United States Patent

[11] 3,601,736

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[73] Assignee **Wagner Electric Corporation**

[54] **TIME DELAY BIMETALLIC RELAY**
3 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **337/101,** 337/102, 337/111
[51] **Int. Cl.** **H01h 37/10,** H01h 37/52, H01h 61/04
[50] **Field of Search** 73/363.5; 337/95, 99, 100, 101, 102, 103, 111, 370, 371, 378, 379, 85, 86, 96

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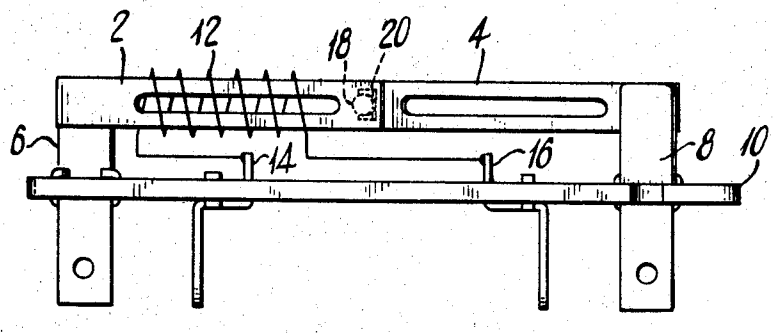
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ABSTRACT: A relay employing two slotted bimetallic blades mounted substantially parallel and overlapping at their free (unmounted) ends with a heater element associated with one of the blades.



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Fig. 1.

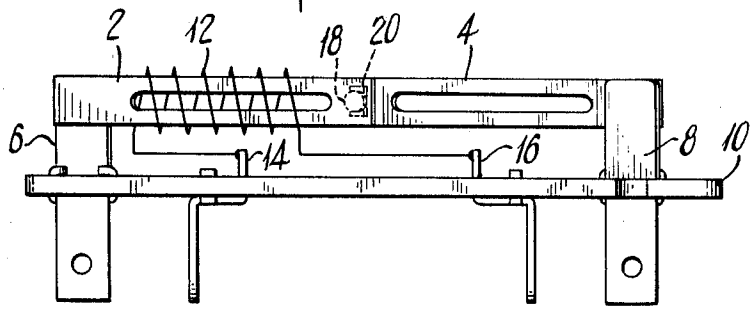
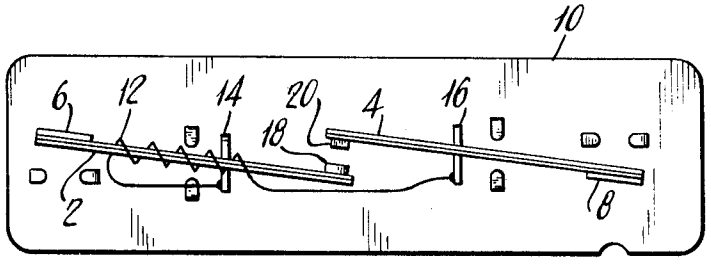


Fig. 2.



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TIME DELAY BIMETALLIC RELAY

The present invention relates to a relay employing two slotted, overlapping bimetallic blades, preferably with a contact mounted on the overlapping end of each blade, the other ends of the blades being rigidly mounted to terminals extending through an insulating base. The slotted blades are blades, and therefore deflect more rapidly. The free ends of to cool more rapidly then the ordinary solid, rectangular blades, and therefore deflect move rapidly. The free ends of for the blades deflect in the same direction when the ambient temperature changes, thus compensating for any variations in ambient temperature. Also, since the blades are of substantially the same shape, load current passing through the blades when their free ends are in contact causes substantially the same increase in temperature of each blade, thereby causing substantially the same deflection of each blade.

A further advantage of employing bimetallic blades which are slotted along major portions of their length is that the blades may be made wider and thicker, i.e., the blades may be larger in the vertical dimensions of FIG. 1 and FIG. 2, respectively. Previously, the blades were made either very thin or with greatly reduced width in order to keep the blade mass within acceptable limits. The reduction in width made machine-handling of the blades much more difficult. Reducing the thickness of the blade resulted in frequent cutting of the insulated heater wire, which is machine-wrapped around the active blade in the process of mass manufacture, because of the resulting thin blade edges. These serious disadvantages are overcome by the slotted bimetallic blades employed in the bimetallic relay embodying the present invention. Also, slotting enables the formation of longer bimetallic blades, i.e., blades greater in the horizontal dimension of FIGS. 1 and 2. This in turn facilitates the adjustment of the gap between the contacts, which adjustment is carried out by twisting either or both of the terminals on which the blades are mounted.

A better understanding of the present invention may be had by reference to the accompanying drawings, of which:

FIG. 1 is a side elevation of an embodiment of the present invention;

FIG. 2 is a top elevation of an embodiment of the present invention.

