Aug. 6, 1940. J. SACHS 2,210,263

AUTOMATIC CIRCUIT BREAKER

Filed Feb. 27, 1939

Fig. 1

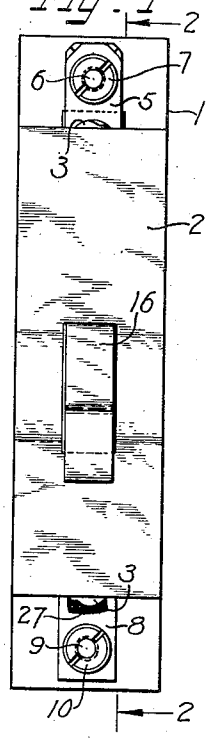


Fig. 2

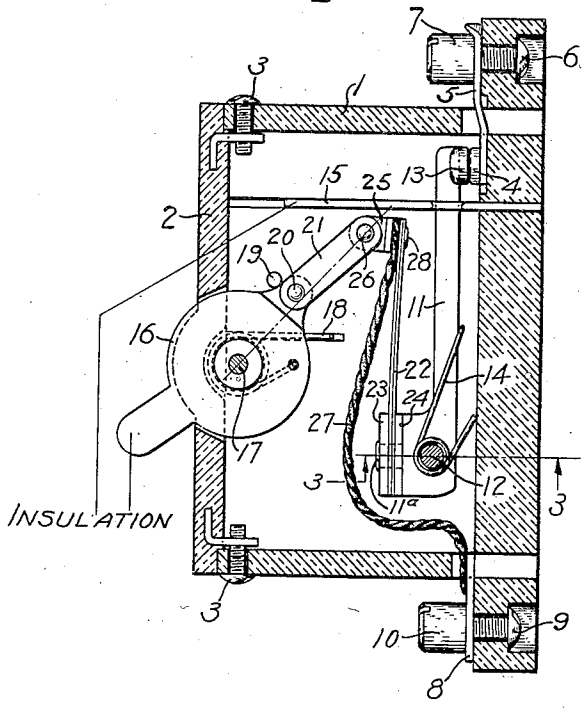


Fig. 4

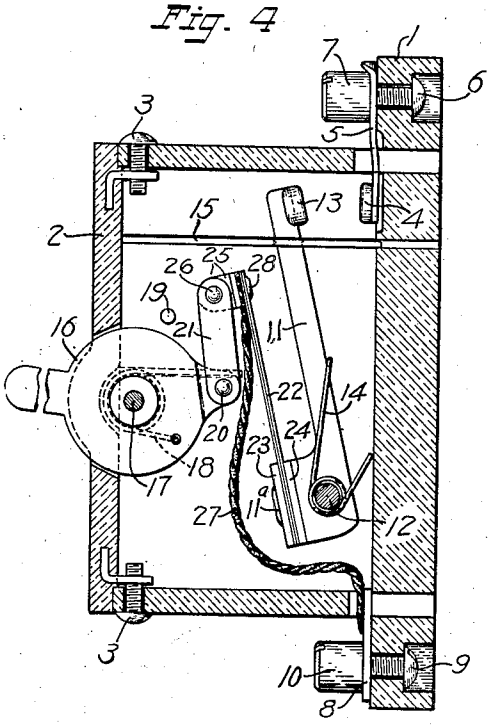
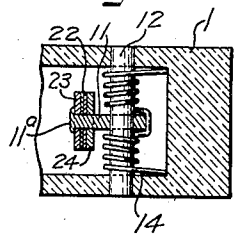


Fig. 3



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2,210,263

UNITED STATES PATENT OFFICE

2,210,263

AUTOMATIC CIRCUIT BREAKER

Joseph Sachs, West Hartford, Conn., assignor to Colt's Patent Fire Arms Manufacturing Company, Hartford, Conn., a corporation of Connecticut

Application February 27, 1939, Serial No. 258,704

4 Claims. (Cl. 200—113)

In accordance with the present invention I provide a circuit breaker incorporating, in modified and simple form, certain of the features set forth in my Reissue Patent No. 20,018, in my Patents 1,812,846 and 2,131,640, all entitled Automatic circuit breaker, and also certain of the features set forth in the copending application of Sachs and Christensen Serial No. 202,295 entitled Automatic circuit breaker. I provide a bodily movable thermally-responsive bi-metallic element which serves as a resilient connection between a toggle and the movable switch member. Normally the resilient element holds the toggle in overset position and thus holds the switch member in closed-circuit position, but upon the attainment of an excess current condition the bi-metallic element is heated and is deflected in the direction to reduce the pressure on the toggle, thus permitting the toggle to move so as to release the switch member for circuit-opening movement.

