March 3, 1931. O. S. JENNINGS 1,794,901

CIRCUIT BREAKER

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Fig. 1.

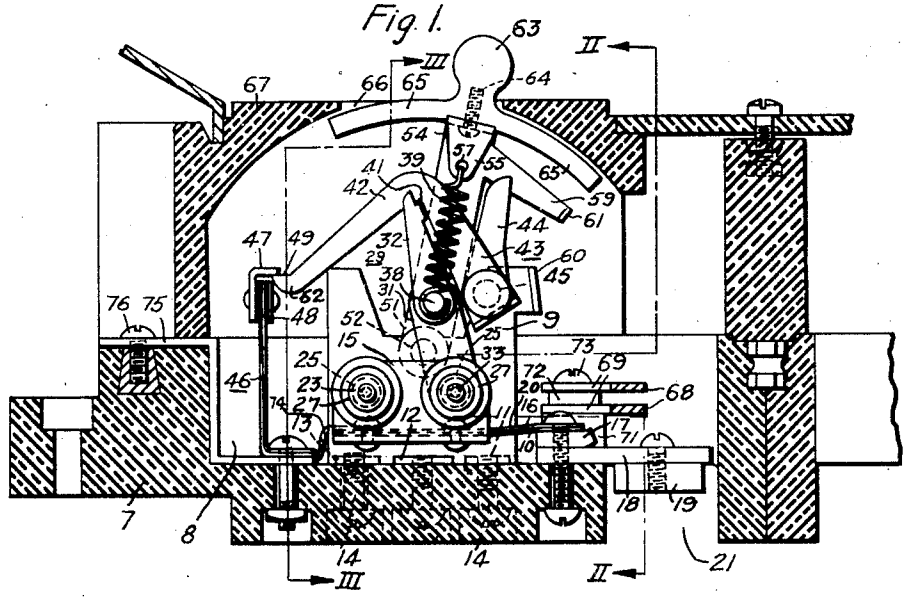
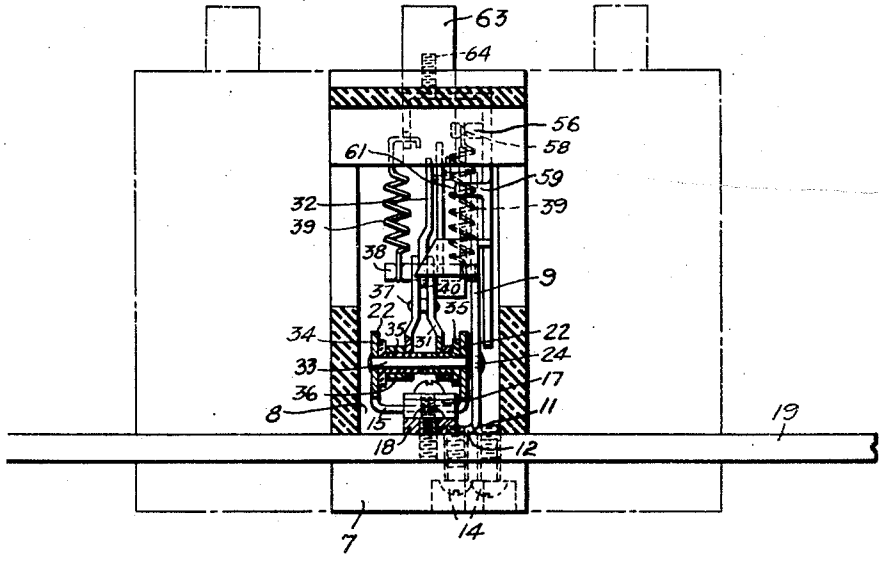


Fig. 2.



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Fig.3.

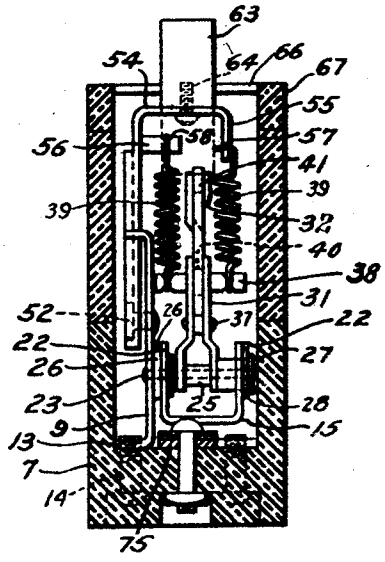


Fig.4.

