

Sept. 17, 1935.

H. A. WILHELM

2,014,958

THERMAL RELAY

Original Filed Dec. 5, 1932

Fig. 1

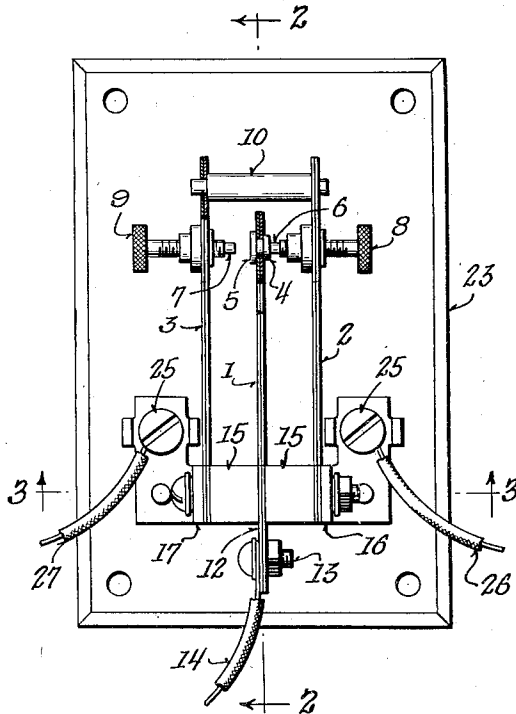


Fig. 3

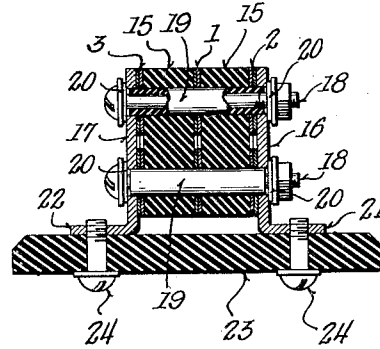
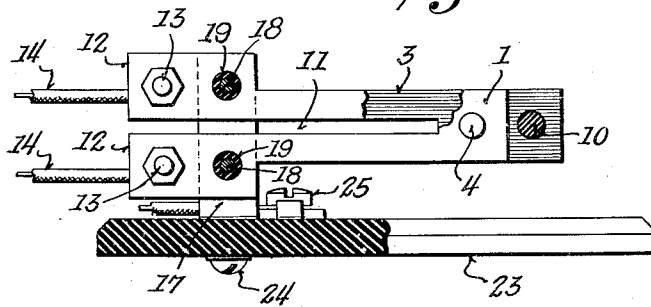


Fig. 2



INVENTOR.

Henry A. Wilhelm

BY

Arthur R. Woodcock
ATTORNEY.

UNITED STATES PATENT OFFICE

2,014,958

THERMAL RELAY

Henry A. Wilhelm, Milwaukee, Wis., assignor to
Square D Company, Detroit, Mich.

Original application December 5, 1932, Serial No.
645,764. Divided and this application August
24, 1934, Serial No. 741,227

3 Claims. (Cl. 200—113)

This invention relates to thermal relays and is particularly directed to a terminal relay for use with electrical equipment such as automatic starters as disclosed in my copending application S. N. 645,764 for Time relay for power control filed December 5, 1932.

This application is a division of my above noted application.

Objects of this invention are to provide a thermal relay which corrects for ambient temperature variations, which is adapted to be heated by an electric current, which provides a time delay for a given value of heating current, which requires no extra heating elements, and in which the relatively stationary contacts are carried by thermal elements responsive to ambient temperature variations, thereby securing a substantially predetermined period for the device irrespective of the temperature of the air or changes thereof, so that the device may be installed in any desired location and will automatically adjust itself for any variation in temperature, such adjustment being automatically provided, although the variation in the temperature of the surrounding air may be very great indeed.

In greater detail objects of this invention are to provide a thermal relay in which the active thermal element is so formed that it serves as its own heater and carries the heating current, in which the heating current though traversing the element travels a path greater than the length of the element, and in which terminals are provided in a simple, compact, and readily accessible manner for the several elements of the device.

Further objects are to provide a thermal relay in which the active thermal element is centrally arranged between two outer thermal elements with one end of each element securely clamped in a base or supporting block and in which each element has a free end, in which the free ends of the outer elements carry a bracing or spacing member, thus forming, in effect, a braced rectangular frame responsive to ambient temperature variations and carrying the relatively stationary contacts, such contacts being adjustable, and in which the movable contacts are carried adjacent the free end of the active thermal element and are adapted to contact with one or the other of the relatively stationary contacts.

An embodiment of the invention is shown in the accompanying drawing, in which:

Figure 1 is a face view of the thermal relay.

Figure 2 is a sectional view on the line 2—2 of Figure 1, with parts broken away.

Figure 3 is a sectional view on the line 3—3 of Figure 1, with parts broken away.

