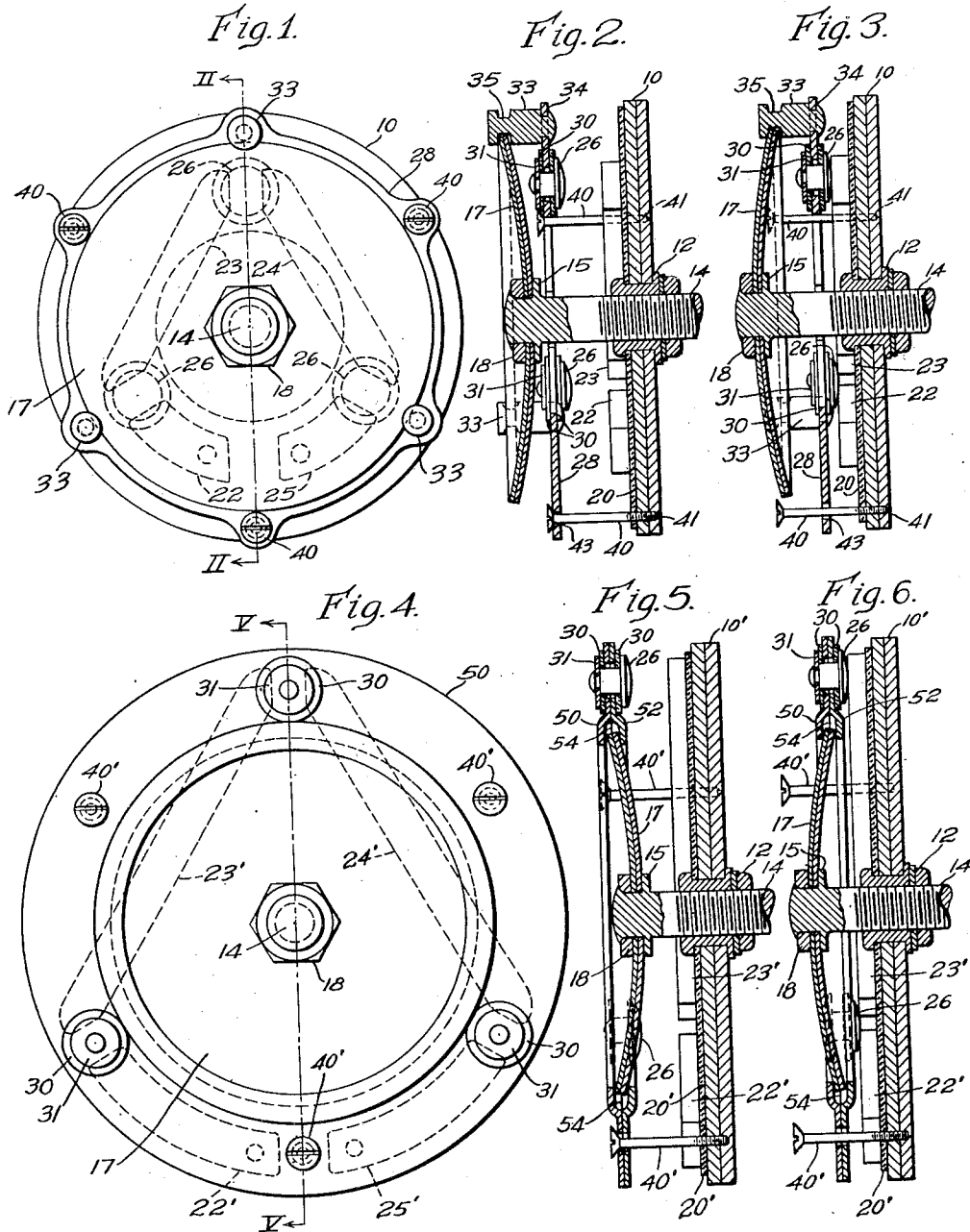


Sept. 24, 1935.

E. BLETZ ET AL
THERMOSTATIC DEVICE
Filed Aug. 25, 1933

2,015,545



WITNESSES:

E. J. Meller.
L. E. Bryant

INVENTORS.

