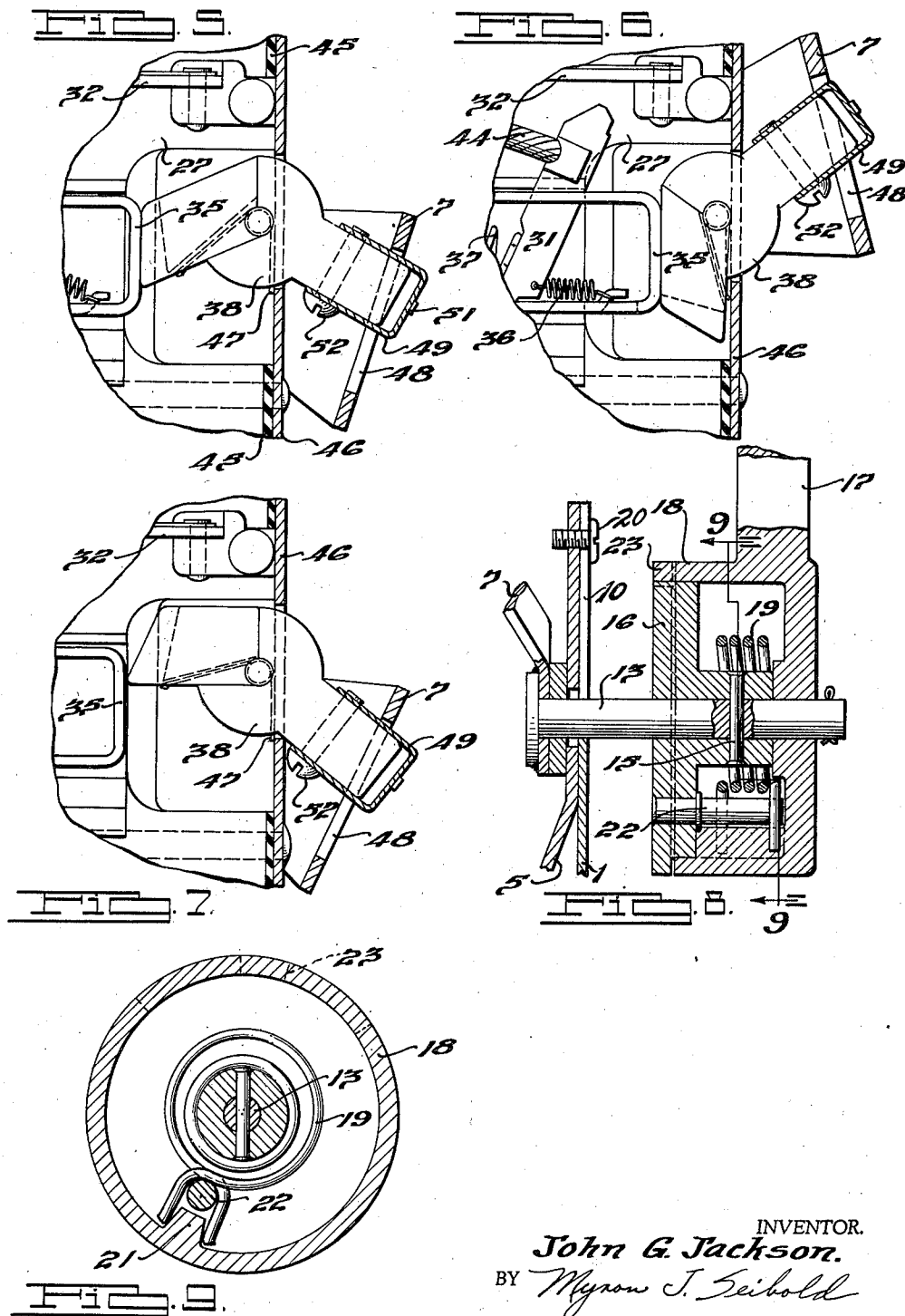
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CIRCUIT BREAKER

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,231,072

CIRCUIT BREAKER

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Application May 23, 1936, Serial No. 81,369

14 Claims. (Cl. 200-168)

This invention relates to devices for making and breaking electric circuits and more particularly to electrical circuit breakers automatically operable in response to current overload.

