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A. M. MacFARLAND

THERMAL RELAY

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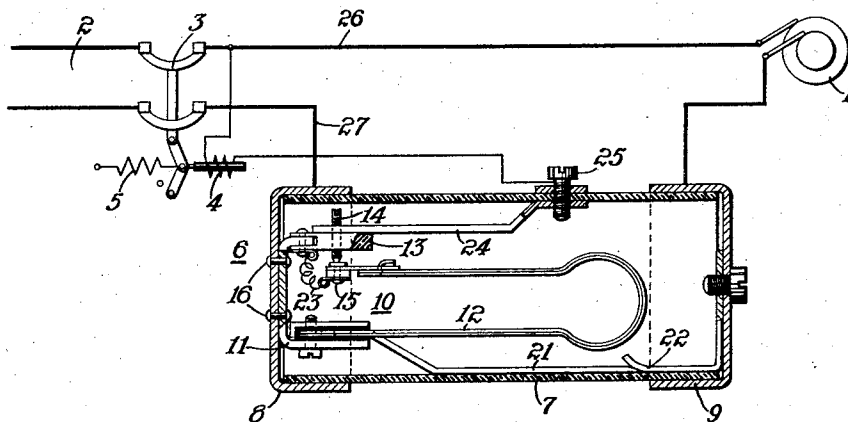


Fig. 1.

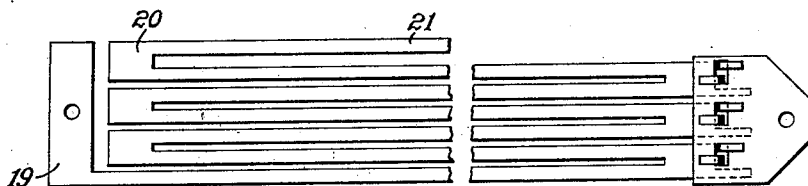


Fig. 2.

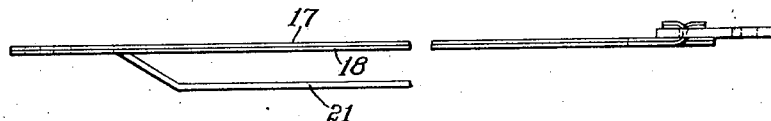


Fig. 3.

WITNESSES:

H. J. Shelhamer
J. E. Doster

INVENTOR

Allis M. MacFarland

BY

Wesley E. Carr

ATTORNEY

UNITED STATES PATENT OFFICE.

ALLIS M. MACFARLAND, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

THERMAL RELAY.

Application filed August 17, 1920. Serial No. 404,064.

To all whom it may concern:

Be it known that I, ALLIS M. MACFARLAND, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Thermal Relays, of which the following is a specification.

My invention relates to thermal relays and particularly to bimetallic thermal relays.

One object of my invention is to provide a relay having a thermal-responsive device that inherently shall have such heating characteristics as to ensure effective operation, when connected in circuit with a device to be protected, without the use of auxiliary heating devices.

Another object of my invention is to provide a bimetallic member that inherently shall have high electrical resistance.

Another object of my invention is to provide a relay of the cartridge type that shall have means whereby the thermal elements and contact members thereof may be mounted, as a unit, on one ferrule of the cartridge.

Another object of my invention is to so loop the bimetallic members that a relatively long member may be disposed within a short cartridge.

A further object of my invention is to provide a relay, of the above-indicated character, that shall be simple and inexpensive to construct and effective in its operation.

Heretofore, when thermal relays were used for the protection of electrical apparatus, it was found desirable, especially when the device to be protected consumed a relatively small value of current, to provide a heating element for the thermal-responsive member. This was found necessary by reason of the fact that insufficient heating was obtained when the thermal-responsive device was made of such mechanical structure as to ensure effective operation.

In view of the above, I provide a bimetallic member of the required mechanical strength to obtain effective operation and I slit the same alternately from opposite ends thereof to constitute an electrical conductor having relatively high resistance. It will be seen that, with this arrangement, sufficient heat may be generated in a rela-

tively large bimetallic member, by a relatively small current traversing the same, to cause effective operation thereof. I further mount the bimetallic element and the contact members, as a unit, on one ferrule of a device of the cartridge type, in order to ensure, at all times, effective alinement between the contact members and consequent accuracy of operation. Looping the bimetallic member permits the disposition of a relatively long member within a relatively short cartridge.

Figure 1 of the accompanying drawings is a diagrammatic view of an electric circuit that includes a thermal relay embodying my invention;

Fig. 2 is a plan view of the bimetallic member shown in the relay in Fig. 1, and

Fig. 3 is an edge view of the member shown in Fig. 2.

A motor 1, or other electrical translating device to be protected, is provided with current from a circuit 2 through an interrupter 3. The interrupter 3 is provided with a low-voltage holding coil 4 and a spring 5 for actuating the same when the coil 4 is de-energized. The circuit of the coil 4 is controlled by a thermal relay 6 which is connected in circuit with the motor 1.

The thermal relay 6, as shown in Fig. 1, comprises a cylindrical casing 7, two end ferrules 8 and 9 and a unitary thermal-responsive device 10. The unitary thermal-responsive device 10 comprises a supporting member 11 to which is secured a bimetallic member 12 and an insulating block 13 upon which a contact member 14 is adjustably mounted. A contact member 15 is mounted on the bimetallic member 12 but is insulated therefrom and is adapted to engage the contact member 14. The supporting member 11 is secured to the ferrule 8 by rivets 16.

