Aug. 6, 1940. E. BLETZ 2,210,701

THERMOSTAT

Filed April 25, 1939

Fig. 1.

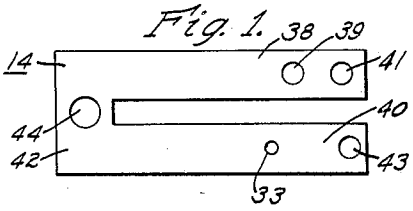


Fig. 2.

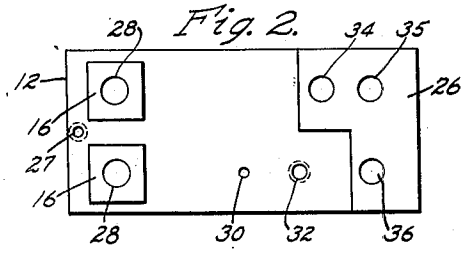


Fig. 3.

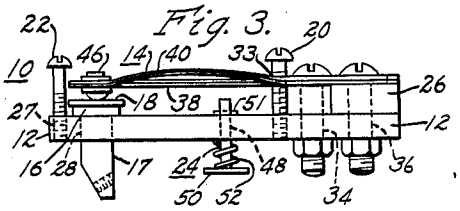


Fig. 4.

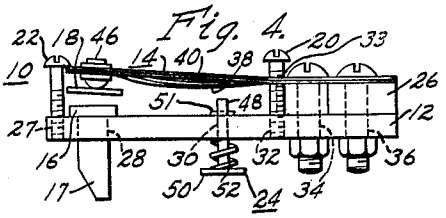


Fig. 5.

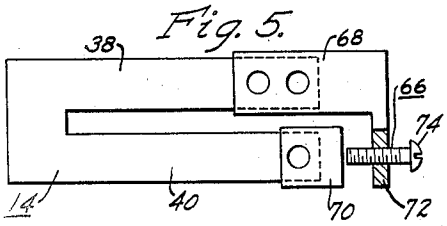


Fig. 6.

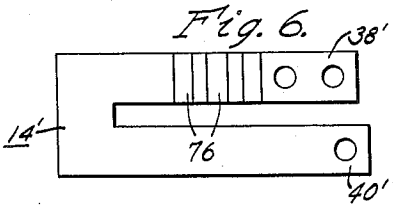


Fig. 7.

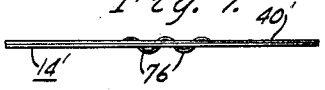


Fig. 8.

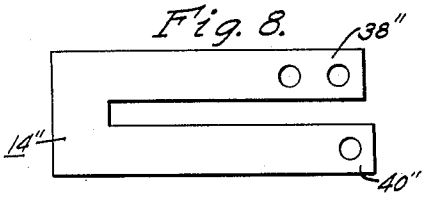


Fig. 9.



Fig. 10.

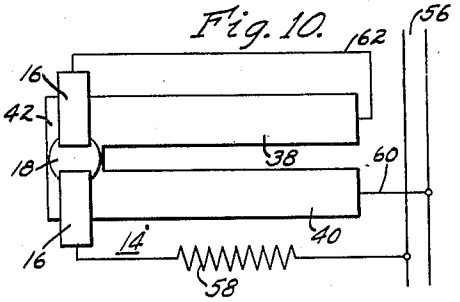
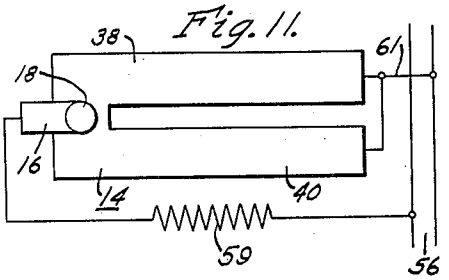


Fig. 11.



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2,210,701

UNITED STATES PATENT OFFICE

2,210,701

THERMOSTAT

Edward Bletz, Lexington, Ohio, assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application April 25, 1939, Serial No. 269,939

7 Claims. (Cl. 200—138)

My invention relates to thermostats, and more particularly to bimetallic snap-acting strip-type thermostats.

An object of my invention is to provide an efficient, inexpensive, rugged, snap-acting, bimetallic, strip-type thermostat which may be operated by an ambient temperature or by an electric current passing therethrough.

A further object of my invention is to provide a thermostat having a furcated bimetallic member in which at least one leg of the member is in compression and one leg is in tension.

Another object of my invention is to provide a thermostat having a furcated bimetallic member in which one leg is in compression, and adjusting means which cooperates with the supporting structure and the compressed furcation.

