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[54] THERMOSTAT

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[51] **Int. Cl.** **H01h 85/16**

[58] **Field of Search** 337/39, 40, 42, 44, 78, 337/336, 371, 380, 354

[56] **References Cited**

UNITED STATES PATENTS

3,038,255	3/1967	Faggiano	337/380 X
3,500,277	3/1970	Nardulli	337/343
3,609,622	9/1971	Pringle et al.	337/380 X
3,718,880	2/1973	Pringle et al.	337/380

FOREIGN PATENTS OR APPLICATIONS

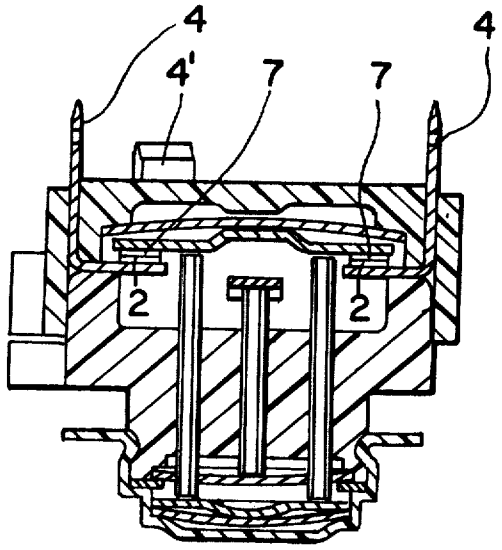
1,916,646	4/1970	Germany	337/354

Primary Examiner—J. D. Miller
Assistant Examiner—Fred E. Bell

[57] **ABSTRACT**

Single- or multi-temperature thermostat controlled by heat deformable release blades, provided with an insulating box-like body acting as a free seating for the moving parts of one or more switches and as a connection seating for the fixed parts thereof, and also provided with a second insulating body acting as a sliding seating for the control pushbuttons and as a plug for a metal cup containg the temperature responsive elements.

11 Claims, 4 Drawing Figures



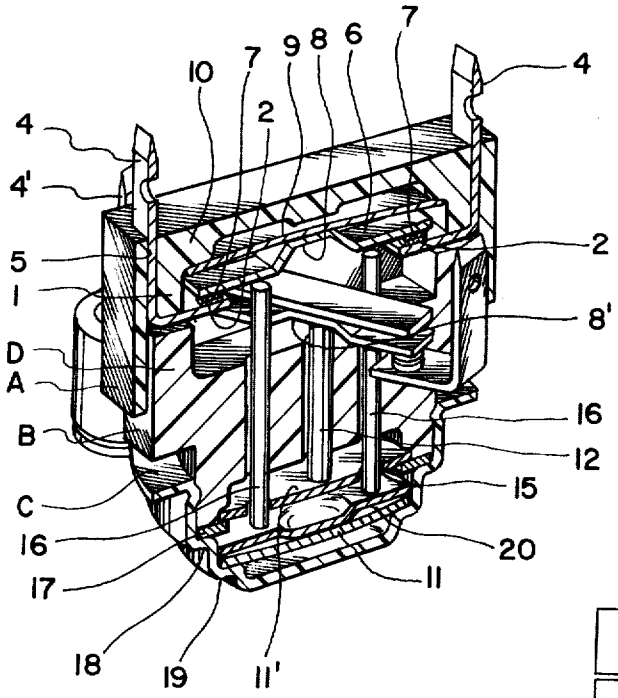
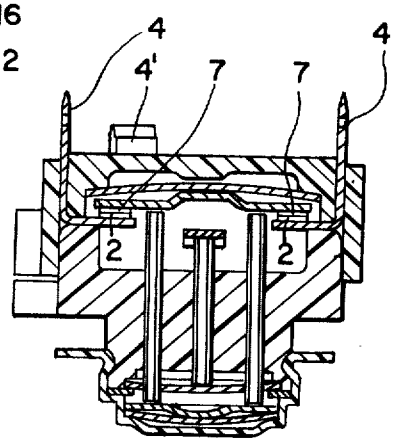


Fig. 1.

Fig.2.



