Aug. 6, 1940. J. SACHS 2,210,261

AUTOMATIC CIRCUIT BREAKER

Filed Feb. 27, 1939

Fig. 2

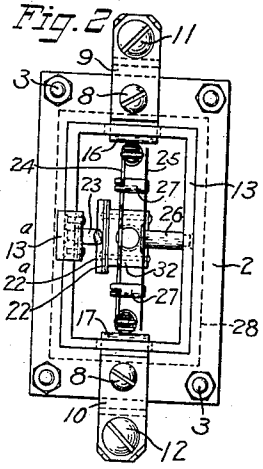


Fig. 1

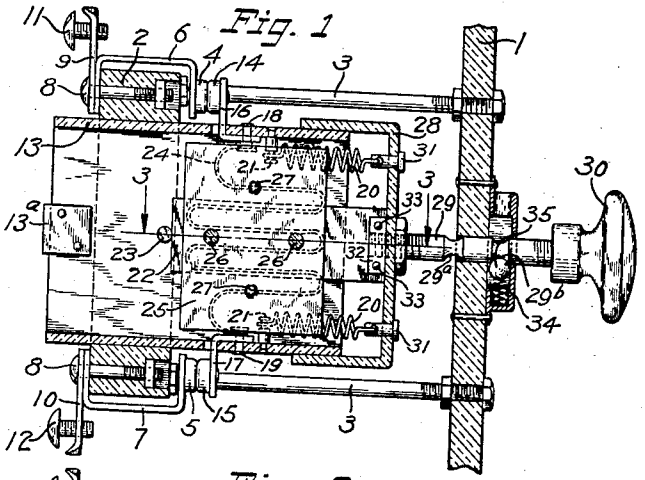


Fig. 3

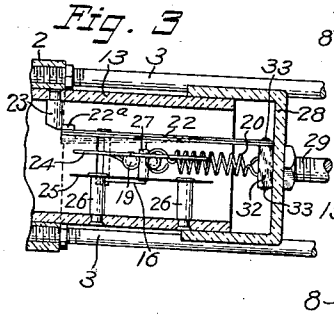


Fig. 4

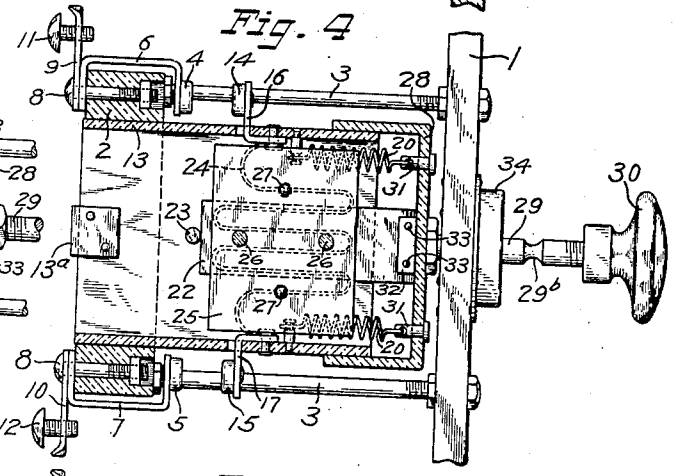
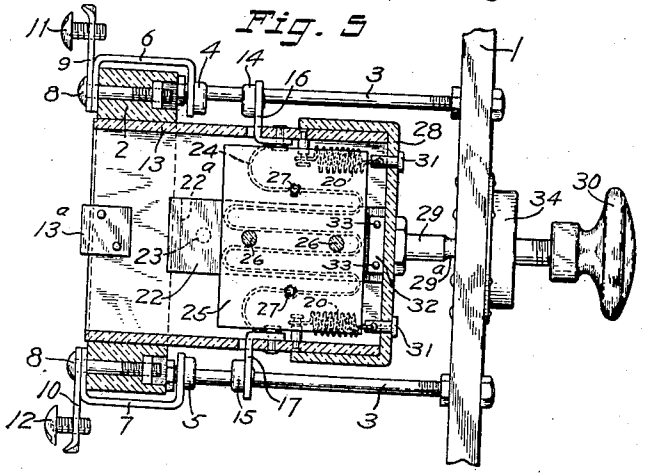