Still another object of my invention is to provide a bimetallic thermostat having a furcated bimetallic member in which one of the furcations thereof is under compression and having a resetting mechanism resiliently mounted upon the supporting structure and cooperating with the bimetallic member for resetting such member upon its automatic disengagement.

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 plan view of the bimetallic element incorporated in a device embodying my invention;

Fig. 2 is a plan view of the supporting structure for the device embodying my invention;

Figs. 3 and 4 are side elevational views of the device embodying my invention illustrating its operative and inoperative positions;

Fig. 5 is a diagrammatic view illustrating a modified form of an adjusting mechanism for the device shown in Figs. 3 and 4;

Figs. 6 and 7 are plan and side views, respectively, of a modified form of a bimetallic member adapted to be used in the device illustrated in Figs. 3 and 4;

Figs. 8 and 9 show a plan and side elevational view of a second modified form of bimetallic member of a device embodying my invention, and

Figs. 10 and 11 show diagrammatic views of a device embodying my invention incorporated with a power circuit.

Referring to the accompanying drawing, I show a thermostat 10 having a base or supporting structure 12, a furcated bimetallic member 14, cooperating contacts 16 and 18, adjusting means 20 cooperating with the supporting structure and the bimetallic member, adjusting means 22 cooperating with the supporting structure 12 and the free end of the bimetallic member 14, and a manual reset mechanism 24 for manually resetting the thermostat.

The base 12 comprises, in this instance, a substantially flat strip of metal through which there extends a plurality of apertures 28, 30, 32, 34, 35 and 36 for purposes hereinafter described. It is to be understood, however, that the base 12 may be formed from any other suitable material such as a phenolic resin. A right-angle-shaped supporting ledge 26 is rigidly attached to one end of the base 12, its legs being respectively located in line with the apertures 34, 35 and 36. Further, the apertures 34, 35 and 36 extend through the supporting ledge 26. The apertures 35 and 36 are substantially on a line parallel to the transverse axis of the supporting structure 12.

The bimetallic member 14 is, in this instance, bifurcated, having furcations or prongs 38 and 40 and an end portion 42. The end portion 42 is, in this instance, integral with the furcations 38 and 40. However, it is to be understood that such end portion may be a separate integral member rigidly attached to the furcations 38 and 40 to form a functionally integral furcated bimetallic member. Furcations 38 and 40 are, in the preferred form, substantially the same length and have apertures 39, 41 and 43 located in the end thereof. Apertures 39 and 41 are in the end of the furcation 38, while the aperture 43 is positioned within the end of the furcation 40. It will be noted that the apertures 41 and 43 are not along a transverse axis of the overall bimetallic member 14. In other words, the apertures 41 and 43 are substantially offset, with respect to each other, and are adapted to cooperate with the apertures 35 and 36 of the supporting structure 12 in a manner as hereinafter described. An aperture 44 is located in the end portion 42 of the bimetallic member 14 for the purpose of retaining the movable contact 18. Such contact 18 is attached to the end portion 42 by means of suitable nuts and bolts, or the like, 46.

Stationary contacts 16 are rigidly and insulatedly attached to one end of the supporting structure 12 and electrically associated with a terminal 17. These contacts cooperate with the movable contact 18 as the bimetallic member moves from one operative position to another.

Adjusting means 20 consists, in this instance, of a screw which is threadedly attached to the

base 12 within the threaded aperture 32. The screw or adjusting member 20 is also adapted to threadedly engage the furcation 40 of the bimetallic member through aperture 33 in a manner as hereinafter described.

The adjusting means 22 comprises a screw member which is, in this instance, threadedly attached to the base 12 within the aperture 27. The adjusting member or screw 22 is positioned beyond the end of bimetallic member 14 and does not engage such member except when it is in an inoperative position as hereinafter described.

The manual reset mechanism 24 comprises a shaft 48 slidably mounted within the aperture 30 in base 12, a resilient member 52, flat button 50 and a small pin 51. The pin 51 is adapted to extend through the upper end of the shaft or stem 48 so as to prevent the shaft 48 from being pulled down through the aperture 30 in the base 12. The button 50 is rigidly attached to or integral with the lower end of the shaft 48 while the resilient member 52 is operatively associated with the lower surface of the supporting structure 12 and the upper surface of the button 50. Accordingly, the resilient member 50 biases the shaft 48 downwardly against the pin 51.

