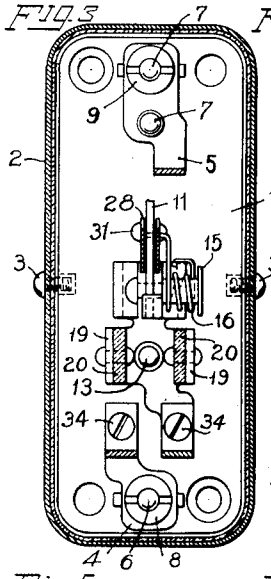
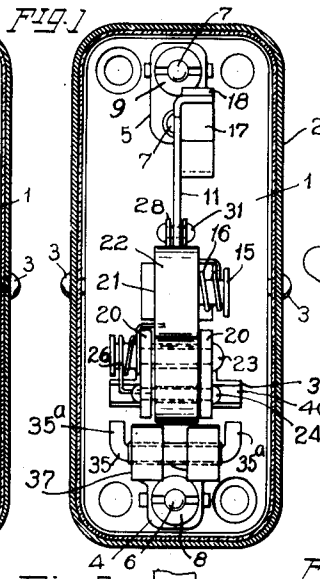
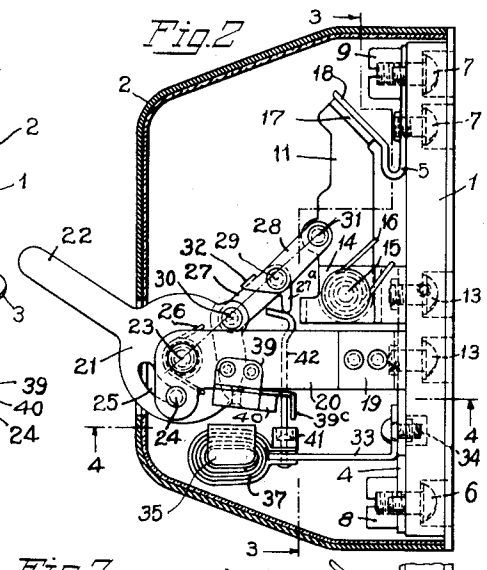
June 30, 1931. J. SACHS 1,812,847

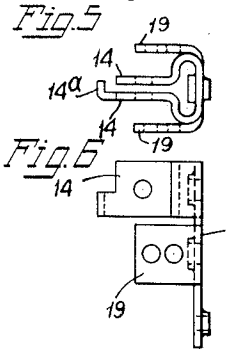
AUTOMATIC CIRCUIT BREAKER

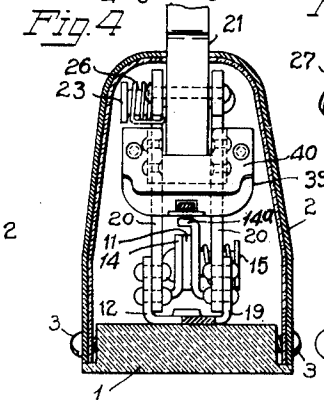
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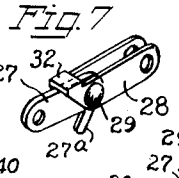


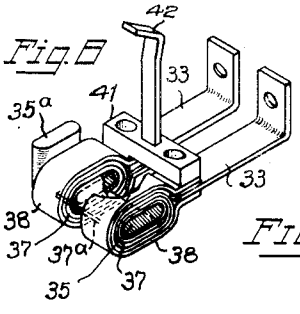


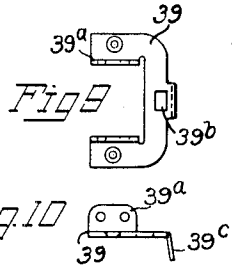


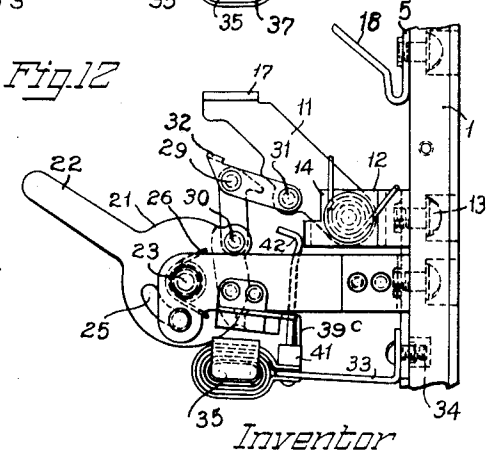












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Patented June 30, 1931 1,812,847

