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THERMOSTAT

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Fig. 1.

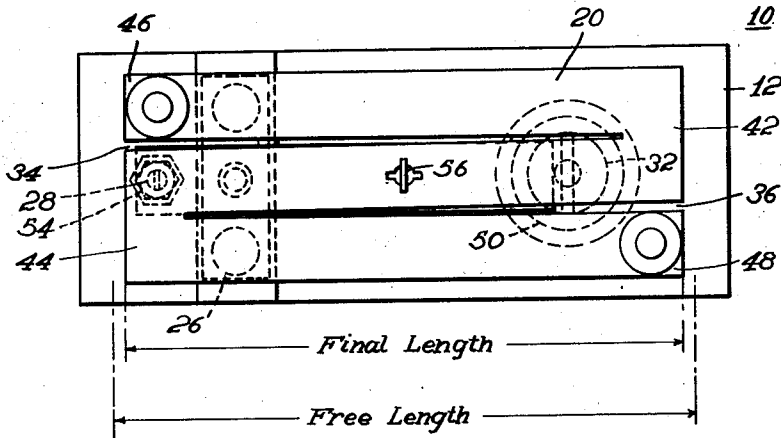


Fig. 2.

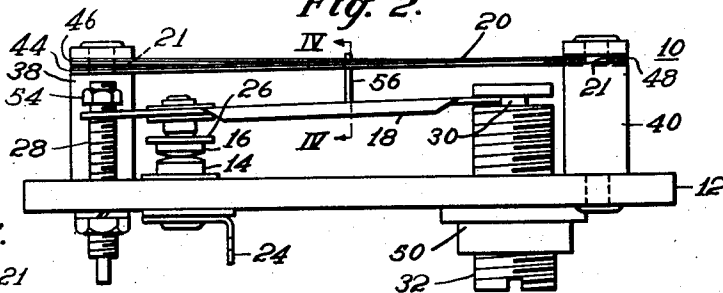


Fig. 5.

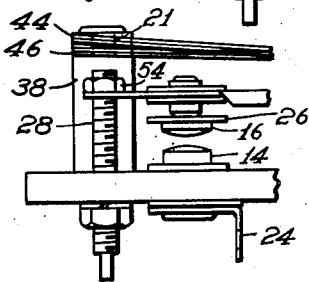
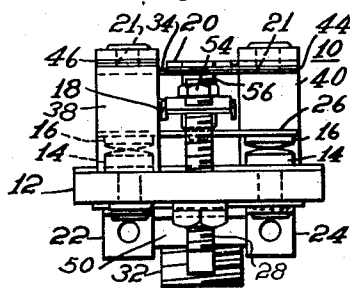


Fig. 4.



Fig. 3.



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THERMOSTAT

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7 Claims. (Cl. 200-138)

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

An object of my invention is to provide an inexpensive, simple, highly sensitive, rugged bi-
5 metallic element for a snap-acting thermostat.

Another object of my invention is to provide an N-shaped bimetallic element for a thermostat which is adapted to be longitudinally constrained so as to provide a powerful snap-action thereof
10 along a plane normal to the surface thereof.

A further object of my invention is to provide a thermostat having a longitudinally constrained bimetallic element which is adapted to move from one position to another with a snap action
15 and which is associated with an adjustably positioned contact arm for energizing or deenergizing cooperating contacts.

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

In the accompanying drawing:

Figs. 1, 2 and 3 are top, side and end views,
25 respectively, of the thermostatic structure embodying my invention; and

Fig. 4 is a sectional view taken along the line IV-IV of Fig. 2.

Referring to the accompanying drawing in which like reference characters indicate like parts in the several figures, I show a thermostat
30 10 comprising a supporting structure 12, cooperating contacts which include a pair of stationary contacts 14 and a pair of movable contacts 16, a movable or fulcrumly mounted contact arm 18 and a bimetallic element 20.

The supporting structure 12 is, in this instance, a flat strip of preferably insulating material. However, it is to be understood that any other
35 suitable shape or configuration may be used in lieu thereof. A plurality of apertures are located within the structure 12 to support or retain suitable posts and operating members as hereinafter described.