The bimetallic member 12 comprises two strips of metal 17 and 18 having different temperature coefficients and effectively secured together in face-to-face relation. Slits are cut in the bimetallic member 12 from the respective ends thereof in such manner as to greatly increase the resistance to the flow of current therethrough. That is, with the bimetallic member slit, as shown in Fig. 2, the resistance to the flow of current from the point 19 to the point 20 is

considerably greater than the resistance to the flow of current from one end to the other of the original strip. The point 19 of the member 12 is electrically connected to the supporting member 11, and the point 20 is connected, through a conductor 21, to the ferrule 9 by frictional engagement with a member 22 that is electrically connected to the ferrule 9. The contact member 15 is insulated from the bimetallic member 12 and is electrically connected, through a flexible connector 23, to the ferrule 8, through the supporting member 11 to preclude the control current from traversing the strip 12. The ferrules 8 and 9 are adapted to be received by ordinary cartridge-fuse clips.

The contact member 14 is connected, through a conductor 24, to a terminal post 25, which, in turn, is connected, through the coil 4 of the interrupter 3, to a conductor 26 of the circuit 2. It will be understood that the relay 6 is placed in series with the conductor 27 of the circuit 2 in order that the coil 4 may be connected across the circuit.

In order to dispose a long bimetallic member in a short cartridge, the member is so looped, at a point intermediate the ends thereof, that the overall length of the looped member is substantially one-half of the original length.

Since the resistance to the flow of current through the element 12 is relatively high, it will readily be seen that the device may be adjusted to cause disengagement of the contact members 14 and 15 when a predetermined value of current has traversed the motor 1 for a predetermined interval of time.

The heating characteristics of the device 6 may be such as to conform exactly to that of the motor 1 or they may be such that the time interval is sufficient to secure adequate protection to the motor 1.

With my device, adequate protection will be obtained, irrespective of the current traversing the motor 1. That is, if the motor 1 consumes only a fraction of an ampere, sufficient heating will obtain in the element 12 to cause the same to operate effectively to de-energize the coil 4 which permits the spring 5 to open the interrupter and thus disconnect the motor 1 from the circuit. The coil 4, being a low-voltage coil, will, of course, also permit the interrupter 3 to open when the voltage across the circuit 2 falls below a predetermined value. Since the unit 10, comprising the bimetallic member 12 and the contact members 14 and 15, is mounted on one ferrule of the device, it will be understood that the necessity for accurate alinement of the ferrules 8 and 9 is obviated, whereby a more accurate device is obtained with less expense.

My invention is not limited to the specific structure illustrated, as it may be modified

without departing from the spirit and scope of the same as set forth in the appended claims.

I claim as my invention:

1. A thermal relay comprising a tubular member of insulating material, ferrules disposed at the respective ends thereof, a supporting member disposed on one ferrule, a bimetallic member disposed on the supporting member and looped back to permit a relatively long element to be disposed within a space of predetermined length, means for connecting one end of the bimetallic member to the opposite ferrule, and a contact member controlled by the bimetallic member.

2. A thermal relay comprising a cylindrical casing, two end ferrules therefor, a slotted bimetallic member supported on one ferrule only and looped to permit a relatively long element to be disposed within a space of predetermined length, means for connecting the ends of the bimetallic member to the respective ferrules, and a contact member controlled by the bimetallic member.

3. A thermal relay comprising a cylindrical casing, two end ferrules therefor, a slotted bimetallic member supported on one ferrule only and looped to permit a relatively long element to be disposed within a space of predetermined length, means electrically connected to one end of the bimetallic member for slidably engaging means electrically connected to one ferrule, and a contact member controlled by the bimetallic member.

4. A thermal relay comprising a cylindrical casing, two end ferrules therefor, a slotted bimetallic member supported on one ferrule only and looped to permit a relatively long element to be disposed within a space of predetermined length, means electrically connected to one end of the bimetallic member for slidably engaging means electrically connected to one ferrule, a contact member controlled by the bimetallic member, and an adjustable contact member adapted to be engaged by the former contact member and having means for being connected into an auxiliary circuit.

5. A thermal relay comprising a cylindrical casing, two end ferrules therefor, a bimetallic member of substantially U-shape having the ends thereof connected to the respective ferrules, a contact member controlled by the bimetallic member, an adjustable contact member adapted to be engaged by the former contact member until the bimetallic member is heated to a predetermined degree, and means for connecting the adjustable contact member into an auxiliary circuit.

6. A thermal relay comprising two end ferrules, a slotted bimetallic member supported at one end on one ferrule and having the other end thereof so looped as to permit

the disposition of a relatively long member in a relatively short space, and means for connecting the bimetallic member between both ferrules.

- 5 7. A thermal relay comprising two end ferrules, a looped bimetallic member, a supporting member therefor mounted on one ferrule, a contact member controlled by the bimetallic member, and an adjustable con-
10 tact member mounted on the supporting member and adapted to be engaged by the former contact member, the controlling bi-

metallic member being so looped as to permit the disposition of a relatively long bimetallic member in a relatively short space 15 and to dispose the co-operating contact members adjacent the supporting member, and means for electrically connecting the bimetallic member between both ferrules.

In testimony whereof, I have hereunto 20 subscribed my name this 11th day of August, 1920.

ALLIS M. MacFARLAND.