Oct. 24, 1967 YONG WON KIM 3,349,206

THERMOSTAT SWITCH AND VARIABLE ADJUSTING MEANS THEREFOR

Filed Aug. 10, 1965

Fig. 1.

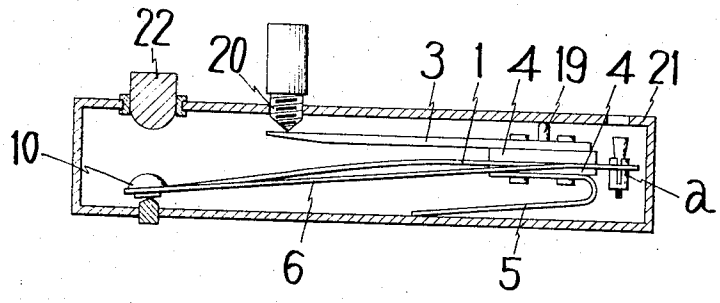


Fig. 2.

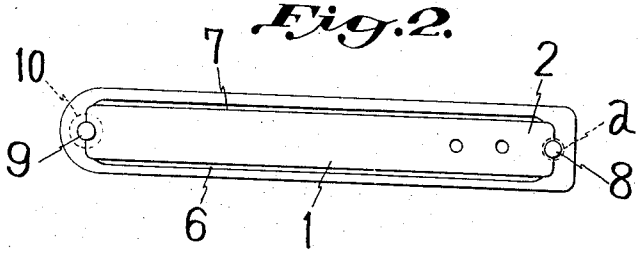


Fig. 3.

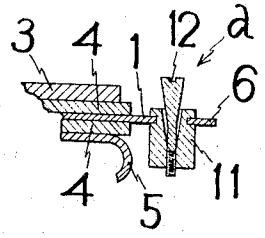
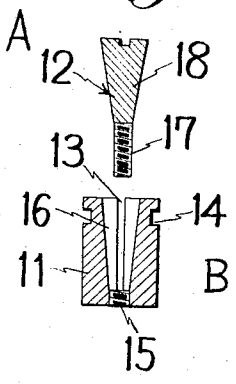


Fig. 4.



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THERMOSTAT SWITCH AND VARIABLE ADJUSTING MEANS THEREFOR

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The present invention relates to a thermostat, in general, and to a thermostat switch and variable adjusting means therefor, in particular.

It is the principal object of the present invention to provide a thermostat leading to an ideal product which meets such various requirements that: it should be positive in action and performance; capable of use at elevated temperatures due to application of high currents; most simplified in structure; and made available in miniature size or much smaller size than conventional products.

With this and other objects in view which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawing, in which:

FIG. 1 is a side elevation, the case being in section;

FIG. 2 is a top plan view of a combination of a bimetal element with its back plate;

FIG. 3 is a fragmentary section of the essential elements of the thermostat; and

FIG. 4 is a further fragmentary exploded section of an adjusting means of the essential elements, as shown in FIG. 3.

Referring now to the drawing, a thermostat, in accordance with the present invention, is provided wherein one end of a bimetal or other resilient metal body is fixed to the inner side of a supplementary plate (back plate) and the other end thereof is movably attached to the back plate in such manner, that the metal body is curved to an arcuate side section and that when actuated the metal body can warp jumpingly to the opposite side thereby to open or close contacts, the resilient metal body being provided preferably at its stationary end with an adjusting means which permits adjusting the warping degree of the metal body as desired.

In particular as indicated in the drawing, a bimetal or other resilient metal body **1** is riveted in the proximity of its root end **2** together with a plate spring **5** integrally to a contact adjusting plate **3** by means of washers **4**. A back plate **6** is provided with an elongated opening or groove **7** somewhat wider than the bimetal body **1**, but of the same length, and surrounding the bimetal body **1**. In the inner central portions of both ends of the back plate **6** holes **8** and **9** are provided in contact with both ends of the bimetal body **1**. An adjusting means to be described later, is fitted through the hole **8**, and a movable contact **10** is riveted through the hole **9**, so that the bimetal body **1** and the back plate **6** are riveted together and the bimetal body **1** is compressed longitudinally to an arcuately curved section.

This arrangement takes advantage of the physical phenomenon, that the rivet yields to the pressure applied vertically in the course of riveting and its diameter in the central portion which has the least resistance is expanded, so that the bimetal body **1** and the back plate **6** are pressed out horizontally in opposite directions, thereby, forming some gap therebetween. Thus, the other end of the back plate **6** is pressed in the direction of the front end and the root end **2** of the bimetal body **1** is pressed in opposite direction, and while the adjusting means *a*, fitted between the two elements by means of the hole **8**, is held in position, the bimetal body **1** is compressed longitudinally over a distance corresponding to the gap formed between the bimetal body **1** and the back plate **6** to an arcuately curved

side section, because the bimetal body **1** and the groove **7** of the back plate **6** are equal in length.

As described above, the bimetal body **1** is integrated at one end with the back plate **6**, as the movable contact **10** is riveted and holds the adjusting means *a* at the other end between the root end **2** and the back plate **6**. By adjusting the diameter of the adjusting means *a*, therefore, the warping degree of the bimetal body **1** can be adjusted as desired.

The adjusting means *a* comprises a cylindrical adjusting member **11** and a meshing adjusting screw **12**, as shown in FIGS. 3 and 4. The cylindrical adjusting member **11** is a short cylinder provided with vertical slits **13** from the top end to close to the bottom, a groove **14** on the circumference close to the top end, an internal thread **15** at the bottom, and further provided with a recess **16** having a gradually widening diameter toward the top. The adjusting screw **12** is provided with an external thread **17** which meshes the thread **15** of the adjusting cylinder **11**, and is also provided with a head **18**, the diameter of which is gradually widening toward the top.