Referring to the drawing, it will be seen that the device comprises a bimetallic, movable, thermal member 1 which is mounted between two relatively stationary bimetallic thermal members 2 and 3. The member 1 is provided with contacts 4 and 5 on opposite sides which are adapted to engage stationary contacts 6 and 7 carried by the members 2 and 3 respectively. The contacts 6 and 7 are adjustable, each independently of the other, and the adjustment may be obtained by means of the thumb screws 8 and 9 which carry the contacts 6 and 7, respectively, as shown in Figure 1.

The members 2 and 3 are joined adjacent their outer free ends by a shouldered insulating pin 10 so that they move as a unit in either direction.

The central member 1 is slotted centrally as indicated at 11 in Figure 2 and is thus in the form of a loop. This thermal member is provided with terminal portions 12 which may be widened and are provided with terminal screws or bolts 13 by means of which the conductors 14 may be attached, so that current may be circulated directly through the member to heat the member and cause it to deflect. It is to be noted that the current path through the member is greater than the length of the member.

It is to be noted that the members 1, 2 and 3 may be very readily mounted as shown in the drawing. The member 1 may be carried between a pair of insulating blocks 15. The members 2 and 3 may be readily clamped against these blocks by means of terminal plates 16 and 17 which are clamped in place by means of bolts 18, such bolts passing through insulating bushings 19 and being provided with insulating washers 20 beneath the head and nut of each bolt.

The terminal plates 16 and 17 are provided with outwardly turned terminal and supporting feet 21 and 22 which are secured to the insulating base or support 23 by means of screws 24. The terminal feet are provided with terminal screws 25 by means of which conductors 26 and 27 may be electrically connected.

When the member 1 is heated by current supplied through conductors 14, such member moves to the left as viewed in Figure 1. A certain interval of time elapses, however, before the contact 5 engages the contact 7. When the heating current is stopped, a certain interval of time elapses before the contact 4 engages the contact 6. These time intervals may be varied by varying the setting of the contacts 6 and 7.

It is to be noted that the length of the path taken by the heating current through the member 1 is greater than the length of such member. This is desirable if small heating currents are used as it increases the resistance of such member to the passage of the heating current and increases the heat developed by such current. Also, by means of this construction the necessity of an auxiliary heating coil is avoided.

The invention also provides means for correcting for changes in the ambient temperature. For example, if the temperature rises, the members 2 and 3 move to the left as viewed in Figure 1, the same amount as the member 5 shifts due to this change in ambient temperature. A decrease in temperature effects a reverse motion of the three members 1, 2 and 3. It will be seen, therefore, that the device automatically corrects for changes in the temperature of the surrounding air and thus the interval is not varied, although there may be a great variation in the temperature of the air.

The insulating spacer 10 between the outer members forms a brace on the one hand, and on the other hand insures the retention of uniform spacing between the members 2 and 3 irrespective of the movement of such members. The members 2, 3 and 10 form, in effect, a braced frame within which the member 1 operates.

It is to be noted also that the device is very simple, that the construction may be readily produced with a minimum of expense, and that the device may be readily installed wherever desired.

Although the invention has been described in considerable detail, it is to be understood that such description is intended as illustrative rather than limiting, as the invention may be variously embodied and is to be interpreted as claimed.

I claim:

1. In an automatic time relay, a central thermal element, a pair of outer thermal elements, supporting means for the inner ends of said thermal elements, insulating means between said central and outer thermal elements, clamping means for clamping said thermal elements, said supporting means and said insulating means together, all of said thermal elements having free outer ends, an insulating spacer between the free ends of said outer thermal elements, a contact car-

ried adjacent the free end of said central thermal element, and cooperating contacts carried adjacent the free ends of said outer thermal elements, said central thermal element having its free end terminating inwardly of the free ends of said outer thermal elements and spaced inwardly from said insulating spacer.

2. In an automatic time relay, a central thermal element, a pair of outer thermal elements, supporting means for the inner ends of said thermal elements, insulating means between said central and outer thermal elements, clamping means for clamping said thermal elements, said supporting means and said insulating means together, all of said thermal elements having free outer ends, an insulating spacer between the free ends of said outer thermal elements, a contact carried adjacent the free end of said central thermal element, and cooperating contacts carried adjacent the free ends of said outer thermal elements, said central thermal element having its free end terminating inwardly of the free ends of said outer thermal elements and spaced inwardly from said insulating spacer, said central thermal element being of U-shape with the ends of the legs thereof adjacent said supporting means and having terminal portions projecting rearwardly from said supporting means.

3. In an automatic time relay, a central thermal element, a pair of outer thermal elements, insulating means between the central and outer thermal elements, supporting terminal means located outwardly of the outer thermal elements, clamping means for clamping said supporting terminal means, said insulating means, and said thermal elements together, all of said thermal elements having free outer ends, the outer ends of the outer thermal elements projecting beyond said central thermal element and having an insulating spacer braced between and carried by the outer ends of said outer thermal elements, said central thermal element being of U-shape and having projecting terminal portions extending rearwardly of said insulating means, said central thermal element having a contact adjacent its outer end and at least one of said outer thermal elements having a cooperating contact.

HENRY A. WILHELM.