June 1, 1943. P. R. LEE 2,320,873

THERMOSTAT

Filed Aug. 17, 1940

Fig. 1.

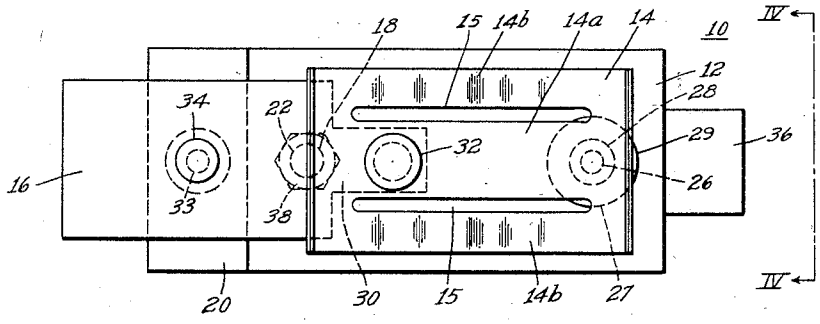


Fig. 2.

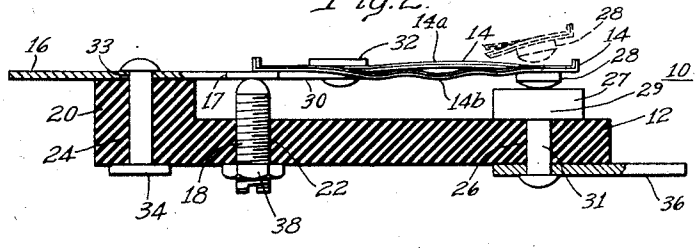


Fig. 3.

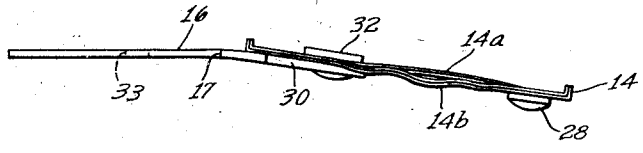
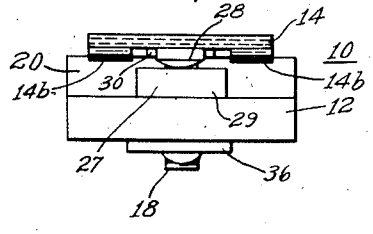


Fig. 4.



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UNITED STATES PATENT OFFICE

2,320,873

THERMOSTAT

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Application August 17, 1940, Serial No. 353,021

6 Claims. (Cl. 297—15)

My invention relates to thermostats and more particularly to adjustable bimetallic snap-acting thermostats.

An object of my invention is to provide a simple, rugged, efficient, snap-acting bimetallic thermostat which has a calibrating or adjusting member independent of the bimetallic element.

A further object of my invention is to provide a snap-acting thermostat utilizing a three-legged bimetallic element which is resiliently attached to a supporting structure by a resilient member attached to the central leg only of such element.

Another object of my invention is to provide means for calibrating a thermostat having an inherently snap-acting bimetallic element by varying the position of the fixed end of such element.

Still another object of my invention is to provide calibrating means for an inherently snap-acting bimetallic element which cooperates with only a portion of such element.

Other objects of my invention will either be pointed out specifically in the course of the following description of a device embodying my invention, or will be apparent from such description.

In the accompanying drawing,

Figure 1 is a top plan view of a thermostat embodying my invention,

Fig. 2 is a partial sectional and elevational view of the device shown in Fig. 1,

Fig. 3 is a side elevational view of a portion of the thermostatic structure embodying my invention, and

Fig. 4 is an end view of the device shown in Figs. 1 and 2, taken along line IV—IV of Fig. 1.

Referring to the accompanying drawing, in which like reference characters indicate like parts in the several figures, I show a thermostat 10 comprising a supporting structure 12 having a stationary contact 27, a bimetallic snap-acting element 14 carrying a cooperating contact 28, a resilient member 16 for attaching the element to the supporting structure 12 and an adjusting or calibrating member 18 engaging the resilient member 16 for adjusting the operating temperature of the bimetallic element.