Edward Bletz &
Lewis J. Greenawalt.
BY
W. R. Coley
ATTORNEY

UNITED STATES PATENT OFFICE

2,015,545

THERMOSTATIC DEVICE

Edward Bletz, Lexington, and Lewis J. Greenawalt, Mansfield, Ohio, assignors to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application August 25, 1933, Serial No. 686,758

5 Claims. (Cl. 200—138)

Our invention relates to thermostatic devices and it has particular relation to temperature-responsive switches of the type in which a snap-acting disk of bimetallic construction is utilized to effect a quick-make-and-break action.

In the construction of thermostats of the type shown in Patent No. 1,448,240, which issued March 13, 1923, to J. A. Spencer, in which a snap-acting disc in the form of a non-developable sheet of two metals having different thermal coefficients is utilized, it has become almost universal practice to support the disc by suitable means engaging its center instead of its perimeter, and to mount the circuit-closing members actuated thereby near the perimeter instead of at the disc center.

Contact members so mounted are thus caused to move in an arcuate path through a distance which is somewhat less than the axial travel of the rim of the actuating disc. This particular arrangement of parts is thus subject to the disadvantage of requiring an appreciable amount of play or lost motion in the contact member mountings in order to allow the members to be self-aligning with the stationary contacts with which they are disposed to engage when occupying one limiting position of their arcuate path of travel. A further disadvantage results from the fact that the magnitude of contact movement, in this construction, cannot be made as great as that of the travel of the rim of the disc, since the contact members must, of necessity, be mounted at some intermediate radius which is less than that of the disc rim.

Our invention is directed to an improved form of construction for thermostatic devices of the type under consideration which overcomes the disadvantages named and which possesses additional advantages to be particularized hereinafter.

Generally stated, the object of our invention is to provide a snap-acting-disc thermostat in which the movable contact members are actuated in a straight-line path of travel through a distance equal to the axial movement of the disc rim.

More specifically, an object of our invention is to provide a form of construction which eliminates the usual tilting of the contact members as the bimetal disc snaps from one position to the other and which takes full advantage of the disc movement.

Another object of our invention is to improve the self-aligning characteristics of the contact members in such a manner that the necessary

play in contact mounting may be substantially reduced.

A further object of our invention is to increase the speed of motion and magnitude of the contact separation in thermostatic devices of the type under consideration.

In practicing our invention, we provide an auxiliary ring member upon which the movable contact members of the thermostatic switch are mounted, which ring member is supported from the outer edge or rim of the snap-acting disc at a plurality of peripherally spaced points. The arcuate movements of the disc rim are thereby converted into straight line or axial movements of the contact-carrying ring, which in magnitude are equal to the axial travel of the disc rim.

Our invention itself will best be understood from the following description of specific embodiments thereof when taken in conjunction with the accompanying drawing in which:

Figure 1 is a plan view of a thermostatic switch constructed in accordance with one embodiment of our invention in which the auxiliary contact-carrying ring is disposed intermediate the snap-acting disc and the switch base;

Fig. 2 is a sectional view taken on the line II—II of Fig. 1, showing the device of Fig. 1 in its opened-contact position;

Fig. 3 is a similar section view illustrating the device of Fig. 1 in its closed-contact position;

Fig. 4 is a plan view of a thermostatic switch constructed in accordance with a second embodiment of our invention in which the auxiliary contact-carrying ring is disposed to surround the snap-acting disc; and

Figs. 5 and 6 are section views taken on the line V—V of Fig. 4 illustrating the switch in its opened- and closed-contact positions respectively.

Referring to the drawing, and particularly to the first three figures thereof, the base or supporting member of the switch is shown generally at 10, and is preferably composed of two sheets of metal. An internally threaded sleeve 12 is snugly fitted in a hole in the center of the base member and accommodates a threaded stud 14 which carries at one end thereof a flange 15 against which the snap-acting bimetallic disc 17 comprised by the switch is suitably held by means shown in the form of a collar or nut 18.