One object of the present invention is the conversion of a circuit breaker whose manual operation is normally dependent upon the speed of the operating handle into an enclosed type of circuit breaker wherein the speed of the operation of the breaker mechanism will be independent of the speed of the exterior handle.

Another object of the invention is to provide a quick make and break mechanism for an automatic electric circuit breaker.

Another object of the present invention is to provide an enclosed circuit breaker with quick make and break mechanism exterior of the circuit breaker mechanism and with provision for indicating the automatically tripped condition of the breaker mechanism.

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

Figure 1 is a front elevational view of an enclosed circuit breaker according to the present invention.

Figure 2 is a vertical sectional view taken on the line II-II of Figure 1 with a portion broken back to show the over-center operating spring.

Figure 3 is a horizontal sectional view taken on the line III-III of Figure 1 with certain parts left in elevation.

Figure 4 is a vertical sectional view of the circuit breaker mechanism taken on the line IV-IV of Figure 3.

Figure 5 is a partial sectional view showing the operating parts in manual "off" position.

Figure 6 is a partial sectional view showing the operating parts in automatically tripped position.

Figure 7 is a partial sectional view showing the operating parts in the resetting position.

Figure 8 is a detail sectional view of the hub portion of the exterior operating handle.

Figure 9 is a sectional view taken on the line IX-IX of Figure 8.

The circuit breaker according to the present invention includes an exterior enclosing box 1 having a cover 2 provided with an opening 3 closed by a plate of glass or other transparent material 4. Within the box a generally U-shaped supporting plate 5 is hingedly mounted on the side wall as at 6. Upon the opposite side walls

of strap 5 is pivotally supported an operating strap 7. The end of the strap 7 remote from the exterior operating handle to be hereinafter described is provided with a flanged portion 8 having a slot therein through which projects a spring guide 9 pivotally mounted on a rivet 11 secured to the strap 5. A compression spring 12 surrounds the guide 9 and is compressed between flange 8 and rivet 11. At its opposite end the strap 7 is rigidly secured to a pin 13 extending through an opening in the strap 5 and a slot 10 in the side wall of the box to the exterior thereof. A stud 20 threaded into the strap 5 and tightenable against the side wall of the box is provided for maintaining the strap within the box interior. A plate 14 rigid with the strap 5 may be provided closely surrounding the pin 13 to provide a bearing therefor.

Keyed on the pin 13 as by rivet 15 is an exterior operating portion 16. Pivotaly mounted on the pin 13 is an operating handle 17 having a cup-shaped portion 18 cooperating with the operating portion 16 to form an enclosure for a torsion spring 19 which is disposed around a hub part of the operating portion 16. The interior of the cup portion 18 on the handle 17 is provided with a projection 21 and the operating portion 16 has a pin 22 rigid therewith and the opposite ends of the torsion spring 19 are disposed at opposite sides of the pin 22 and the projection 21.

The handle 17 is provided with a projection 23 within a notch 24 in the operating portion 16. The projection 23 and the ends of the notch provide for limited lost motion connection between the handle 17 and the operating portion 16 and for positive movement of the operating portion 16 by means of the handle when the projection 23 engages the opposite ends of the notch.