Fig. 5



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2,210,261

AUTOMATIC CIRCUIT BREAKER

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Application February 27, 1939, Serial No. 258,702

6 Claims. (Cl. 200—122)

This invention relates to a circuit breaker of the general type disclosed in my reissued Patent No. 20,018 entitled Automatic circuit breaker. In the circuit breaker disclosed in the patent there is a bi-metallic latch bodily movable with the movable contact carrying member and electrically connected in the circuit so as to be heated and deflected upon the attainment of excess current conditions. This latch normally serves to hold the contact member against circuit-opening movement but permits such movement when heating and deflection occur. The patent also discloses a manually movable operating member with which the contact member is normally mechanically connected so that the operating member can hold or move the contact member, the mechanical connection being broken or released upon heating and deflection of the bi-metallic element or latch. Upon the breaking of the mechanical connection the contact member moves to open-circuit position independently of the operating member.

In accordance with the present invention the bi-metallic element or latch is movably supported independently of the contact member and does not necessarily move with it, and it may be carried by and movable with the operating member. Inasmuch as the bi-metallic latch is separate from the contact member it carries no current and the heating of the latch is effected by means of a heating element which is carried by and movable with the contact member and which is adjacent the bi-metallic element when the contact member is in closed-circuit position.

In the accompanying drawing I have shown the embodiment of the invention which I now deem preferable, but it will be understood that the drawing is intended for illustrative purposes only and is 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 drawing:

Fig. 1 is a longitudinal vertical sectional view of a circuit breaker embodying the invention.

Fig. 2 is a rear view of the circuit breaker.

Fig. 3 is a fragmentary horizontal sectional view taken along the line 3—3 of Fig. 1.

Fig. 4 is a view similar to Fig. 1, but showing the parts in the positions which they take when the circuit breaker is opened manually.

Fig. 5 is a view similar to Fig. 1, but showing the parts in the positions which they take when the circuit breaker is opened automatically.

In the drawing I have shown a circuit breaker adapted to be mounted upon and at the rear of a vertical panel board, but it will be understood that the invention is not so limited. As shown there is a vertical panel board 1 formed of slate or other insulating material. Behind the panel is an insulating base member 2 which is held in fixed relationship with the panel board 1, as for instance by means of tie rods 3, 3.

Carried by the base member 2 is at least one stationary contact, and preferably there are two such contacts 4 and 5. The two contacts 4 and 5 are respectively carried by resilient conductors 6 and 7 which are connected with the base member 2 by means of screws 8, 8. The screws 8, 8 also hold conductors 9 and 10 having screws 11 and 12 therein which cooperate with the conductors to constitute wire terminals.

The base member 2 has a large horizontal opening therein which is shown as being rectangular. Approximately fitting the opening in the base member and rectilinearly movable therein is an insulating element 13, this being in the form of a rectangular shell or tube open at both ends. The insulating element 13 constitutes the main body of the contact carrying member and when there are two stationary contacts, the member 13 carries two movable contacts 14 and 15 adapted respectively to engage and disengage the stationary contacts 4 and 5. As shown the contacts 14 and 15 are carried by conductors 16 and 17 which extend into the interior of the element 13 through suitable holes and which are held in place by rivets 18 and 19.

Springs 20, 20 are provided which serve to bias the contact member for movement toward its open-circuit position, that is in the forward direction, these springs being connected with studs 21, 21 which project inward from the walls of the insulating element 13. Forward movement of the contact member is limited by a metallic stop 13a which is adapted to engage the base member 2 as shown in Fig. 1.

The contact member, although biased by the springs 20, 20 for movement in the forward circuit-opening direction, is normally mechanically held against such movement, the means for so holding the contact member including a bi-metallic element 22 which is supported separately from the contact member. Preferably and as shown, the bi-metallic element 22 is in the form of a latch which has a shoe 22a thereon normally in engagement with a stud 23 projecting inward from one side wall of the element 13. When the bi-metallic element or latch 22 is at normal temperature, the shoe 22a thereof is engaged by

the stud 23 and the contact member is held in its closed-circuit position as shown in Figs. 2 and 3. However, when the bi-metallic element or latch 22 is heated it deflects laterally as shown in Fig. 3 so as to disengage the stud 23 and permit the contact member to move to open-circuit position under the influence of the springs 20, 20.

