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THERMAL CIRCUIT BREAKER

Filed April 3, 1951

FIG. 1.

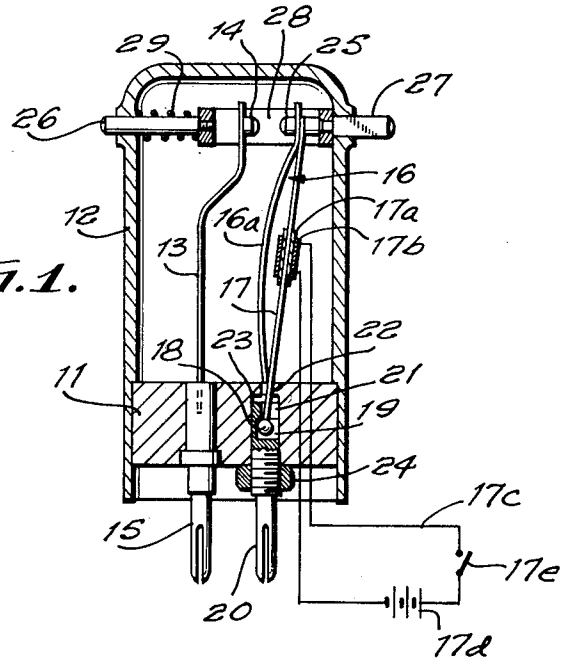
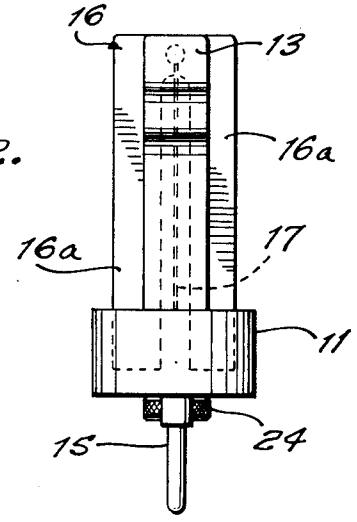


FIG. 2.



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THERMAL CIRCUIT BREAKER

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In Switzerland January 19, 1951

8 Claims. (Cl. 200—113)

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An embodiment of the thermal circuit breaker according to my invention is shown by way of example in the accompanying drawing, wherein

Fig. 1 is a sectional side elevation; and

Fig. 2 is an end elevation, the protection cover being removed.

In these figures, 11 indicates a supporting member or socket to which a housing 12 of insulating material is attached. A conducting lamella 13 with a contact 14 is conductively connected to a terminal 15 sealed into the socket 11. The slightly curved leaf spring member 16 together with a heat responsive elongated member or filament 17 attached to its central portion forms an M-shaped element. A ball 18 attached to the lower end of a heat responsive elongated member or filament 17 is held in a recess 19 provided in a terminal 20. The lower end of the filament 17 is passed through a slot 21 in the uppermost part of the terminal 20 and through a small opening 22 of the socket 11. The upper part of the terminal 20 as well as the hole 23 of the socket 11 are of square section in order to prevent rotation of the terminal 20. The latter has a screw threaded mid portion cooperating with a nut 24 for adjusting the bias tension of the filament 17. The legs 16*a* of the U-shaped leaf spring 16 are clamped into the socket 11 and initially stressed in such a way that the contact piece 25 fixed to the cross bar of the leaf spring 16 and conductively connected with the filament 17 is normally kept remote from the fixed contact 14, the distance between the contacts 14 and 25 being increased with increasing tension of the filament 17. In horizontally arranged holes of the housing 12 one of which has square section, a frame 28 of insulating material is mounted slidably but unrotatably by means of its bolts 26 and 27 the latter of which serves as an operating knob and is held in its rest position by a coil spring 29 (Fig. 1).

The operation of this device is as follows:

By pressing on the bolt 27 the M-shaped elements 16 and 17 are moved toward the conducting lamella 13 until contacts 14 and 25 are in electrical contact. In this position an electric current will flow through terminal 15, conducting lamella 13, contact pieces 14 and 25, filament 17 and terminal 20, thus increasing the temperature of the filament 17. The leaf spring 16 is held in its working position by the tension of the filament 17. With increasing temperature the filament 17 is extended so that at a certain point the bending tension of the leaf spring 16 becomes sufficiently large to overcome the resistance of the filament 17. This position of the element 16, 17 is an unstable one. If the heating is continued the element 16, 17 snaps back into its end position at the right whereby the contact pieces 14 and 25 are separated.

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The engagement of the contact pieces 14 and 25 also takes place by a sudden snapping; in this case the increasing resistance of the filament 17 against its extension and the increasing resistance of the leaf spring 16 against bending are overcome by the pressure on the bolt 27 up to the point where the unstable position is reached. After that the elastic tension of the filament 17 is sufficient for a further bending of the leaf spring 16 and producing a contact pressure thereby bending the lamella 13.

By means of the nut 24 the bias tension of the filament is adjustable, whereby the circuit breaker may be designed for different intensities at which the controlling current by heating the filament causes the opening of the switch.