Upon the supporting strap 5 is mounted a circuit breaker denoted generally at 25 and corresponding in general to that disclosed in applicant's copending application, Serial No. 64,575, filed February 18, 1936, now Patent No. 2,096,544. This circuit breaker may be of single or multiple type and has been here illustrated as a three pole circuit breaker. The circuit breaker comprises a generally cup-shaped base 26 having a pair of walls 27 dividing the base into three compartments for the individual poles of the breaker. At one end of the base are provided stationary contacts 28 leading to terminal connectors 29 at the exterior of the circuit breaker enclosure. Each pole is further provided with a floating contact bar 31 having a contact sur-

face at one end cooperating with the corresponding stationary contact 28 and latched at its opposite end to a common latching member 32. The bars 31 are provided with notches 33 in their upper edges received within the ends of slots 34 within operating members 35. Light tension springs 36 bias the members 35 within the notches 33 in the floating bars. Main operating springs 37 bias the bars against the stationary contacts and the latching surfaces and for rotation about their engagement with the operating members 35.

Individual operating handles 38 are provided with interior cam surfaces 39 cooperating with the operating members 35 to effect longitudinal movement thereof to move the contact bars 31. Individual bimetallic elements 41 are provided mounted at one end on connectors 42 leading to terminals 43 on the exterior of the breaker enclosure. Flexible leads 40 interconnect the free ends of the bimetallic members 41 with the bars 31. The latching element 32 comprises individual latches for the individual bars rigidly joined together for common movement by any one of the bimetallic members 41 in order to release all the bars 31 in response to movement of any one of the bimetals 41. Spring strips 44 bias the main portion of the latching element 32 away from the bimetallic members 41. The opposite ends of the breaker are provided with fibre shields 45 and the enclosure is completed by a top cover 46 riveted or otherwise secured to the base. A light spring 47 biases the handles 38 for rotation into engagement with the members 35 to secure an indicating position as hereinafter explained.

The operating strap 7 is provided with a wide slot 48 and within this slot are disposed the operating handles 38 when the breaker is mounted on the strap 5. The handles have been shown as joined together by a U-shaped extension piece 49 to insure that the handles will not slip out of the slot 48. An indicating stripe 51 is placed at the front of the extension 49. This extension piece is clamped on the handles by means of studs 52.

Upon the side wall of the box adjacent the over-center spring 12 are disposed a rigid stop 53 for positively stopping the operating strap 7 in the normal "on" position of the parts and a resilient stop 54 for resiliently stopping the strap in the "off" position of the parts. The resilient stop includes a bracket 55 rigid with the side wall of the box and provided with a slot through which extends the guide or pin portion 56 on the stop 54. A compression spring 57 is provided about the guide between the bracket and the stop.

It is understood that extension 49 is an optional portion of the device as the parts may be constructed so that the handle may be inserted well within the slot 48 in the strap 7 as it is mounted on the strap 5, whereupon the extension 49 becomes unnecessary and the indicating stripe 51 may be placed upon the central handle. It is unnecessary that the individual handles 8 be joined together as shown by the extension 49 as they will have common movement in any event by engagement with the strap 7.

The parts as shown in Figure 4 are in the normal operating position. To move the parts to "off" position the exterior operating handle is rotated in a downward direction whereupon the handle moves relatively to the operating portion 16, thus placing the spring 19 under tension.

This continues until the extension 23 on the operating handle engages the corresponding end of the notch 24 in operating portion 16, whereupon this portion is positively moved by the handle. This movement also moves the operating strap 7 which is rigidly connected to the operating portion 16 through pin 13 and the compression spring 12 is moved toward its dead center position from the position shown in Figure 2. As the spring 12 approaches its dead center position the force necessary to move it decreases very rapidly and the force stored in spring 19 throws it through its dead center position whereupon the over-center spring 12 continues the movement of strap 7 into the "off" position shown in Figure 5. In this movement the strap 7 will engage the resilient stop 54 and be maintained in position in Figure 5 by this resilient stop. To move the parts back to the "on" position the handle is simply rotated upwardly whereupon a reverse action takes place with the spring 19 being again tensioned to throw the over-center spring 12 through its dead center position whereupon the parts will assume the position shown in Figures 2 and 4.