UNITED STATES PATENT OFFICE

JOSEPH SACHS, OF WEST HARTFORD, CONNECTICUT

AUTOMATIC CIRCUIT BREAKER

Application filed April 30, 1929. Serial No. 359,385.

In accordance with the present invention I provide an automatic circuit breaker which as concerns its mechanical operation is in some respects similar to that disclosed in my copending application for automatic circuit breakers, Serial No. 353,052 filed April 6, 1929; and I also provide as a part of the circuit breaker an electroresponsive device which is similar to that disclosed in my co-pending application for electro-responsively controlled mechanism Serial No. 338,314, filed February 7, 1929.

In the accompanying drawings I have shown the embodiment of the invention which I now deem preferable, but it will be understood that the drawings are for illustrative purposes only and are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a front view of a circuit breaker embodying the invention, the enclosing cover being shown in section.

Fig. 2 is a side view of the circuit breaker as shown in Fig. 1, the enclosing cover being shown in section.

Fig. 3 is a vertical sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a transverse sectional view looking upward along the line 4—4 of Fig. 3.

Figs. 5 and 6 are top and side views respectively of an element constituting a part of the mechanism.

Fig. 7 is a perspective view of the two toggle links.

Fig. 8 is a perspective view of the electro-responsive thermal-magnetic unit.

Figs. 9 and 10 are plan and side views of a detail of the magnet mounting.

Figs. 11 and 12 are fragmentary views similar to Fig. 2 but showing the parts in different relative positions.

Referring to the drawings, 1 represents a base of insulating material, which is located at the rear and which serves for supporting the other parts of the circuit breaker. A cover 2 may be provided for enclosing the circuit breaker, thus being fastened to the base by means of screws 3, 3.

Connected with the base near the bottom and top respectively thereof are conductor plates 4 and 5, the plate 4 being held by a screw 6 and the plate 5 being held by screws 7, 7. Nuts 8 and 9 engaging respectively with the screw 6 and with the upper screw 7 serve as means for the attachment of conductor wires by which the circuit breaker is connected in an electric circuit.

A movable contact member 11 is provided and for supporting this contact member and for other purposes there is a supporting member 12 formed of sheet metal and shaped approximately as shown in detail in Figs. 5 and 6. This is secured to the base by screws 13, 13. The supporting element 12 has two parallel forward projecting ears 14, 14 between which the movable contact member 11 is mounted for pivotal movement. As illustrated, a stud or rivet 15 extends through holes in the two ears 14, 14 and serves as the pivotal support for the contact member 11. A clip 14^a on one of the ears 14 limits forward movement of the contact member. Preferably and as shown, a spring 16 surrounding the end of the stud 15 serves to bias the contact member 11 toward its forward or open-circuit position.

The contact member 11 carries a contact 17, which contact may, if desired, be formed as an integral part of the contact member. Carried by the base is a stationary contact 18, the contact 17 being movable into and out of engagement with the said stationary contact. As shown the contact 18 is formed as a part of the conductor plate 5.

The supporting element 12 has two parallel forward extending ears 19, 19, to which are attached by riveting or otherwise two forward extending parallel side plates 20, 20. Mounted between the two side plates 20, 20 near the forward ends thereof is a pivotally movable actuator 21 provided with a projecting handle 22. The handle extends through a suitable opening in the casing 2. The actuator is mounted on a stud 23 which extends transversely through holes in the two side plates 20, 20. A pin 24 also extends

transversely between the two side plates 20, 20 and through a slot 25 in the actuator 21. The pin 24, by reason of its engagement with the ends of the slot 25, serves to limit the pivotal movement of the actuator and handle. The actuator and handle are biased toward their lower or open-circuit position by means of a coil spring 26 surrounding the stud 23.