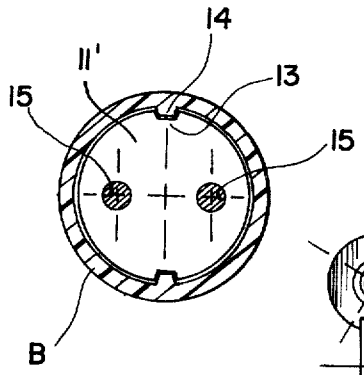


Fig.3.

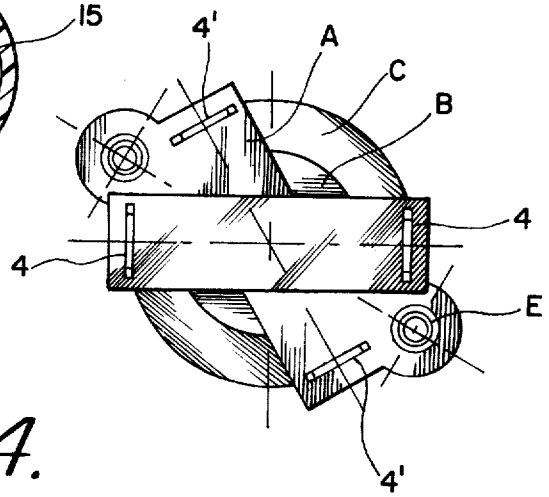


Fig.4.

THERMOSTAT

It is well known that present single or dual temperature thermostats, as controlled by bimetallic release plates or blades, are essentially simple pushbutton switches, wherein the release or tripping inversion in the curvature of a bimetallic disc, as a predetermined temperature is achieved, will exert the axial pressure provided on the pushbutton of common switches by the pressing action of a finger.

It is also known the commercial availability of particular two-temperature thermostatic switches, controlled by bimetallic release plates or blades, wherein simple conformations and arrangements and combinations of known elements provide for the useful advantage of reducing the overall size nearly to that of a single-temperature thermostat, with the resulting advantage of a lower cost and ready installation with respect to two independent single-temperature thermostats.

In present two-temperature thermostats, as controlled by bimetallic release discs which due to the two different temperatures necessarily have different thermal characteristics and structures, in order to allow for accomodating in a single metal cup and operating parallel pushbuttons in different arrangements (passing through the bottom of an insulating box-like body acting as fastening seating for the electric elements of one switch, or both switches), the latter (that is to say the switches) at present always comprise a fixed contact and a movable contact mounted on the free end of a thin resilient plate or blade which at contact closed condition has a flexure for ensuring the required contact pressure.

Upon inversion in curvature for each of the bimetallic discs, the pushbuttons will transmit the bias as received by the disc to the resilient plate or blade of the corresponding switch, further bending or flexing it and thereby causing a quick contact interruption.

In the above mentioned conventional thermostats, either of single- or two-temperature type, the electric elements are made fast with the insulating box-like holdere by riveted joints, causing partial deformations, particularly at the fixed end of the flexible plate or blade for the movable contact, and require the use of registering (preferably micrometrical) means to restore the contacts to the desired geometrical pattern, as required for correctly utilizing the releases or trippings of its own bimetallic disc through the pushbutton, the length of which can be maintained at very close tolerances, to effect proper opening and closing travel of the contacts.

From a strict mechanical standpoint, it will be also found in said present two-temperature thermostat that the flexible plates or blades are used for the movable contacts cannot retain the original mechanical lamination characteristics because of being almost always plastically yielded by repeated bendings, and one of these plates or blades is also provided with an intermediate hole (having stiffened edges), operating as a free passage for a rod comprising the pushbutton of the top switch.

From a thermal standpoint, said flexible plates or blades are subjected to heating proportional to the square of the intensity of electric current flowing therethrough, the resilient stiffness thereof being further altered.

The subject invention is not limited to simple formal variations relative to the above mentioned present thermostats, but is grounded on substantial structural and functional novelties aiming to the following objects:

1. to remove the present assembling problems;
2. to avoid the need of riveted joints for the electrical members;
3. to simplify and standardize the electrical members so as to be the same for one or more temperatures;
4. to avoid the need of manual registering members for the contacts;
5. to allow for a ready automatic control for the positioning of the electrical and thermomechanical members;
6. to enable an entire automation for the assembling operations;
7. in a preferred embodiment to ensure a constant resilient stiffness for the contacts, independently of the intensity of the electric current;
8. to allow for using the same metal flat bottom cup in single- and two-temperature thermostats;
9. to allow for using bimetallic discs of a same diameter in two-temperature thermostats; and
10. to transmit the drive from the discs to the switches of two- or multi-temperature thermostats by means of independent pushbuttons not passing through the moving members of intermediate switches.