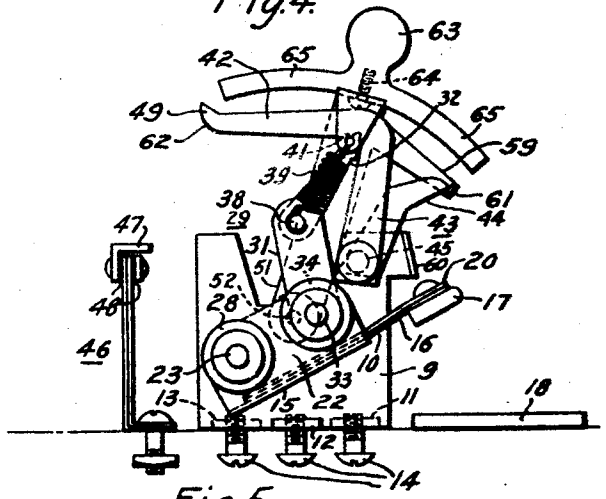


Fig.5.

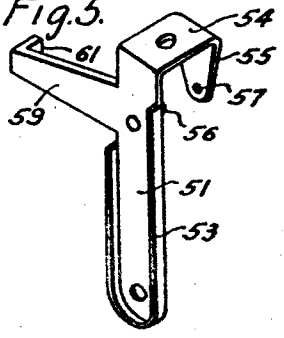
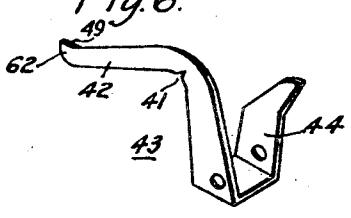


Fig.6.



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Patented Mar. 3, 1931 1,794,901

UNITED STATES PATENT OFFICE

OLIVER S. JENNINGS, OF MANSFIELD, OHIO, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

CIRCUIT BREAKER

Application filed April 20, 1929. Serial No. 356,646.

My invention relates to circuit breakers and particularly to circuit breakers for controlling small power and lighting circuits and which are particularly adapted for use as entrance circuit breakers for house-wiring and as branch-line distributing-panel circuit breakers.

An object of my invention is to provide a circuit breaker of the type illustrated in the copending application filed August 11, 1927, by Fred G. Von Horn, Serial No 212,289, and assigned to the Westinghouse Electric & Manufacturing Company, wherein the structural details are of such design that the component parts of the circuit breaker may be inexpensively manufactured and readily assembled.

A further object of my invention is to provide a circuit breaker of the type above-mentioned, that shall be of compact construction and adapted for mounting in the panel structure disclosed in my copending application, Serial No. 356,647, and filed concurrently herewith.

A further object of my invention is to provide a circuit breaker wherein the component parts thereof may be mounted upon a single supporting plate to be secured to an insulating base, thereby reducing the number of parts required and facilitating assembly of the device, as well as reducing the cost of manufacturing.

These and other objects that will be made apparent throughout the further description of my invention are attained by means of the apparatus hereinafter described and illustrated in the accompanying drawings, wherein—

Figure 1 is an elevational view partially in longitudinal section of a circuit breaker and enclosure embodying features of my invention,

Fig. 2 is an elevational view partially in transverse section of the circuit breaker shown in Fig. 1, the section being taken on the broken line II—II thereof and further illustrating the manner in which a plurality of units are assembled when used in a panel structure,

Fig. 3 is a transverse section of a circuit breaker shown in Fig. 1, taken on lines III—III thereof,

Fig. 4 is an elevational view of the circuit breaker shown in Fig. 1, showing the circuit breaker in tripped-open position, and

Figs. 5 and 6 are perspective views, respectively, of the operating lever and the cradle for supporting the switch-operating toggle.

Referring to the drawings, the circuit breaker comprises an insulating base 7 having a recess 8 therein, in which the circuit-breaker unit is mounted. A supporting plate 9 is provided with three integral base lugs 11, 12 and 13 that extend at right angles from the bottom edge of the supporting plate and serve as securing means for attaching the supporting plate to the base by means of the screws 14, as indicated in the drawings.