I provide a releasable mechanical connection between the actuator 21 and the contact member 11. As shown and as preferred, this mechanical connection comprises two toggle links 27 and 28. The two links are pivotally connected together at 29 and are respectively pivotally connected with the actuator and the contact member at 30 and 31. As shown the link 27 is a single link and the link 28 is a double link, preferably formed of a single sheet of metal with the two parts connected by an integral transverse element 32. This element 32 normally engages the link 27 to limit relative movements of the links as clearly shown in Figs. 2 and 7. The link 27 is provided with a tail piece 27ª for a purpose to be described.

It will be observed that the two links 27 and 28 constitute a mechanical connection between the actuator and the contact member. When the actuator and handle are manually moved to their lower open-circuit position as shown in Fig. 11, the contact member is moved to its open-circuit position. When the actuator and handle are returned to their upper closed-circuit position as shown in Fig. 2, the contact member is also returned to its closed-circuit position. When the parts are in the position shown in Fig. 2, the actuator and handle are releasably held in their closed-circuit position by reason of the fact that the pivotal axis at 30 is below the line connecting the axes as 23 and 31. Thus there is provided a locking toggle action.

In order that the releasable connection between the actuator and the contact member may be electro-responsively released to permit the automatic movement of the contact member to its open circuit position, I make use of an electro-responsive thermal-magnetic unit of the type shown in my aforesaid copending application, Serial No. 338,314. This unit comprises two parallel or substantially parallel bi-metallic strips 33, 33 which extend forward and are mechanically and electrically connected at their respective rear ends to the conductor plate 4 and the supporting element 12 by means of screws 34, 34. A magnet coil is carried by the two strips 33, 33 and is electrically connected between them so as to complete the electric circuit. The magnet is shown as having a core 35 which extends transversely of the strip parts 33, 33 and which has upward projecting end portions 35ª, 35ª. The coil 37 of the magnet surrounds the core 35 and the said coil is preferably formed in two parts which are spaced transversely from each other as shown. Each of the two parts of the coil 37 is preferably formed of a flat strip of conducting material carried by and electrically connected with the corresponding thermal strip part 33. The material forming each part of the coil 37 may be an integral extension of the corresponding thermal strip part 33, or it may be a separate strip of material secured to the corresponding thermal strip part by riveting or otherwise. The two parts of the coil may conveniently be formed of a single piece of metal having a transverse connecting portion 37ª as shown. The conducting element or strip forming the coil is suitably insulated in any desired way, as for instance, by wrapping it with a suitable insulating material. The two parts of the coil 37 may be mechanically protected by sheathing elements 38, 38 as shown.

Connected to the two side plates 20, 20 is a transverse supporting element 39 preferably of non-magnetic material. As shown this element 39 is provided with ears or tabs 39ª, 39ª by means of which it is riveted to the two side plates 20, 20. Secured to the supporting element 39 is a magnet armature 40 which is so positioned as to be adjacent the upward extending ends 35ª, 35ª of the magnet core 35.

From the foregoing description it will be apparent that the combined thermal and magnetic unit is electrically connected in the circuit between the two wire terminals of the circuit breaker. The construction and location of the unit is such that when current flows through it the thermal strip parts and the magnet combine to exert a force tending to deflect the magnet portion thereof upward. The tendency is for the thermal strip parts 33, 33 to be flexed in the upward direction and for the core 35 of the magnet to be drawn toward the stationary armature 40. This tendency of the unit to be deflected upward upon the passage of excess current is utilized to release the toggle link. For this purpose there is provided a transverse bar 41 of insulating material which carries near its center a rod 42 extending upward between the two side plates 20, 20 to the proximity of the tail 27ª of the link 27 as clearly shown in Fig. 2. The rod 42 extends through a hole 39ᵇ in the supporting element 39. When a current greater than a predetermined maximum passes through the thermal-magnet unit the combined thermal and magnetic forces act to move the rod 42 upward against the said tail of the link 27, thus, breaking the toggle and releasing the contact member 11 so that it can move forward to its open-circuit position as shown in Fig. 12. A projection 39ᶜ on the supporting element 39 serves as a stop to limit the upward movement of the thermal-magnetic unit and associated parts.