The above mentioned objects, resulting in a substantial reduction in production costs on an industrial scale, both because of the reduction in processing and assembling times, and ensuring a higher functional efficiency for a greater duration (independent of the possibility of readily replacing the worn out contacts with new contacts), are mostly achieved by the novel structural principle according to the present invention, substantially consisting of using two insulating box-like bodies, capable of being oppositely arranged and closed or sealed by tightening of two rivets (or screws or equivalent outside means), one of said box-like bodies serving as a seating for the movable parts of the contacts and as an external connection for the device, and the other or second box-like body serving as a sliding seating for the pushbuttons controlled by the bimetallic discs installed in the metal cup externally clamped to the second box-like body, and finally the clamping of the two box-like bodies providing for holding the fixed end portions of the electric switches pressed in the seatings thereof by means of extensions projecting from said box-like body serving as a seating for the thermomechanical members.

The particular novel structural principle of the present invention, as well as the complementary structural and functional features of thermostats made in accordance with said principle, are shown by way of illustrative examples by the accompanying schematic drawings, in which:

FIG. 1 is a schematic perspective view of a two-temperature thermostat according to the present invention, having double-interruption contacts;

FIG. 2 is a main axial sectional view of the two-temperature thermostat having double-interruption contacts as in FIG. 1;

FIG. 3 is a front plan view of the top bimetallic disc shown in FIGS. 1 and 2, freely passed through by the pushbuttons controlled by the rigid bottom overlying the lower bimetallic disc and;

FIG. 4 is a plan view of the thermostat shown in sectional view in FIG. 2.

References common to the several figures of the accompanying drawings will indicate:

A. An insulating box-like body serving as a seating for the movable parts of the electric switches, and as a connection for the fixed parts of the latter;

B. An insulating base body serving as a sliding seating for the pushbuttons, and as a closing plug for the metal cup (C) enclosing the bimetallic predetermined curvature dises controlling the pushbuttons; and

D. Extensions of body (B) penetrating the box-like body (A) for clamping the fixed parts of the switches against the connection seatings, and clamping the two insulating bodies (A) and (B) by tubular rivets (E), or bolts, screws, or equivalent means.

In the preferred embodiments having double-interruption switches, as shown in FIGS. 1–4, the fixed parts of the switches are all the same, with contacts 2 bent at right angles to the plugs 4 outwardly projecting through thin slits 5 of body A, the seatings 1 of which are coplanar with the clamping extensions D.

The movable portion of said double-interruption switches comprises a rigid plate 6 provided at the ends with two contacts 7 and centrally saddle bend 8, a thin flexure spring 9 acting thereon, this spring being straight in its original state (that is when unloaded), and maintained curved by the abutment of its end portions against the inclined seatings 10 of the cavities in the box-like body A.

As to the rigid portion 6, the invention contemplates the use of a metal strip having side silver platings replacing the standard contacts 7.

In two-temperature thermostats the subject invention is further characterized by providing in said box-like body A cavities at different levels for the two switches, so as to allow for the latter the use of fixed end portions which are fully identical, and also for a suitable arrangement of the control pushbuttons thereby obtaining a further equality of the movable parts of the two switches. In accordance with the particular functional structural features of the present invention for providing a two-temperature double-interruption thermostat, as in FIGS. 1, 2, and 3, a switch 8′ is controlled through the axial pushbutton 12 by a proper bimetalllic disc 11′ which is provided with two notches 13 engaged in lugs 14 of the seating in said insulating body B, maintaining a correct orientation for two symmetrical eccentric diametral holes 15 of said disc, the holes providing for the free passage of a pair of parallel pushbuttons 16 operating on the moving bridge 6 of the second switch.