When assembling the thermostatic device embodying my invention, the supporting structure 12 is cut from a suitable stock material and the apertures 27, 28, 30, 35 and 36 are cut or punched therein. The supporting ledge is then integrally attached to the base 12, forming a part thereof, with the apertures 34, 35 and 36 extending therethrough. The bimetallic member 14 with the apertures 39, 41 and 43 located within the ends of the furcations 38 and 40 thereof is then positioned upon the supporting ledge 26, with the apertures 39 and 41 in furcation 38, cooperating with apertures 34 and 35 in the supporting structure 12, and the aperture 43 in furcation 40 cooperating with the aperture 36 in the supporting structure. It therefore follows that, inasmuch as the apertures 35 and 36 located on the supporting structure are in a straight line, and that, inasmuch as the cooperating apertures 41 and 43 in the bimetallic member 14 are offset, the furcation 40 will be compressed or bowed, say, upwardly as illustrated in Fig. 3. It is to be understood that, if desired, the apertures 35 and 36 may be positioned out of line with the cooperating apertures 41 and 43 located in a straight line. This procedure would likewise bow the furcation 40 upwardly, as hereinabove described.

The furcation 40 will thus be in compression. Conversely, the furcation 38 will thus be in tension. The furcated bimetallic member 14 is thus attached to the structure by means of furcations 38 and 40 with one furcation 40 in compression and one furcation 38 in tension, so as to produce a snap acting action of such member as it changes from one operating position to another.

The adjusting means 20 is then threadedly inserted through the aperture 33 in furcation 40, and through the aperture 32 in the supporting structure 12. Accordingly, the screw or adjusting means 20 may thus, depending upon the relative rotation thereof, raise or lower the furcation 40 upwardly or downwardly with respect to the base 12. This, in turn, increases or decreases the compression within the furcation 40 and accordingly adjusts the disengaging or opening temperature setting of the bimetallic member 14.

The adjusting member 22 may likewise be threadedly engaged within the aperture 27 within the base 12, while the head thereof extends over the bimetallic member 14. Accordingly, the head of the adjusting screw 22 may be moved vertically relative to the supporting structure 12 and limit the upper position of the bimetallic member 14 when in a disengaged position (see Fig. 4). This, in turn, affords adjustable means of varying the inoperative position or closing temperature of the bimetallic member.

The device embodying my invention thus includes, in combination, a supporting structure, a furcated bimetallic member attached to the structure with one furcation thereof in compression and one in tension, with adjustable means cooperating with the compressed furcation for varying the degree of compression of such furcation for adjusting the operation of such member, and a second adjusting means cooperating with the free end of the bimetallic member for varying the closing temperature of such thermostatic device.

The thermostatic structure 10 may be operatively associated with the supply circuit 56 (see Figs. 10 and 11) with the furcations 38 and 40 of the bimetallic member 14 being either in series or in parallel with the supply circuit. With the furcations 38 and 40 in series with a resistor, or the like 58, the circuit through the resistor 58 may include the conductor 60, furcation 40, end portion 42, furcation 38, conductor 62, stationary contact 16, movable contact 18, a second stationary contact 16 and a resistor 58 to the supply circuit 56. Accordingly, it follows that when the thermostatic device 10 is in an operative position with the movable contact 18 engaging the stationary contact 16, the full amount of current passing through the resistor 58 will pass through each furcation of the bimetallic member. Then as the bimetallic member 14 increases in temperature, either due to the passage of current therethrough or to a suitable increase in the ambient temperature thereabouts, or both, the bimetallic member 14 will snap upwardly, disengaging the contacts 16 and 18 (see Fig. 4). The current passing through the resistor 58 to the power supply is thus interrupted.

Then, as the bimetallic member 14 cools to its closing temperature, such member will snap back to its operative position where the contacts 16 and 18 again become engaged. However, if it be desired to close the bimetallic member by hand, the button 50 and shaft 48 of the manual resetting device 24 would be pushed upwardly against the compressed or bowed furcation 40 of the bimetallic member 14 causing such furcation to arch upwardly and the movable contact 18 to be moved downwardly with a snap action. The bimetallic member would thus remain closed if the temperature be close to the closing value, and would return to an open position if the temperature is not of such magnitude.

If the resistor should be of a considerably greater capacity such as resistor 59 illustrated in Fig. 11, it may be desired to have the furcations 38 and 40 in parallel. Accordingly, the current passes through the resistor 59 to the stationary contact 16, movable contact 18 and then divides, and equal portions thereof traverse the respective furcations 38 and 40 to the conductor 61 and the supply circuit 56. However, the thermal operation of the thermostat remains substantially as hereinabove described in which the bimetallic member operates with a snap action.