The cooperating contacts include a pair of stationary contacts 14 and a pair of movable con-
40 tacts 16. The stationary contacts 14 may be insulated from and rigidly attached to the supporting structure 12, in any well known manner. In addition, the contacts 14 are rigidly attached to and electrically associated with suitable metallic terminal straps 22 and 24. The movable
45 contacts 16 are rigidly attached to a metallic flexible movable contact bar 26 which, in turn,

is flexibly and insulatedly attached to the free end of the contact arm 18. The electrical path through the thermostat is say from terminal strap 22 through one stationary contact 14, the cooperating movable contact 16, movable contact bar 26, second movable contact 16, and the second stationary contact 14 to terminal strap 24.

The contact arm 18 is, in this instance an elongated relatively light sheet metal member which is adapted to be retained in position by means of a calibrating post 28 at one end thereof, and the adjusting screw 32 at the other end thereof. The contact end of arm 18 has a notch therein (not shown) which loosely fits about the calibrating post 28 permitting such arm to move with respect thereto. The other end of such arm 18 is, in this instance, substantially square and fits into slot 30 of adjusting screw 32. The left-hand or contact end of the contact arm 18 is thus adapted to freely move vertically along the calibrating post as a guide; and the entire arm is adapted to flex about the adjusting screw 32, as hereinafter described.

The bimetallic element 20 comprises, in this instance, a substantially flat elongated bimetallic member having elongated slots 34 and 36 cut from opposite ends of the element. In this way there is formed a substantially N or Z shaped member having two exterior portions, strips, or legs with free ends 42 and 44 connecting the respective exterior legs to a central leg. The substantially N-shaped element 20 when in its free or unrestrained position (that is, before being mounted on base 12) is considerably longer than when occupying the illustrated operative or constrained position. Note Fig. 1 which indicates the free length and final constrained (by longitudinal compression) length of the element 20. Holes 21 are provided near the free ends 46 and 48 of the exterior legs of element 20 to receive the supporting posts or studs 38 and 40. The bimetallic element 20 when in an unconstrained position will not function with a snap action. However, upon being longitudinally
45 constrained so as to have an uneven configuration, the element will snap from a lower position (Fig. 2) to an upper position (Fig. 5).

A plurality of upstanding posts 38 and 40 are rigidly attached to the supporting structure 12 near diametrically opposite corners thereof. The posts 38 and 40 are adapted to be inserted in holes 21 in the free ends of the N-shaped bimetallic element 20. However, it is desired to emphasize the following construction: lines passing through holes 21 parallel to the ends of ele-

ment 20 are closer together in the assembled position of element 20 than in the free or flat position thereof. This condition results from placing the posts 38 and 40 sufficiently close together to buckle the legs of element 20 to the extent illustrated. It will be noted that the lines mentioned are a distance apart corresponding to the legend "Free length" in Fig. 1 before the element 20 is assembled and are a lesser distance apart corresponding to the legend "Final length" when the element is assembled on posts 38 and 40.

Accordingly, since the element 20 is rigidly attached to the posts 38 and 40, such element is constrained into an uneven or buckled configuration with the larger or free movable end portions 42 and 44 thereof being either below or above the level of the free ends 46 and 48 thereof which are rigidly attached to the posts 38 and 40, respectively. It follows that as the temperature of the bimetallic element 20 is changed, the element 20 will flex from the normal lower position (Fig. 2) to an upper position, as shown in Fig. 5. In other words the larger or free movable end portions 42 and 44 will snap upwardly with respect to the fixed ends 46 and 48 of the element 20. In other words, the central portion of the bimetallic element 20 will move with a powerful linear snap-acting motion along a plane substantially normal to the central portion of the element 20. The thermostat 10 embodying my invention utilizes this linear motion of the central portion of the element to operate the cooperating contacts 14 and 16.

The adjusting screw 32 is threadedly engaged or attached to the supporting structure 12 and to a suitable bushing or sleeve 15 attached thereto. The adjusting screw is located substantially along the longitudinal axis of the supporting structure 12 and element 20 and the upper end thereof is located intermediate the element 20 and structure 12. It is, therefore, obvious that as the adjusting screw 32 is rotated the upper end thereof will be moved either upwardly or downwardly depending upon the rotation of such screw. An annular slot 30 in which one end of contact arm 18 is loosely disposed; is located within the upper portion of the screw and is likewise moved as the screw 32 is located within the sleeve 50.

The calibrating screw 28 is, in this instance, likewise located along the longitudinal axis of the supporting structure at a point somewhat near the opposite end from that of the adjusting screw 32. However, this particular location is not essential and any other suitable arrangement for positioning the left hand end of arm 18 may be employed. An adjustable nut 54 is positioned upon the upper end of the calibrating screw 28 to prevent the ready removal of the contact arm 18 and to permit calibration of the closing temperature of the thermostat as hereinafter described.