The supporting structure 12 is, in this instance, formed of any suitable insulating material such as a phenolic resin, or the like. The structure 12 comprises an elongated main portion having an upstanding end portion 20 located at one end thereof for supporting the resilient member 16, as hereinafter described. A suitable threaded aperture 22 is located along substantially the longitudinal axis of the structure 12, to receive the adjusting member 18, as hereinafter described. In addition, apertures 24 and 26 are located within either end of the supporting structure 12 to receive suitable rivet like members, as hereinafter described.

The bimetallic element 14 is of an inherently snap-acting type and is formed in a well known manner, as described in United States Letters Patent No. 2,259,312, issued to P. R. Lee, on October 14, 1941, and assigned to the assignee of this invention. This bimetallic element comprises a centrally located longitudinal extending strip 14*a* separated by slots 15 from outer strips 14*b*, extending substantially parallel to the central strip 14*a*. The outer strips 14*b* are crimped so as to cause the structure to be flexed into an arcuate configuration, with the central uncrimped strip 14*a* thereof being of a different configuration than the remainder of the element.

It is to be understood, however, that, while a three-legged snap-acting bimetallic element is shown, any other inherently snap-acting member may be used in lieu thereof. The bimetallic member 14 is, in this instance, rigidly attached near, say, the "fixed end" thereof, to the supporting structure 12 through the use of the resilient member 16 which is adapted to engage with or to be attached to one end of the central strip 14*a*, as more fully hereinafter described. A movable contact 28 is spot welded or brazed to the free end of the bimetallic member 14 so as to move therewith.

The resilient member 16 is, in this instance, an elongated spring member which is slightly bent, say, along a transverse line 17 intermediate the free end of such member and the bimetallic element 14 (see Fig. 3). In other words, the resilient member 16 and bimetallic element 14 in this instance do not form a straight line when in their free or unmounted position. The resilient member 16 has an outwardly extending relatively narrowed protruding portion 30 (see Fig. 1). The portion 30 of resilient member 16 is adapted to extend beneath the central strip 14*a* and is rigidly attached thereto by a suitable rivet 32. The resilient member 16 is thus attached to a point in the central strip 14*a* of such bimetallic element 14. An aperture 33 is located within the central portion of the resilient member 16 and is adapted to be positioned above the raised portion 20 of supporting structure 12 in line with the aperture 24 passing therethrough. A suitable rivet 34 may then be passed through the apertures 24 and 32 and spun over to rigidly attach the resilient member 16 to the supporting struc-

ture 12. The bimetallic element 14, being attached to the free end of the resilient member 16 is thus positioned substantially parallel to the supporting structure 12 with the movable contact 28 located upon the free end of such element engaging stationary contact 27.

The resilient member 16 being bent along line 17 and being mounted upon the relatively flat portion 20 of structure 12 causes such member 16 to bias the element 14 downwardly. It is obvious, however, that resilient member 16 may have any other suitable longitudinal curvature, with a corresponding complementary portion 20 of structure 12, so as to bias the bimetallic element 14 downwardly or in a clockwise direction.

The stationary contact 27 comprises, in this instance, an enlarged head portion 29 and a small cylindrical shank portion 31 adapted to be rigidly attached to the supporting structure 12. The shank portion 31 of the stationary contact 27 is adapted to pass through the aperture 26 and also to pass through a corresponding aperture in a suitable terminal strap 36. The lower end of the shank portion 31 of the contact 27 is then spun over tightly against the terminal strap 36 so as to rigidly attach the contact 27 and strap 36 to the supporting structure 12.

With the resilient member 16 being bent downwardly with respect to the main portion thereof when in its normal unmounted position, it follows that, after such resilient member is attached to the flat topped portion 20 of supporting structure 12, the bimetallic element 14, being attached to the bent portion of the resilient member 16, will be biased downwardly or into a contact-engaging position.

The adjusting or calibrating member 18 is, in this instance, an elongated setscrew having a rounded point at its upper end. Such calibrating member is adapted to be threadedly positioned within the aperture 22 in the supporting structure 12. The adjusting or calibrating member 18, because of the threaded engagement with the supporting structure 12 is capable of being run up against the lower surface of the resilient member 16 so as to predeterminedly alter or determine the amount of downward biasing action of such member upon the bimetallic element 14. In other words, the adjusting or calibrating member 18 is adapted to change the opening temperature of the thermostat as such member is moved upwardly against the spring 16. A suitable lock nut 38 is run upon the lower portion of the setscrew adjusting member 18 so as to engage the lower surface of the supporting structure 12 and to lock such member in its predetermined set position. In other words, the adjusting calibrating member 18 is used primarily as a factory setting means for determining the fixed opening temperature of the thermostat.