If it be desired, an additional or modified form of adjusting means 66 may be used to adjust the

degree of compression within the furcation 40 of bimetallic member 14. When using the adjusting device 66, the supporting ledge 26 comprises two members 68 and 70. The portion 68 is rigidly attached to, or integral with, the supporting structure 12 (see Fig. 5). The portion 70 is movably or slidably attached to the supporting structure 12 while the furcation 40 of bimetallic member 14 is rigidly attached thereto. The adjusting means 66 includes a flange portion 72 which is functionally integral with the stationary member 68 and an adjusting screw 74 threadedly engaged therewith. The adjusting screw 74 is adopted to contact the outer edge of the movable portion 70 of the supporting ledge 26. Thus, as the adjusting screw 74 is rotated inwardly or outwardly, the slidable portion 70 and the end of the furcation 40 are likewise moved inwardly or outwardly. The compression within furcation 40 is thus either increased or decreased while the shape of the furcation is likewise changed. Accordingly, it follows that the adjusting mechanism 66 may likewise selectively adjust the degree of compression within the furcation 40 so as to adjustably vary the operating characteristics of the bimetallic member 14.

If it be desired, the bimetallic member 14 may be permanently deformed so as to increase the relative lengths of the furcations of bimetallic member 14 after having been cut a uniform length.

Referring to Figs. 6 and 7, it will be observed that the furcation 38' of bimetallic member 14' has been subjected to a crimping operation in which a series of waves or undulations 76 have been formed therein. These waves or undulations have the effect of decreasing the length of the furcation 38'.

Accordingly, it is obvious that when the bimetallic member 14' is attached to the supporting structure 12 in which the apertures 35 and 36 of the supporting ledge 26 are in a straight line, as hereinabove described, the furcation 40' will be bowed upwardly and will be subjected to compression, while the corrugated furcation 38' will be under tension.

As an additional modification of the bimetallic member 14, the leg 40'', after having been formed, may be substantially reduced in thickness or coined so as to increase its length. The bimetallic member 14'' (see Fig. 8) will thus have two or more substantially flat furcations 38'' and 40'' with 40'' being substantially longer than the furcation 38''. Accordingly, as hereinabove described, when the bimetallic member 14'' having furcations of uneven length, is attached to the supporting structure 12 in which the apertures are substantially in a straight line, the furcation 40'' having the longer length will be under compression, while the shorter furcation 38'' will be under tension.

Various other modifications may be made in the device embodying my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art and the appended claims.

I claim as my invention:

1. A thermostatic device including, in combination, a supporting structure and a furcated bimetallic member having a closed end, said member attached to the structure so that one furcation is attached to said structure at a different effective distance from said closed end than the other thereby to cause one furcation to be in compression and one in tension to produce a snap-action of such member.

2. A thermostatic device including, in combination, a supporting structure and a furcated bimetallic member having a closed end, said member attached to the structure by means of the ends of the respective furcations being fixed at different effective distances from said closed end so that at least one furcation is in compression and one in tension to produce a snap-action of such member.

3. A thermostatic device including, in combination, a supporting structure, a furcated bimetallic member attached to the structure with one furcation in compression and one in tension, and means cooperating with the compressed furcation for varying the shape thereof for adjusting the operation of such member.

4. A thermostatic device including, in combination, a supporting structure, a furcated bimetallic member attached to the structure with one furcation in compression and one in tension, and adjustable means cooperating with the compressed furcation for varying the degree of compression of such furcation for adjusting the operation of such member.

5. A thermostatic device including, in combination, a supporting structure, a furcated bimetallic member attached to the structure with one furcation in compression and one in tension, and adjustable means cooperating with the compressed furcation for adjusting the operation of such member, and adjustable means cooperating with the free end of the bimetallic member for adjusting the operation of such member.

6. A thermostatic device including, in combination, a supporting structure, a furcated bimetallic heat-responsive member, said member attached to the structure by means of the furcations with one furcation in compression and one in tension for producing a snap-action of such member, cooperating contacts, one of such contacts attached to the support and a second attached to the free end of the bimetallic member, an adjusting member cooperating with the structure and the compressed furcation for adjusting the contact disengagement temperature of the bimetallic member, and a second adjusting member cooperating with the structure and the free end of the bimetallic member for adjusting the contact reengagement temperature of the bimetallic member.

7. A thermostatic device including, in combination, a supporting structure, a furcated bimetallic heat-responsive member, said member attached to the structure by means of the furcations with one furcation in compression and one in tension for producing a snap-action of such member, cooperating contacts, one of such contacts attached to the support and a second attached to the free end of the bimetallic member, an adjusting member cooperating with the structure and the compressed furcation for adjusting the contact disengagement temperature of the bimetallic member, a second adjusting member cooperating with the structure and the free end of the bimetallic member for adjusting the contact reengagement temperature of the bimetallic member, and means resiliently attached to the supporting structure for manually reengaging the contacts.

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