A suitable link member 56 is used to connect the central portion of the middle leg of the N-shaped bimetallic element to the contact arm 18. Such link member 56 may, if desired, be punched from, or be integral with the contact arm 18. A plurality of undercut portions 57 are located within the upper end of such link to afford positive engagement with the bimetallic element 20 (see Fig. 4). This link thus insures the movement of contact arm 18 with and as a result of the movement of the central portion of the bimetallic element 20. Accordingly, it follows that when the bimetallic element 20 flexes to an up-

per position, with say, an increase in temperature thereof, the link 56 moving therewith will move the contact arm 18 likewise upwardly so as to disengage the cooperating contact (see Fig. 5). Then as the temperature of the bimetallic element 20 decreases, the element flexes to its normal or engaged position, the link 56 likewise forcing the contact arm 18 downwardly, reengaging the cooperating contacts.

As the bimetallic element 20 and contact arm 18 moves from the lower to an upper position, the contact arm 18 in effect rotates around a point within the annular groove 30 of adjusting screw 32 as an axis. It is, therefore, obvious that as such adjusting screw is either lowered or raised, the corresponding movement is directed to the contact arm 18 and, therefore, may be used to raise or lower the operating range of the thermostat.

It is, therefore, obvious that I have provided a thermostatic structure having a bimetallic heat responsive element comprising an elongated substantially N-shaped member which is longitudinally compressed or constrained by attachment at each end thereof to a supporting structure whereby such element is adapted to move from an operative to an inoperative position or vice versa and by means of suitable linking members to correspondingly actuate suitable cooperating contacts.

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. In a thermostat having a supporting structure and cooperating contacts, a bimetallic heat-responsive element comprising an elongated substantially N-shaped member having two outer legs, said outer legs being longitudinally compressed by attachment of the free ends thereof to the supporting structure for producing a snap action of such element in response to changes in temperatures thereof.

2. In a thermostat having a supporting structure and cooperating contacts, a bimetallic heat-responsive element comprising an elongated substantially N-shaped member having two outer legs, said outer legs being longitudinally compressed by attachment of the free ends thereof to the supporting structure for producing a snap action of such element in response to changes in temperatures thereof, and means associated with the bimetallic element and cooperating contacts for engaging and disengaging such contacts in response to the movements of the element.

3. A thermostat comprising, in combination, a supporting structure, cooperating contacts, an elongated bimetallic element having longitudinal slots therein, one extending from each end thereof, forming an N-shaped member, the ends of the exterior legs of said member being attached to the support to reduce the length of the bimetallic element and to ensure a snap action thereof, and means engaging the bimetallic element and one of said contacts to operate such contact in response to the movements of the element.

4. A thermostat comprising, in combination, a supporting structure, cooperating contacts, an elongated bimetallic element having longitudi-

nal slots therein, one extending from each end thereof, forming an N-shaped member, the ends of the exterior legs of said member being attached to the support to reduce the length of the bimetallic element and to ensure a snap action thereof, a contact arm swingably mounted intermediate the bimetallic element and support for carrying at least one of said cooperating contacts, and means engaging the element and contact arm so as to move the arm in response to the movements of the bimetallic element.

5 5. A thermostat comprising, in combination, a supporting structure, a bimetallic element mounted substantially parallel to and spaced from the supporting structure, a contact arm fully mounted intermediate the bimetallic element and supporting structure, cooperating contacts, including at least one movable contact insulatedly attached to the contact arm, adjusting means cooperating with the arm for adjustably limiting the movements thereof, said bimetallic element consisting of a central strip and two exterior strips the ends of which are positioned diametrically opposite for compressibly mounting

the element to the supporting structure whereupon said central strip is under tension, and means joining the central strip and contact arm for moving such arm in response to the movements of the element.

6. A thermostat comprising, in combination, a supporting structure, an elongated substantially N-shaped bimetallic member longitudinally constrained by said supporting structure whereby the exterior legs of said member are under compression and the cross leg is under tension for producing a snap acting movement of the cross leg, said movement being substantially lineal and normal to the plane of said member.

15 7. In a thermostat having a supporting structure, a bimetallic heat-responsive element comprising an elongated substantially N-shaped member having two outer legs, said element having a longitudinal compressive force applied exteriorly thereto through attachment of the free ends of said outer legs to the supporting structure.

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