For heating the bi-metallic element 22 I provide a heating element 24 which is carried by and is bodily movable with the movable contact member and which is electrically connected in the circuit. When there are two movable contacts, the heating element 24 is connected in series between the two contacts. As shown the heating element is a resistance wire bent in serpentine form and electrically and mechanically connected at its ends with the conductors 16 and 17 by means of the rivets 18 and 19. Preferably for mechanically supporting the heating element 24 I provide a vertical sheet 25 formed of mica or other insulating material and carried by the studs 26, 26 projecting inward from one side wall of the insulating element 13. Projecting from the sheet 25 are studs 27, 27 which have slots in their outer ends to receive and hold the wire 24 constituting the heating element. It will be observed with the parts in the closed-circuit positions shown in Figs. 2 and 3 the heating element 24 is closely adjacent the bi-metallic element 22 so as to be adapted to readily transmit heat thereto.

Preferably I provide an operating member which is associated with the movable contact member in such a way that it can hold it in its closed-circuit position or can move it in either direction to disengage or engage the contacts for ordinary switching purposes. As shown, the operating member comprises an insulating element 28 having a transverse end wall and having side walls which surround the insulating element 13 and are in telescopic relationship therewith. The operating member also comprises a longitudinal rod 29 which is connected with the insulating element 28 at its inner or rear end and which projects through a suitable hole in the insulating panel board 1. At its outer or forward end, the rod 29 is provided with a handle 30.

The before-mentioned springs 20, 20 are connected at their outer or forward ends with the insulating element 28, metallic studs 31, 31 being provided for the more convenient attachment of the ends of the springs. It will be observed that the springs 20, 20 are connected between the contact member and the operating member and thus serve to bias the contact member for independent circuit-opening movement. The before-mentioned bimetallic element or latch 22 is connected at its outer or forward end with the operating member. As shown there is provided a square nut 32 into which the rod 29 is threaded and this nut serves not only for engagement with the rod 29 but also for securing the bimetallic latch. The latch is connected with the nut by means of rivets 33, 33.

The rod 29 is provided with two notches 29^a and 29^b and the front panel board 1 carries a housing 34 in which there is a spring pressed ball 35 adapted to enter either one of the notches 29^a or 29^b. When the ball is entered into one of the notches it tends to hold the rod 29, and in fact the entire contact member, either in the closed-circuit position or in the open-circuit position. However, by means of the handle 30, the resistance offered by the ball can be overcome and the operating member can be moved from one position to the other.

Fig. 1 shows the circuit breaker with its various parts in closed-circuit position. Electrical connection is established from the contacts 4 and 14 through the heating element 24 to the contacts 15 and 5. The ball 35 holds the operating member in closed-circuit position and the bimetallic latch 22 holds the operating member and the contact member in fixed relationship and therefore holds the contact member in closed-circuit position. When it is desired to open the circuit manually for ordinary switching purposes, the handle 30 is moved forward and the contact member moves in unison with the operating member, the parts taking the positions shown in Fig. 4.

In the event of an excess current condition in the circuit, the heating element 24 becomes heated to a temperature greater than normal and the heat of the said element is transmitted to the latch 22 which deflects laterally as shown in Fig. 3 so as to disengage the stud 23. Thereupon the entire contact member is moved by the springs 20, 20 to open-circuit position as shown in Fig. 5, thus breaking the circuit at two places. It will be observed that this movement is entirely independent of the operating member which remains in its closed-circuit position.

After the circuit has opened automatically as described and the parts are in the position shown in Fig. 5, the operating member can be again connected with the contact member by moving the handle forward to the position shown in Fig. 4. The stop 13^a prevents the contact member from moving forward beyond the position shown in Fig. 5. In this position the latch 22, if sufficiently cooled, re-engages with the stud 23 and the handle can then be moved rearward to restore all of the parts to the closed-circuit positions as shown in Fig. 2.