According to the invention, the edge 11′ of the disc is carried as free in its seating by a washer 17 clamped against said insulating body B by the step 18 of cup C. The lower step 19 of said cup C is a bearing seat for the edge of a common bimetallic disc 111, on which a partially drawn rigid disc 20 is shown for transmitting the central release or tripping movement of the curvature reversal for disc 11 to the two side pushbuttons 16.

The level of step 18 is such that the edge of said rigid disc 20 nearly contacts said washer 17 at the end of the curvature reversal of disc 11, in order to ensure the same upward movement for the two pushbuttons 16, and thereby a correct double interruption for the contacts.

The particular functional structural features of the present invention, also suitable for providing three-temperature thermostats, are also such as to enable embodiments other than those herein schematically shown and described, still within the scope of the invention and for the specified objects.

What I claim is:

1. A double-interruption thermostat comprising:

a body of electrically insulating material;

a switch having a pair of fixed contacts electrically insulated from each other and attached to said body, and a pair of mating contacts biased into contacting engagement with said fixed contact;

an electrically conductive connecting strap carrying one of said movable contacts at each of its ends;

a bimetallic element having edges restrained by said body and portions between its edges movable responsive to temperature change; and

a push-rod having a first end adjacent said bimetallic element and a second end adjacent said strap between the ends of said strap, said push-rod dimensioned for effecting movement of said conductive strap responsive to movement of portions of said bimetallic element, thereby breaking contact between both pairs of engaged contacts simultaneously at a predetermined temperature.

2. The thermostat as claimed in claim 1, wherein:

said fixed contacts each include a lug portion for connection to an external conductor, and a contact arm portion bent at a right angle with respect to said lug portion, said contact arm portion carrying a fixed contact point thereon;

said body comprises a first body member carrying said fixed contacts, said movable contacts, and said strap, and a second body member having a bone therethrough for slidably carrying said push-rod, said first and second body member being joined together by fastener means;

and said lugs project externally through slits in said first body member and are held in a fixed position by a clamping action between seating portions of said first and second body members.

3. The thermostat as claimed in claim 1, including a metal cup containing said bimetallic element, said cup adaptable to snap-fit over the end of said second body member opposite the end which mates with said first body member, said cup cooperating with said second body member to clamp said bimetallic element into a fixed position.

4. The thermostat as claimed in claim 1, wherein said strap is a rigid bar with its central portion saddle shaped in a direction away from the direction of contact engagement, said thermostat further comprising:

a flexure spring having a first portion restrained by said first body member and a second portion engaging the saddle portion of said strap to bias said strap in a contact-making direction.

5. The thermostat as claimed in claim 1 including a second switch having a second pair of fixed contacts electrically insulated from each other and attached to said body, and a second pair of mating movable contacts biased into contacting engagement with said second fixed contact;

a second electrically conductive connecting strap carrying one of said second movable contacts at each of its ends;

a second bimetallic element having edges restrained by said body and portions between its edges movable responsive to temperature change: and

a pair of second push-rods each having a first end adjacent said bimetallic element and a second end adjacent said strap between the ends of said strap, said push-rods dimensioned for effecting movement of said conductive strap responsive to movement of portions of said bimetallic element, thereby breaking contact between both pairs of engaged contacts simultaneously at a predetermined temperature.

6. The thermostat as claimed in claim **5**, wherein said first bimetallic element has a pair of apertures therein through which said pair of second push-rods protrude, whereby said first and second switches may have common operating axes.

7. The thermostat as claimed in claim **6**, wherein the longitudinal axes of said first and second straps are angularly spaced from one another.

8. The thermostat as claimed in claim **5**, wherein said first and second switches have similar parts, said body shaped to seat said switches in different planes within said body.

9. The thermostat as claimed in claim **5**, wherein the predetermined operating temperature of said first bimetallic element is different than that of said second bimetallic element.

10. The thermostat as claimed in claim **6**, wherein said first push-rod is movable by the center of said first bimetallic element, and said thermostat includes a rigid support strip positioned between the ends of said second push-rods and said second bimetallic element, whereby curvature reversal of said second bimetallic element is effective to move the center of said support strip which in turn moves said second push-rods simultaneously in a contact opening direction.

11. The thermostat as claimed in claim **3** including a washer clamped between said metal cup and said body, said washer acting as a support for said bimetallic element and as a heat transfer means thereto.

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