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 front view of a circuit breaker embodying the invention.

Fig. 2 is a vertical sectional view taken along the line 2—2 of Fig. 1 and showing the movable parts in closed-circuit positions.

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

Fig. 4 is a view similar to Fig. 2 but showing the movable parts in open-circuit positions.

Referring to the drawing, 1 represents as an entirety a casing or housing which is shown as molded from a suitable insulating material. This housing is closed at the sides and is substantially closed at the ends and at the rear, but it is open at the front where there is provided a removable insulating cover 2 normally held in place by screws 3, 3.

A stationary contact 4 is mounted within the housing 1 near the rear thereof, this contact being carried by a conductor 5 held in place by a screw 6. A nut 7 on the screw 6 cooperates with the conductor 5 to constitute a wire terminal. Also mounted on the housing is a stationary conductor 8 held in place by a screw 9. Connected with the conductor 8 is a suitable wire connecting terminal such as a nut 10.

Movably mounted within the housing 1 is a contact carrying member 11 which is shown as being pivotally movable, being mounted upon a transverse pivot pin 12 which extends transversely between the side walls of the housing 1. The contact member 11 carries a movable contact 13 adapted to engage the stationary contact 4 as shown in Fig. 1. The contact member 11 is biased for movement in the circuit-opening or contact disengaging direction by means of a spring 14. As shown the contact member 11 extends through a hole in a movable insulating baffle plate 15 guided in grooves in the side walls of the housing. This baffle plate serves to separate the arcing zone at the contacts from the mechanism of the circuit breaker.

A pivotally movable operating member 16 is provided, this being mounted on a pivot pin 17 which extends transversely between the side walls of the housing 1. This operating member extends through a suitable opening in the front cover 2 of the housing, and it is biased for movement in the clockwise or circuit-opening direction by means of a spring 18. A transverse stop pin 19 limits the movement of the operating member in the counterclockwise direction.

Pivotally connected with the operating member at 20 is a link 21, this preferably comprising two similar parts positioned at opposite sides of the operating member. The link 21 and the operating member 16 are adapted to cooperate with each other and form a toggle which operates in the manner to be described.

A resilient mechanical connection is provided between the link 21 and the contact member 11, and in accordance with the present invention this resilient connection is provided by means of a thermally-responsive bi-metallic element or strip 22. This bi-metallic element is rigidly connected at its lower end with the contact member 11, the said member having an integral forward extension 11a which projects through a hole in the strip. Metallic washers 23 and 24 are provided at both sides of the element 22 and all of these parts are held in fixed relationship by riveting over the forward end of the extension 11a as clearly shown in Fig. 2. At or near its upper end, the bi-metallic element 22 carries a yoke 25 which is pivotally connected at 26 with the link 21.

A means is provided for causing the bi-metallic element to be heated and deflected upon the attainment of excess current conditions in the

circuit. As shown the bi-metallic element is directly connected in the circuit so as to carry current, and for this purpose there is provided a flexible electrical conductor 27 which is electrically connected at one end with the upper end of the bi-metallic element. As shown, this conductor 27 is clamped between the element 22 and the said yoke 25, these parts being held in clamped relationship by a rivet 28. The other end of the flexible conductor 27 is connected by soldering or otherwise to the before-mentioned conductor 3 at the lower end of the housing. With the parts in closed-circuit positions as shown in Fig. 2, the circuit extends from the contacts 4 and 13 through the contact member 11 to the bi-metallic element 22, and from the bi-metallic element 22 the circuit extends through the flexible conductor 27 to the stationary conductor 3.

The bi-metallic element 22 is resilient and Fig. 2 shows this as slightly flexed, this element applying pressure in the forward direction to the toggle which consists of the link 21 and the operating member 16. This pressure serves to hold the toggle in its overset position as shown, and thus the said strip in connection with the toggle serves to hold the contact member in the closed-circuit position and to apply the necessary pressure at the contacts 13 and 4. It will be obvious that by moving the operating member in the clockwise diretcion the toggle can be broken or released so as to permit the movable parts to move to their open-circuit positions as shown in Fig. 4. It will be observed that the toggle serves directly to hold the movable contact in engagement with the stationary contact, the actual contact pressure being transmitted directly through the toggle.