Upon the passage of an overload current through any one of the bimetals 41 the latching element 32 will be moved toward the corresponding end of the circuit breaker enclosure whereupon the bars 31 will be released and will rotate about their engagement with operating members 35 under the bias of the springs 37 into the position shown in Figure 6, which is the automatically tripped position of the breaker. As the spring 47 is relatively weak, the operating members 35 in this position have moved upwardly rotating the handles counterclockwise as shown. This indicating position of the operating handle may be viewed from the exterior of the circuit breaker enclosure through the window at the front of the cover and the automatically tripped condition of the circuit breaker can be readily ascertained. This movement of the operating handles is permitted by the enlarged slot 48 in the operating strap 7. To make the visual indication of the tripped condition more apparent indicia may be placed on the front cover in alignment with the stripe 51 in its "on" and tripped positions as shown in Figure 1.

To reset the circuit breaker mechanism after an automatic trip the handle is rotated downwardly beyond its "off" position, whereupon the parts assume the position shown in Figure 7. In this movement the strap 7 must be positively moved against the resilient stop 54 until the operating handles 38 move beyond their "off" position. In this movement the contact ends of the bars 31 engage the bottoms of the arc chambers and thereafter rotate about their engagement with the operating members 35 until their latching ends pass beneath the latch portions on the latching element 32. Release of the operating handle after this reset operation places the parts in normal "off" position as in Figure 5 and to again place the circuit breaker in normal operating position the handle is moved upwardly as in normal manual operation.

It is seen that while the normal operation of the circuit breaker itself is dependent upon the speed of operation of the handles 38, provision is here made for providing quick make and break operation of the circuit breaker mechanism in response to the operation of the exterior handle 17 while at the same time preserving automatic trip indication. This enables the rather

simple circuit breaker mechanism shown to be used where quick make and break operation is required without the necessity of changing to the expensive and complex type of circuit breaker where the quick make and break mechanism is a part of the normal circuit breaker operating mechanism.

When the cover of the enclosing box is opened the stud 20 may be loosened and the hinge strap 10 5 is then free to be swung to the exterior of the box carrying with it the circuit breaker and its operating mechanism so as to uncover the box interior and provide a large space to facilitate the drawing in of wires and the attachment of a conduit.

It is understood that in its broad aspects applicant's invention includes the use of any external quick make and break operating mechanism with any type of circuit breaker and that while certain preferred embodiments of the invention have been specifically disclosed, 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:

I claim:

1. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operating handle on the exterior of said box, means operatively connecting said handle with said operating means, means for causing the movement of said operating means in response to movement of said handle to be snap-like in action, means for resiliently stopping said connecting means in one direction to maintain said operating means in a normal position, said handle positively moving said connecting means against the bias of said resilient means to move said operating means to resetting position after an automatic operation of the circuit breaker mechanism.

2. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operating handle on the exterior of said box, means operatively connecting said handles with said operating means, means for causing the movement of said operating means in response to movement of said handle to be snap-like in action, means for positively stopping said connecting means in one direction, and a resilient stop for said connecting means in the opposite direction, said handle positively moving said connecting means against said resilient stop to effect movement of said operating means to resetting position.

3. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operating handle on the exterior of said box, means operatively connecting said handle with said operating means and providing for limited independent movement of the operating means to a position indicating automatic operation of the circuit breaker mechanism, and means moving

said connecting means with a snap action in response to movement of the handle.

4. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having manual operating means therefor projecting through the enclosure and disposed within the box, an operating handle on the exterior of said box, means operatively connecting the handle at the exterior of the box with the operating means within the box, said last mentioned means providing for limited movement of the operating means independent of the exterior handle into an indicating position, said operating means assuming said indicating position in response to an automatic operation of the circuit breaker mechanism, and a window in said box adjacent to said operating means for disclosing said indicating position to inspection without the necessity of opening the box.

5. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operating handle on the exterior of said box, means operatively connecting said handle with said operating means and providing for limited independent movement of the operating means, said operating means assuming an indicating position in response to an automatic operation of the circuit breaker, a window in said box adjacent to said operating means for disclosing said position, and means for causing the movement of said operating means in response to movement of said handle to be snap-like in action.

6. An electric circuit breaker comprising an outer enclosing box, a circuit breaker enclosure mounted within said box, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, the speed of manual operation of said mechanism being dependent on the speed of movement of said operating means, an operating handle on the exterior of said box, and means for moving said operating means with a snap action in response to movement of said exterior handle.

7. An electric circuit breaker comprising an outer enclosing box, a hinged supporting strap within said box, a circuit breaker enclosure mounted on said strap for swinging movement to the exterior of the enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operator pivoted on said strap and engaging said operating means, over-center spring means operatively connected to said operator, and a handle on the exterior of said box operatively connected to said operator.

8. An electric circuit breaker comprising an outer enclosing box, a hinged supporting strap within said box, a circuit breaker enclosure mounted on said strap for swinging movement to the exterior of the enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the enclosure, an operator pivoted on said strap and engaging said operating means, over-center spring means operatively connected to said operator, a

handle on the exterior of said box operatively connected to said operator through a lost motion connection, and spring means biasing said handle to a definite position with respect to said operator, said last mentioned spring means being compressed by movement of the handle in either direction to throw said over-center spring means through dead-center position.

9. Electric circuit breaker apparatus comprising an outer enclosing box, a complete unitary electric circuit breaker mounted within said box and including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and operating means projecting through the front of the enclosure, an operating handle at the exterior of said outer enclosing box, and means for moving said operating means with a snap action in response to movement of said exterior handle, irrespective of the speed of movement of the exterior handle.

10. Electric circuit breaker apparatus comprising an outer enclosing box, a complete unitary electric circuit breaker mounted within said box and including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and operating means projecting through the front of the enclosure, the speed of manual operation of said mechanism being dependent upon the speed of movement of said operating means, an operating handle at the exterior of said outer enclosing box, means operatively connecting said handle with said operating means, and means independent of said circuit breaker mechanism for causing the movement of said operating means to be snap-like in action in response to movement of said handle, irrespective of the speed of movement of the handle.

11. Electric circuit breaker apparatus comprising a complete unitary electric circuit breaker including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the front of the enclosure, a second operating means exterior to said enclosure, and means at the exterior of the enclosure interconnecting said operating means and effecting movement of said first operating means with a snap-like action in response to movement of said second operating means, irrespective of the speed of movement of said second operating means.

12. Electric circuit breaker apparatus comprising a complete unitary electric circuit breaker including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the front of the enclosure, the speed of manual operation of said mechanism being dependent upon the speed of movement of said operating means, a second operating means exterior to said enclosure, and snap acting operating mechanism exterior to said enclosure and operatively connected to said operating means for moving said first operating means with a snap action in response to movement of said second operating means, irrespective of the speed of movement of said second operating means.

13. Electric circuit breaker apparatus comprising an outer enclosing box, a complete unitary electric circuit breaker mounted within said box and including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and operating means projecting through the front of the enclosure, the speed of manual operation of said mechanism being dependent upon the speed of movement of said operating means, an operating handle at the exterior of said outer enclosing box, means including a lost motion connection for connecting said exterior handle to said operating means, and an over-center spring for effecting snap acting movement of said operating means in response to movement of said exterior handle.

14. Electric circuit breaker apparatus comprising a complete unitary electric circuit breaker including an enclosure, automatic and manual electric circuit breaker mechanism mounted within said enclosure and having operating means projecting through the front of the enclosure, the speed of manual operation of said mechanism being dependent upon the speed of movement of said operating means, a second operating means exterior to said enclosure, means including a lost motion connection for connecting said operating means, and an over-center spring for effecting snap acting movement of said first operating means in response to movement of said second operating means.

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