Referring now specifically to FIG. 1, the slotted bimetallic blades 2 and 4 are mechanically and electrically connected to terminals 6 and 8, respectively, which terminals extend through a base 10 formed of an insulating material, which is preferably substantially rectangular in shape. The heater element 12, which may consist of a resistive wire coated with an insulating material, is wrapped around active blade 2. In the embodiment shown, terminals 14 and 16 extending through the base 10 serve to connect heater element 12 to a source of current. However, in some applications it may be desirable to have heater element 12 connected between the blade-supporting terminals 6 and 8, thereby obviating the need for terminals 14 and 16.

Referring now specifically to FIG. 2, the free end of active blade 2 and the free end of compensating blade 4 may be seen to overlap near the center area of the base 10. In the preferred embodiment of the present invention, contacts 18 and 20 are mounted in the respective areas of overlap of blades 2 and 4. These contacts are not required to form an operative device however. As is shown in this figure, the blades 2 and 4 are substantially parallel to one another.

The operation of the relay illustrated in the drawings is as follows:

When terminals 6 and 8 are connected in a load current path which is to be controlled, and terminals 14 and 16 are connected to a controlling source of current, the passage of heating current through heater element 12 will cause active blade 2 to deflect toward compensating blade 4. Thus, blade-mounted contacts 18 and 20, which are normally open in the embodiment shown, will be brought into engagement. With contacts 18 and 20 closed, the controlled load current path

will be closed through terminal 6, blade 2, contacts 18 and 20, blade 4, and terminal 8. The heating effect of load current passing through blades 2 and 4 is neutralized by offsetting increments of deflection of both blades 2 and 4. Whatever increment of deflection of active blade 2 results from load-current heating, compensating blade 4 will move an equal increment, since both blades 2 and 4 are of the same materials and have substantially the same geometry, and therefore have substantially the same resistance. When the controlling heating current is reduced sufficiently, the active blade 2 will cool and cause contacts 18 and 20 to disengage. Thus, load current ceases to flow through both blades 2 and 4, which will then return to their normal or equilibrium positions. In the equilibrium position, the positions of the contacts 18 and 20 relative to one another will remain constant over a wide range of ambient temperatures, since any increment of deflection by one blade as a result of change in ambient temperature will be offset by a corresponding increment of deflection by the other blade.

The slots extending along the length of the bimetallic blades 2 and 4 enable faster reaction by the blades to changes in temperature, i.e., both heating and cooling, for the reason that the value of the ratio of blade surface area to blade mass is greatly increased over the value of that ratio for solid rectangular blades. Thus, the rate of heat transfer for the slotted blades is greater than for the solid blades.

Although the relay illustrated in the drawings and described above has normally open contacts, by proper choice and orientation of the bimetallic blades relative to one another, a device embodying the present invention may be constructed with normally closed contacts. In some applications, it might be desirable to have a second heater element associated with the compensating blades. This second heater element could be controlled from the same current source as the first heater element or from a separate source.

The advantages of the present invention, as well as certain changes and modifications to the disclosed embodiment thereof, will be readily apparent to those skilled in the art. It is the applicant's intention to cover all those changes and modifications which could be made to the embodiment of the invention herein chosen for the purposes of the disclosure without departing from the spirit and scope of the invention.

I claim:

1. A bimetallic relay comprising:
   a. a base formed of insulating material;
   b. a plurality of terminals extending through said base;
   c. first and second substantially parallel bimetallic blades slotted along major portions of their respective lengths and connected mechanically and electrically to first and second terminals, respectively, said blades having substantially the same electrical resistance and extending toward each other between said terminals and overlapping at their free ends;
   d. first and second contacts mounted on the overlapping portions of said first and second bimetallic blades, respectively; and
   e. a heater element wound around said first bimetallic blade and electrically connected between two of said plurality of terminals, whereby said free ends of said first and second bimetallic blades will move through equal offsetting increments of deflection when subjected to changes in ambient temperature over a wide range of ambient temperatures, and load-current heating of said first and second bimetallic blades will also cause said free ends of said blades to move through equal offsetting increments of deflection when said contacts are closed.

2. A bimetallic relay according to claim 1 wherein said heater element is connected between third and fourth terminals.

3. A bimetallic relay according to claim 1 wherein said heater element consists of a resistive wire coated with an insulating material.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,601,736 Dated August 24, 1971

Inventor(s) Manlio O. Sepe

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, Lines 7 to 10 should read:

--ing through an insulating base. The slotted blades are able to cool more rapidly than the ordinary solid, rectangular blades and therefore deflect more rapidly. The free ends of the blades--

Signed and sealed this 14th day of March 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334