The adjusting cylinder **11** is disposed in an opening **8** of said bimetal body **1** in such manner that the slits **13** are arranged perpendicularly to the axis of the bimetal body **1**, and the bimetal body **1** and the back plate **6** are fitted together in the groove **14** of the cylinder **11**. Then, the adjusting screw **12** is inserted into the cylinder **11**. As the head **18** of the adjusting screw **12**, urged into the bore **16** of the adjusting cylinder **11**, expands the latter and compresses the bimetal body **1** toward the front end thereof, thereby permitting free adjustment of the warping degree of the bimetal body **1**.

The bimetal body **1** assembled as above is fitted into a case **21**, swingably with the pressure of the plate spring **5**, with the lever **19** and the screw **20** for adjusting contact separation used as the fulcrums. A fixed contact **22** is supported in the case **21**.

With the construction as described above, the warpable degree of the bimetal body **1** is adjusted with utmost ease by means of the adjusting screw **12**, and, therefore, the warping force for the bimetal body **1**, that is, the time point of temperature for actuating the bimetal body **1**, can be adjusted as desired. Thus, a thermostat having great precision in performance can be obtained. It is also possible to form and assemble the bimetal body **1** and the back plate **6** beforehand, adding greatly to the convenience and exactness of the assembling work. Furthermore, when a warping force is applied to the bimetal body **1** due to a temperature change, the bimetal body **1** warps beyond a certain limit point jumpingly to the opposite side, thereby, effecting positive and quick opening or closing of a circuit. This eliminates the danger of arcing of contacts, and, of course, of localized temperature rises, and renders prominently satisfactory properties to the thermostat.

If the back plate **6** is formed of a highly conductive metal such as phosphor bronze, the current flowing through the bimetal body **1** is fed to the back plate **6**, and any abnormal heat development of the bimetal body **1** due to its specific resistance is reduced substantially to zero and the possibility of erroneous operation is precluded, and stabilized performance is assured without the necessity of using relatively large bimetal bodies **1** for high-current applications.

Although, in the example shown in the drawing, a bimetal body **1** is used, any resilient metal material other than the bimetal body can be used by supporting the contact adjusting plate **3** with a flexible supporter which can expand and contract owing to the expansion of a liquid or solid body in place of the supporting or lever member **19**. Such a resilient metal material is included within the definiton of "bimetal body" for this invention.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claims.

What I claim is:

1. An adjustable thermostat switch comprising
a case,
a back plate,
a bimetal body fixed at one portion to said back plate, said bimetal body mounted in said case,
an adjusting means for adjusting the warping degree of said bimetal body comprising,
a substantially cylindrical adjusting member,
a meshing adjusting screw,
said cylindrical adjusting member including vertical slits extending from the top end to close to the bottom, and having a circumferential groove as well as an inner thread at its bottom, and also a recess having a gradually widening diameter toward its top,
said adjusting screw has an outer thread, engaging said inner thread of said adjusting member, and a head having a gradually widening toward its top, and
said adjusting cylinder is received in an opening of said bimetal body such that said slits are perpendicular to the axis of said bimetal body and said bimetal body and said back plate are fitted together in said circumferential groove of said cylinder.

2. A thermostat comprising
a case,
a bimetal body,
a back plate,
one end of said bimetal body being fixed to said back plate,
an adjusting means provided at the other end of said bimetal body and disposed between said bimetal body and said back plate for movably attaching said bimetal body to said back plate, such that said metal body is curved to form an arcuate side section, and for permitting variable adjustment of the warping degree of said bimetal body,
one of said ends of said bimetal body being movable and carrying a contact movable with said bimetal body,
the other of said ends of said bimetal body mounted substantially stationary relative to and within said case,
a fixed contact fixed to said case and disposed in the path of said movable contact, as well as to be engaged by the latter upon actuating said bimetal body, to open and close, respectively, a circuit, and
said adjusting means comprises a screw means having a variable diameter along its axis.

3. A thermostat comprising
a case,
a bimetal body,
a back plate,

one end of said bimetal body being fixed to said back plate,
an adjusting means provided at the other end of said bimetal body and disposed between said bimetal body and said back plate for movably attaching said bimetal body to said back plate, such that said metal body is curved to form an arcuate side section, and for permitting variable adjustment of the warping degree of said bimetal body,
one of said ends of said bimetal body being movable and carrying a contact movable with said bimetal body,
the other of said ends of said bimetal body mounted substantially stationary relative to and within said case,
a fixed contact fixed to said case and disposed in the path of said movable contact, as well as to be engaged by the latter upon actuating said bimetal body, to open and close, respectively, a circuit,
said adjusting means is disposed at said substantially stationary mounted end of said bimetal body,
said adjusting means is disposed within and in spaced relationship from said case,
said case defines and opening adjacent said adjusting means for access thereto,
said back plate defines an elongated opening therethrough,
said bimetal body has a length substantially equal to said elongated opening and disposed therein,
a plate spring connected to one side of said bimetal body at said substantially stationary mounted end of said bimetal body and resting on said case,
a lever perpendicularly connected to the other side of said bimetal body at said substantially stationary mounted end of said bimetal body and abutting said case,
said lever and said plate spring thereby supporting said bimetal body therebetween and in spaced relationship from said case,
a contact adjusting plate connected to said bimetal body at said substantially stationary mounted end of said bimetal body and extending substantially parallel thereto, and
an adjustable screw disposed in said case and abutting the free end of said contact adjusting plate.

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