The bi-metallic element 22, when heated, tends to deflect in the rearward direction, but it is so proportioned and designed that under normal current it does not deflect to such an extent as to reduce the toggle pressure sufficiently to permit the toggle to open. However, when excess current conditions are attained in the circuit the bi-metallic element 22 deflects rearward to an extent greater than normal, thus reducing the pressure on the toggle to such an extent that the toggle is broken by means of the spring 18. The parts then move automatically to their open-circuit positions shown in Fig. 4, such movement taking place under the combined influence of the springs 18 and 14. After the parts have thus moved to the positions shown in Fig. 14 they can be restored manually to their normal closed-circuit positions as soon as the bi-metallic element 22 has cooled so as to return to its unflexed condition.

It will be observed that I have provided a resilient connection between the operating member and the contact member, this being in accordance with the invention set forth and claimed in the before-mentioned Sachs and Christensen application Serial No. 202,295. It is therefore preferable to avoid any substantial or appreciable resiliency in the mounting of the two contacts 4 and 13. As shown, the conductor 5 which carries the contact 4 is directly supported by the rear wall of the housing 1 so as to avoid any movement of the contact 4. As concerns the manner of opening the circuit, I make use of the invention set forth in my before-mentioned Patent No. 2,131,640. In accordance with the invention set forth in the patent, there is provided a bi-metallic element which normally maintains the desired contact pressure but which upon reduction of the contact pressure below a predetermined minimum, permits the circuit breaker to operate automatically to open the circuit.

What I claim is:

1. An automatic circuit breaker comprising in combination, a stationary contact, a movable contact member having a movable contact adapted to engage and disengage the stationary contact which member is biased toward its open-circuit position, a resilient bi-metallic element rigidly connected at one end with the contact member, a toggle having one link connected with the remaining end of the bi-metallic element and thereby directly serving when in overset position to hold the movable contact member in closed-circuit position, the said toggle being held in its overset position by pressure exerted thereon by the said resilient element, means for biasing the toggle for movement out of the overset position, and means serving upon the attainment of an excess current condition in the circuit to cause the bi-metallic element to be heated and to be deflected in the direction to reduce the pressure on the toggle thereby permitting the toggle to move so as to release the contact member for automatic circuit-opening movement.

2. An automatic circuit breaker comprising in combination, a rigidly supported stationary contact, a contact member guided for movement in a fixed path and including a movable contact rigidly carried thereby and adapted to engage and disengage the stationary contact which member is biased toward its open-circuit position, a resilient bi-metallic element rigidly connected at one end with the contact member, a toggle having one link connected with the remaining end of the bi-metallic element and thereby directly serving when in overset position to hold the movable contact member in closed-circuit position, the said toggle being held in its overset position by pressure exerted thereon by the said resilient element, means for biasing the toggle for movement out of the overset position, and means serving upon the attainment of an excess current condition in the circuit to cause the bimetallic element to be heated and to be deflected in the direction to reduce the pressure on the toggle thereby permitting the toggle to move so as to release the contact member for automatic circuit-opening movement.

3. An automatic circuit breaker comprising in combination, a stationary contact, a movable contact member having a movable contact adapted to engage and disengage the stationary contact which member is biased toward its open-circuit position, a resilient bi-metallic element rigidly connected at one end with the contact member, a toggle having one link connected with the remaining end of the bi-metallic element and thereby directly serving when in overset position to hold the movable contact member in closed-circuit position, the said toggle being held in its overset position by pressure exerted thereon by the said resilient element, means for biasing the toggle for movement out of the overset position, and means for connecting the bi-metallic element in the circuit in series with the contacts so that upon the attainment of an excess current condition in the circuit it is heated and is deflected in the direction to reduce the pressure on the toggle thereby permitting the toggle to move so as to release the contact member for automatic circuit-opening movement.

4. An automatic circuit breaker comprising in combination, a rigidly supported stationary con-

tact, a contact member guided for movement in a fixed path and including a movable contact rigidly carried thereby and adapted to engage and disengage the stationary contact which member is biased toward its open-circuit position, a resilient bi-metallic element rigidly connected at one end with the contact member, a pivotally movable operating member, a link pivotally connected at one end with the operating member and at the other end with the remaining end of the bi-metallic element, the said link cooperating with the operating member to form a toggle which directly serves when in overset position to hold the movable contact member in closed-circuit position and which is normally held in its overset position by pressure exerted thereon by the said resilient element, means for biasing the toggle for movement out of the overset position, and means for connecting the bi-metallic element in the circuit in series with the contacts so that upon the attainment of an excess current condition in the circuit it is heated and is deflected in the direction to reduce the pressure on the toggle thereby permitting the toggle to move so as to release the contact member for automatic circuit-opening movement.

JOSEPH SACHS.