A contact arm 15, comprising a metal plate of U shape, is provided with a flexible extension 16 consisting of a copper strap 10 and a steel strap 20. The contact 16 that carries the contact member 17 is adapted to engage a stationary contact plate 18 that is electrically connected to a feed bus 19 disposed in the recess 21 in the base 7.

The side plates 22 of the contact arm 15 are pivotally mounted upon a rigid shaft 23 that is securely riveted at 24 to the supporting plate 9, the side plates being insulated from the shaft 23 by means of an insulating bushing 25 that surrounds the shaft and upon which the contact arm turns.

The contact arm 15 is insulated from the supporting plate 9 by an insulating washer 26 and from the enlarged retaining head 27 of the shaft 23 by the insulating washer 28. It will be seen from the foregoing that the switch arm is entirely insulated from the supporting structure and may be moved to the full-open position shown in Fig. 4.

The contact arm is actuated by means of a toggle 29 which comprises a pair of links 31 and 32, the former being pivotally connected to the contact arm 15 by means of a shaft 33, it being understood that the link 31 is completely insulated from the contact arm by means of insulating bushings 34, 35 and spacing bushings 36 (see Fig. 2). The link 31 consists of two pieces of sheet metal that

are held together by rivet 37, the upper ends being separated, as indicated in Fig. 3, to straddle the lower end of the link 32. The knee-pivot shaft 38 of the toggle extends through both links and is notched at its ends for receiving the looped ends of a pair of operating springs 39, the purpose of which will more fully appear. The central portion of the shaft is enlarged at 40 to center the shaft and prevent longitudinal development thereof.

The upper end of the toggle link 32 is pivotally supported in a notch 41 of V-shape in an arm 42 of a cradle 43 that comprises a sheet-metal plate bent in U-shape to constitute the cradle 43 having an integral stop arm 44. The cradle 43 is pivotally mounted upon the supporting plate 9 by means of a shaft 45 that is riveted to the supporting plate 9.

The cradle 43 is retained in the closed position shown in Fig. 1 by means of a bimetal thermal element 46 having a latch 47 that is insulated from the element by means of insulating washers 48, the latch serving to engage a shoulder 49 on the cradle arm 42 and releasably retain it against clockwise rotation to the open position of the cradle shown in Fig. 4.

An operating lever 51 is pivotally mounted upon the supporting plate 9 on the side opposite that upon which the contact arm is mounted, by means of a shaft 52 that is riveted to the supporting plate. The lever 51 is provided with a reinforcing flange 53 (Fig. 5) for stiffening the sheet-metal lever which is provided with an integral angularly disposed portion 54 to overhang the outer edge of the supporting plate. The overhanging portion 54 is provided with a depending extension 55, and a stud or shaft 56 is riveted to the lever 51 in alinement with a hole 57 in the depending extension 55.

One end of the innermost spring 39 is provided with a loop that engages a notch 58 in the shaft 56, and the end of the outermost spring 39 is provided with a loop that extends through the hole 57, as indicated in Figs. 3 and 4. The springs 39, therefore, normally exert tension upon the knee pivot of the toggle, tending to collapse or break the toggle and cause the contact arm to move to open position. When the cradle 43 is in the closed position shown in Fig. 1, movement of the operating handle to the right or to the left causes the toggle links to straighten or make the toggle and close the contact arm, or break and open the contact arm, respectively.

The springs 39 are commonly known as over-center springs which serve to either make or break the toggle with a snap action after the operating lever has moved a predetermined distance. When the carriage is released, by reason of the thermal element moving the latch 47 out of engagement with the shoulder 49 of the carriage arm 42, the springs 39 contract and instantly withdraw the carriage arm to the position shown in Fig. 4. This movement of the carriage arm automatically breaks the toggle and causes it to collapse and instantly move the contact arm to open position.

In order to reset the cradle to the closed position shown in Fig. 1, the operating lever 51 is provided with an arm 59 having an angularly disposed finger 61 that engages the end of the cradle arm 44, and moves the cradle 43 from the open position shown in Fig. 4 to the set position shown in Fig. 1 when the lever 51 is moved to the left or in a counterclockwise direction. The finger 61 moves the cradle arm 44, and the cradle arm 42 snaps beneath the latch 47 which is momentarily displaced by the curved edge 62 of the arm 42. The opening movement of the cradle 43 is limited by a fixed stop arm 60 integral with the supporting plate 9. This stop arm also limits the opening movement of the switch contact 17, as indicated in Fig 4.