The heating of the filament 17 is obtained by covering one or several current carrying portions of the heat responsive member 17 with an elastic, electrically insulating layer 17*a* on which a very thin conducting layer 17*b* is applied. The insulating layer consists of a suitable artificial material such as artificial resin, e. g. acetyl cellulose which is brought to the member 17 by dipping, spraying or laminating, or any suitable means. The conducting layer 17*b* consists of platinum, gold or carbon and the like and may be applied by cathodic evaporation or thermal evaporating to one or both surfaces of the respective portion of the filament 17. This thin conducting layer 17*b* is electrically heated by a battery 17*d* connected to the layer 17*b* by a conductor 17*c* containing a switch 17*e* during the operation of the breaker whereby the respective portion of the member 17 is heated through the electrically insulating layer 17*a*.

I wish it to be understood that I do not desire to be limited to the exact details of construction, design and operation shown and described, as modifications falling within the scope of the appended claims, will be apparent to any person skilled in the art.

I claim:

1. A thermal circuit breaker, comprising, in combination, a resilient member including a cross-bar and three legs forming an M-shaped part, a supporting member in which the ends of the legs opposite the cross-bar are fixed, the central leg having a length differing from that of the two outer legs and the longer leg or legs being slightly arcuated, and a control member fixed to

said cross-bar, the resilient member having a portion exposed to the controlling temperature and being under control of a high ohmic heating element.

2. A thermal circuit breaker according to claim 1, the said high ohmic heating element consisting of a thin electrically conducting layer adapted to conduct a control current, the said conducting layer being applied to an insulating coating covering the same portion exposed to the controlling temperature.

3. In a thermal circuit breaker a supporting member and an M-shaped resilient switching member having a central leg, two outer legs and a cross-bar, the said central leg being adjustably fixed to said supporting member and the said two outer legs being clamped fast in said supporting member, the said central leg being shorter than the two outer legs and being coated with an electrically insulating layer which in turn is covered with a thin electrically conducting layer adapted to conduct a control current, and the said cross-bar carrying a contacting element and a control member.

4. In a thermal circuit breaker a supporting member of insulating material, and an M-shaped resilient switching member having a central leg, two outer legs and a cross-bar, the said cross-bar carrying a contact piece and being freely movable opposite a second contact piece carried by a contact spring clamped fast in the said supporting member, the said outer legs of the resilient switching member being clamped fast in said supporting member opposite the said contact spring, the said central leg being adjustably fixed to said supporting member between the clamping points of the said outer legs, the said central leg being shorter than the two outer legs and being coated with an electrically insulating layer which in turn is covered by a thin electrically conducting layer adapted to conduct a control current heating the said central leg in order to produce a switching over the thermal circuit breaker.

5. In a thermal circuit breaker, a thermally operable movable switch unit, comprising, in combination, a supporting member, a slightly curved leaf spring member mounted at one end on said supporting member; a contact member mounted on the other end of said leaf spring member; a heat responsive elongated member secured at one end to said other end of said leaf spring member and at its other end to said supporting member in the region of said one end of said slightly curved leaf spring member, said heat responsive elongated member changing its length depending upon the temperature; and heat-emitting means arranged for heating at least a portion of said heat responsive elongated member whenever required.

6. In a thermal circuit breaker, a thermally operable movable switch unit, comprising, in combination, a supporting member, a slightly curved leaf spring member mounted at one end on said supporting member; a contact member mounted on the other end of said leaf spring member; a heat responsive electrically conductive elongated member secured at one end to said other end of said leaf spring member and at its other end to said supporting member in the region of said one end of said slightly curved leaf spring member, said heat responsive electrically conductive elongated member adapted to be heated by passage of electric current therethrough and to change its length depending upon its temperature; an electric circuit adapted to be connected to the end of said heat responsive electrically conductive elongated member for heating the same by passage of current therethrough; and separate heat-emitting means arranged for heating at least a portion of said heat responsive electrically conductive elongated member whenever required.

7. In a thermal circuit breaker, a thermally operable movable switch unit, comprising, in combination, a supporting member, a slightly curved leaf spring member mounted at one end on said supporting member; a contact member mounted on the other end of said leaf spring member; a heat responsive elongated member secured at one end to said other end of said leaf spring member and at its other end to said supporting member in the region of said one end of said slightly curved leaf spring member, said heat responsive elongated member changing its length depending upon the temperature; an electrically insulating layer arranged on at least a portion of said heat responsive elongated member; and a thin electric current conducting layer arranged on said electrically insulating layer, said conducting layer operating as heat-emitting means for said heat responsive elongated member.

8. In a thermal circuit breaker, a thermally operable movable switch unit, comprising, in combination, a supporting member, a slightly curved leaf spring member mounted at one end on said supporting member; a contact member mounted on the other end of said leaf spring member; a heat responsive elongated member secured at one end to said other end of said leaf spring member and at its other end to said supporting member in the region of said one end of said slightly curved leaf spring member, said heat responsive elongated member changing its length depending upon the temperature; an electrically insulating layer arranged on at least a portion of said heat responsive elongated member; a thin electric current conducting layer arranged on said electrically insulating layer; and means for sending a heating current through said conducting layer.

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