It will be noted that current through the thermostat 10, when connected in or to a suitable circuit which it is desired that the thermostat control, also traverses resilient member 16 and the terminal strap 36. The path of the current would then be substantially as follows: from, say, resilient member 16 to the bimetallic element 14, through the rivet 32, the movable contact 28, stationary contact 27 and out through the terminal strap 36. Passage of current through the bimetallic element 14 in addition to any increase in ambient temperature, will cause the element 14 to increase in temperature. This temperature increase will continue until the predetermined opening temperature thereof has been reached, at which time the element 14 will snap or abruptly move to an upper or contact disengaged position (see dotted lines, Fig. 2). This upward snap-action of the bimetallic element occurs against the downward biasing action of the resilient member 16. With the upward flexment of the element 14 the circuit passing therethrough is broken. The element 14 thus cools until reaching its predetermined closing temperature at which time the element, assisted by the downwardly biasing action of resilient member 16, will snap downwardly to the substantially parallel or contact engaged position (see solid lines, Fig. 2). The thermostat 10 will thus cycle back and forth within substantially fixed temperature limits.

It will be understood that the resilient member 16, as hereinabove described, through the action of adjusting member 18, permits the angular position of the bimetallic element 14 to be selectively changed with respect to its point of support. The adjusting member 18 cooperating with the resilient member 16 thus changes the angular position of the so-called "fixed end" of the bimetallic element 14, or that end attached to the resilient member 16, for the purpose of varying the opening temperature of the thermostat. It is, therefore, obvious that, by adjusting or varying the effective angular position of the fixed end of the bimetallic element, such element may be adapted to flex from a closed to an open position at various predetermined temperatures.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

I claim as my invention:

1. A snap-acting device comprising, in combination, a supporting structure, a snap-acting bimetallic element including a central strip and two exterior strips together with end portions joining the respectively adjacent ends of said strip, and a resilient member rigidly attached solely to the central strip as distinguished from said end portions and to the supporting structure for supporting said element outside of its boundaries.

2. A snap-acting thermostat comprising, in combination, a supporting structure, a snap-acting bimetallic element having a central strip and a movable and a relatively stationary end portion, means attached solely to the central strip of said element for movably attaching such element outside of its boundaries to the supporting structure, said stationary end portion contacting said means over a substantial area, and adjusting means cooperating with said first means for varying the angular position of said central strip and stationary end portion of said element for adjusting the operation of said element.

3. A snap-acting thermostat, comprising, in combination, a supporting structure, a bimetallic element having a central strip and two exterior strips joined by end portions, a resilient member rigidly attached to the central strip of said element for attaching the element outside of its boundaries to the supporting structure and for alone biasing the element into a predetermined position, and adjusting means engaging the resilient member for selectively adjusting the bias-

ing action of said member and the operating temperature of said bimetallic element.

4. A snap-acting thermostat, comprising, in combination, a supporting structure, a bimetallic element including a central strip and two exterior strips, a resilient member rigidly attached to the central strip and secured to the supporting structure outside of the boundaries of said element for alone biasing the element into a predetermined position, and adjusting means retained by the supporting structure engaging the resilient member independently of the bimetallic member for selectively adjusting the operating temperature of such bimetallic element.

5. A snap-acting thermostat, comprising, in combination, a supporting structure, a bimetallic element including a central strip and two exterior strips, and a resilient member rigidly attached to the central strip to constitute the sole place of support of said element and also attached outside of the boundaries of said element to the supporting structure for alone biasing the element into a predetermined position, and adjusting means retained by the supporting structure engaging the resilient member independently of the bimetallic member for selectively varying the position of said place of support of the bimetallic element to adjust the operation of such element.

6. A snap-acting thermostat comprising, in combination, a supporting structure, a snap-acting bimetallic element, resilient means rigidly attached to said element for securing it outside of its boundaries to the supporting structure, and adjusting means cooperating with said resilient means for varying the angular position of said element, said resilient means being biased towards a position of engagement with said adjusting means.

PAUL R. LEE.