The operating lever 51 is provided with an insulating operating handle 63 that is attached to the lever 51 by means of a screw 64. The handle is provided with extensions 65 that serve to close an opening 66 in the insulating cover 67 that is mounted upon the insulating base 7 and attached thereto by any convenient means, such as that illustrated in my copending application above referred to.

In order to facilitate extinguishing the arc when the contact arm is moved to open position, a plurality of metal arc-quenching barrier plates 68 are mounted in spaced relation and insulated from one another within the recess 8 of the base 7, as indicated in Fig. 1, the barrier plates being provided with slots 69 through which the contact 17 moves to open or to closed position. The action of the barrier plates is fully described in my copending application, Serial No. 606,565 filed December 13, 1922. The barrier plates, in this instance, are mounted upon an insulating seat 71 that constitute an integral part of the base 7, and the plates are separated by an insulating washer 72, the plates and washer being retained in assembled position by means of a screw 73.

It will be understood that the base and panel mounting herein shown is disclosed in my copending application, Serial No. 356,647, filed concurrently herewith, no claim being made to the circuit-breaker mounting in this application.

It will be understood that current enters the circuit breaker through the feed bus 19 and passes, through the contact plate 18, contact 17, flexible extension 16 and contact arm 15, to a flexible connector 74 that is connected to one leg of the bimetal terminal element 46 which is of the usual U-shape. The other

leg of the bimetal element is conductively connected to a terminal conductor 75 that extends exteriorly of the base and cover and is provided with a terminal screw 76 to which the branch-line conductor may be connected.

It will be seen from the foregoing that, by reason of mounting the component parts of the circuit breaker unit upon a single supporting plate, the construction is materially simplified and assembly considerably facilitated. The number of parts is reduced and the cost thereof is also reduced to a minimum. The open construction of the circuit-breaker unit also renders the device accessible for inspection and repairs.

While I have illustrated but one embodiment of my invention, it will be apparent to those skilled in the art that various changes, modifications, substitutions, additions and omissions may be made in the apparatus illustrated without departing from the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. A switch structure comprising a single supporting plate, a contact arm pivotally mounted on one side of the plate, a cradle pivotally mounted on the same side of the plate, a toggle connecting the cradle and the contact arm, an operating lever pivotally mounted on the other side of the plate and having a portion overhanging the edge of the plate and a spring connecting the toggle and said portion for actuating the toggle when the operating lever has moved a predetermined distance.

2. A switch structure comprising a single supporting plate, a contact arm pivotally mounted on one side of the plate, a cradle pivotally mounted on the same side of the plate, a toggle connecting the cradle and the contact arm, an operating lever pivotally mounted on the other side of the plate and having a portion overhanging the edge of the plate, a spring connecting the toggle and said portion for actuating the toggle and the contact arm, when the operating lever has moved a predetermined distance and current-responsive means for releasably retaining the cradle in operative position in which the toggle may releasably retain the contact arm in closed position.

3. A switch structure comprising a single supporting plate, a shaft fixed to one side of the plate and extending substantially normal to the plate, a switch arm having two spaced side plates pivotally mounted upon the shaft, a toggle pivotally connected to the switch arm between the side plates, an operating lever pivotally mounted on the other side of the supporting plate and having a portion overhanging the edge of the said plate and a pair of operating springs pivotally connected to the knee pivot of the toggle on opposite sides of the toggle and pivotally connected to the overhanging portion of the operating lever.

4. A switch structure comprising a single supporting plate, a pair of parallel-disposed shafts fixed to one side of the plate and extending substantially normal to the plate, a switch arm having two spaced side plates pivotally mounted upon one of the said shafts, a toggle pivotally connected to the switch arm between the side plates, a cradle of U-shape having two parallel spaced side plates pivotally mounted upon the other shaft and having a pivotal connection to the said toggle, an operating lever pivotally mounted on the other side of the supporting plate and having a portion overhanging the edge of the supporting plate, releasable means for supporting the cradle in operative position wherein the toggle may retain the contact arm in closed position and a pair of springs pivotally connected to the knee pivot of the toggle on opposite sides of the toggle and to the said overhanging portion of the lever for actuating the toggle and contact arm when the latter has moved a predetermined distance.

In testimony whereof, I have hereunto subscribed my name this 3 day of April 1929.

OLIVER S. JENNINGS.