What I claim is:

1. The combination in an automatic circuit breaker, of a stationary contact, a movable contact member having a contact adapted to engage and disengage the stationary contact, the said contact member being biased for movement toward its open-circuit position but being normally mechanically held against such movement, a bimetallic element supported separately from the contact member and deflectible by heat to mechanically release the contact member and permit it to automatically move to open-circuit position, and a heating element carried by and bodily movable with the movable contact member and electrically connected in the circuit in series with the movable contact, the said heating element being adjacent the bi-metallic element when the contact member is in closed-circuit position and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said element so as to cause the release of the contact member.

2. The combination in an automatic circuit breaker, of two stationary contacts, a movable contact member having two contacts adapted to engage and disengage the respective stationary contacts, the said contact member being biased for movement toward its open-circuit position but being normally held against such movement, a bi-metallic element supported separately from the contact member and deflectible by heat to mechanically release the contact member and permit it to automatically move to open-circuit position, and a heating element carried by and

bodily movable with the movable contact member and electrically connected in the circuit between and in series with the two movable contacts, the said heating element being adjacent the bi-metallic element when the contact member is in closed-circuit position and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said element so as to cause the release of the contact member.

3. The combination in an automatic circuit breaker, of a stationary contact, a movable contact member having a contact adapted to engage and disengage the stationary contact, the said contact member being biased for movement toward its open-circuit position, a bi-metallic element supported separately from the contact member and serving as a latch to hold the contact member against circuit-opening movement, the said latch being deflectible by heat to mechanically release the contact member and permit it to automatically move to open-circuit position, and a heating element carried by and bodily movable with the movable contact member and electrically connected in the circuit in series with the movable contact, the said heating element being adjacent the bi-metallic latch when the contact member is in closed-circuit position and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said latch so as to cause the release of the contact member.

4. The combination in an automatic circuit breaker, of a stationary contact, a movable contact member having a contact adapted to engage and disengage the stationary contact, the said contact member being biased for movement toward its open-circuit position, an operating member associated with the movable contact member, a bi-metallic element carried by and movable with the operating member and normally serving to cause the contact member to move in unison with the operating member, the said bi-metallic element being deflectible by heat to mechanically release the contact member and permit it to automatically move to open-circuit position independently of the operating member, and a heating element carried by and bodily movable with the movable contact member and electrically connected in the circuit in series with the movable contact, the said heating element being adjacent the bi-metallic element when the contact member and the operating member are in closed-circuit positions and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said element so as to cause the release of the contact member.

5. The combination in an automatic circuit breaker, of two stationary contacts, a movable contact member having two contacts adapted to engage and disengage the respective stationary contacts, the said contact member being biased for movement toward its open-circuit position, an operating member associated with the movable contact member, a bi-metallic element carried by and movable with the operating member and normally serving to cause the contact member to move in unison with the operating member, the said bi-metallic element being deflectible by heat to mechanically release the contact member and permit it to automatically move to open-circuit position independently of the operating member, and a heating element carried by and bodily movable with the movable contact member and electrically connected in the circuit between and in series with the two movable contacts, the said heating element being adjacent the bi-metallic element when the contact member and the operating member are in closed-circuit positions and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said element so as to cause the release of the contact member.

6. The combination in an automatic circuit breaker, of a stationary contact, a movable contact member having a contact adapted to engage and disengage the stationary contact, the said contact member biased for movement toward its open-circuit position, an operating member associated with the movable contact member, a spring connected between the contact member and the operating member and serving to bias the former for independent circuit-opening movement, a bi-metallic element carried by and movable with the operating member and serving as a latch to normally hold the contact member in fixed relationship with the operating member and to prevent independent circuit-opening movement under the influence of the said spring, the said latch being deflectible by heat to mechanically release the contact member and to permit it to automatically move to open-circuit position independently of the operating member, and a heating element carried by and bodily movable with the movable contact member and electrically connected in the circuit in series with the movable contact, the said heating element being adjacent the bi-metallic latch when the contact member and the operating member are in closed-circuit positions and serving upon the attainment of predetermined abnormal current conditions in the circuit to heat and deflect the said latch so as to cause the release of the contact member.

JOSEPH SACHS.