Fig. 12 shows the contact member in its open-circuit position, it being assumed that the handle 22 has been held in its closed-circuit position and that the circuit has been opened, notwithstanding the holding of the handle. As already pointed out however, the actuator and handle are biased to their open-circuit position by means of the spring 26, being ordinarily held against such movement by reason of the locking toggle action already described. As soon as the pressure on the actuator through the links 27 and 28 is released, the actuator, if not held, immediately moves to its open-circuit position, thus permitting the toggle links to return to their normal operative relationship as shown in Fig. 11. Then the circuit can be again closed by merely moving the handle 22 upward to its closed-circuit position.

What I claim is:

1. An automatic circuit breaker comprising in combination, a movable contact member biased for movement to its open-circuit position, releasable means normally serving to hold the contact member in its closed-circuit position, an electro-responsive unit supported independently of the contact member and comprising a current carrying electro-thermal strip and a magnet coil carried thereby and electrically connected in circuit therewith, and means enabling the said unit upon the passage of excess current through the strip and magnet coil to effect the release of the said releasable means and to thereby permit the automatic movement of the contact member to circuit opening position.

2. An automatic circuit breaker comprising in combination, a manually operable actuator, a contact member biased for movement independently of the actuator toward its open-circuit position, a pair of toggle links pivotally connected respectively with the actuator and the contact member and serving when in their operative relationship to transmit the motion of the actuator to move the contact member for ordinary switching purposes, an electro-responsive unit supported independently of the contact member and comprising a current carrying electro-thermal strip and a magnet coil carried thereby and electrically connected in circuit therewith, and means enabling the said unit upon the attainment of abnormal current conditions therein to change the relation of the toggle links and to thereby permit the automatic movement of the contact member to circuit opening position.

3. An automatic circuit breaker comprising in combination, a manually operable actuator biased for movement toward its open-circuit position, a contact member biased for movement independently of the actuator toward its open-circuit position, a pair of toggle links pivotally connected respectively with the actuator and the contact member and normally serving when in their operative relationship to hold the contact member in its closed-circuit position and to transmit pressure from the contact member to also hold the actuator in its closed-circuit position, the said links also serving upon manual movement of the actuator to move the contact member for ordinary switching purposes, an electro-responsive unit supported independently of the contact member and comprising a current carrying electro-thermal strip and a magnet coil carried thereby and electrically connected in circuit therewith, and means enabling the said unit upon the passage of excess current through the strip and magnet coil to change the relationship of the toggle links so as to release both the actuator and the contact member and permit automatic movement thereof each independently of the other to their open-circuit positions.

4. An automatic circuit breaker comprising in combination two main stationary side plates spaced apart, a manually operable actuator pivotally mounted between the side plates, a movable contact member biased for movement to its open-circuit position, releasable means normally serving to hold the contact member in its closed-circuit position, an electro-responsive unit supported independently of the contact member and comprising an electro-thermal strip and a magnet coil carried thereby, a transversely extending armature cooperating with the magnet of the said unit and mounted on the two main side plates, and means enabling the said unit upon the passage of excess current through the strip and magnet coil to effect the release of the said releasable means and to thereby permit the automatic movement of the contact member to circuit opening position.

5. An automatic circuit breaker comprising in combination two main stationary side plates spaced apart, a manually operable actuator pivotally mounted between the side plates, a movable contact member biased for movement to its open-circuit position, releasable means normally serving to hold the contact member in its closed-circuit position, and electro-responsive unit supported independently of the contact member and comprising an electro-thermal strip and a magnet coil carried thereby, a transversely extending armature cooperating with the magnet of the said unit and mounted on the two main side plates, and a longitudinally movable rod extending between the side plates and connected at one end with the said electro-responsive unit, the rod enabling the said unit upon the passage of excess current through the strip and magnet coil to

effect the release of the said releasable means and to thereby permit the automatic movement of the contact member to circuit opening position.

In testimony whereof I have hereunto set my hand this 21st day of March, 1929.

JOSEPH SACHS.