Insulating material 20, which may be in the form of a sheet of mica, is attached to the base member 10 and upon it are mounted the stationary contact members 22 to 25, inclusive. Disposed in cooperative relation with the stationary

members are a plurality of movable members 26. Connections with an external circuit, which the switch is to control, are made through suitable terminal posts (not shown) which may be attached to the two stationary members 22 and 25, respectively. When, as shown in Fig. 3, the movable members 26 are biased into engagement with the stationary members, a circuit is completed between members 22 and 25, while, when the movable contact members 26 are biased out of engagement from the stationary members, this circuit is interrupted at a plurality of different points.

Instead of mounting the movable members 26 directly on the bimetallic disc 17, as has been the prior practice, we provide an auxiliary ring 28, which is preferably cut from suitable sheet metal, upon which ring the contact members 26 are insulatedly mounted. As illustrated in Figs 2 and 3, washers 30 of insulating material may be utilized to separate the body of each contact member from the ring material through which the stud portion of the contact extends to make a riveted connection with a washer 31.

The ring 28 is supported from the rim of snap-acting disc 17 at a plurality of peripherally spaced points by means of studs 33, each of which is riveted at one end in a suitable hole 34 in the ring and provided at the other end with a slot 35 in which the edge of disc 17 is disposed to fit. The radial clearance between the edge of the disc and the lower portion of the stud slots is made sufficient to accommodate the increased diameter of the disc when it snaps through the central or flat position, and the shoulders comprised by the slots 35 may be so tapered that there is practically no lost motion in an axial direction between the disc rim and the cooperating studs 33.

To maintain a proper alignment of the contact-carrying ring 28 with respect to the stationary contact members carried by base 10, a plurality of screws 40 may be inserted into suitable holes 41 in the base member in a manner that they protrude through circular recesses 43 in the contact-carrying ring 28. If desired, the length of these stop screws 40 may be made such that the heads thereof serve to limit the outward travel of the disc 17 by contacting the ring 28 in the manner shown in Fig. 2.

In the operation of the thermostatic switch constructed in accordance with the embodiment of our invention which has just been described, a suitable change in the temperature to which disc 17 is subjected causes it to preliminarily distort and to then abruptly snap over to the opposite cupped position. Thus, when the switch occupies the open-contact position illustrated in Fig. 2, a proper temperature variation will cause it to snap to the position shown in Fig. 3, the movement of the disc rim being transmitted to the contact-carrying ring 28, which moves to the right in a straight line or axial path, thereby biasing the movable contact members 26 into engagement with the stationary members supported by switch base 10. In a similar manner, when the switch is in the closed-contact position shown in Fig. 3, the occurrence of a proper variation in temperature will cause the disc 17 to move into the position of Fig. 2, thereby rapidly separating the contact members 26 from the cooperating stationary members.

It will thus be evident that the magnitude of contact-member movement is equal to the axial travel of the rim of the bimetallic disc 17 and that the arcuate path of disc movement is con-

verted into straight line motion, which is highly preferable in that it reduces the amount of play or lost motion in the mountings of the stationary contact members necessary to render them self-aligning upon engagement with the stationary members.

The explanation thus far has assumed in effect a non-adjustable thermostat, that is, one in which the bimetal disc 17 is positioned at a fixed distance from the supporting base 10. When it is desired to change the temperature-response characteristics of the thermostat, this may be done by moving the disc support toward or away from the base. In the device shown, such movement may be effected by turning the threaded stud 14 by means of an adjusting knob (not shown) or other suitable means. When, as shown, the travel-limiting screws 40 are so arranged that they restrain disc movement, in the outward or opened-contact position direction, by engaging 20 the contact-carrying ring 28, the outward restraint is imparted to the disc rim and hence is exerted on the same diameter as is the closed-position restraint provided by engagement of contact members 26 with the stationary members 25 carried by base 10. We have found that such equal restraining diameters tend to allow the temperature differential of the thermostat to remain constant for different adjustments.

It will be seen that the construction of our invention just explained does not appreciably increase the overall diameter of the thermostatic switch, although it does somewhat raise the axial dimensions of the device assemblage. In the majority of applications, it will be found that this moderate increase in switch thickness is not particularly objectionable. However, in the event that minimum thickness must be retained, the advantages afforded by our invention may still be realized through the utilization of the construction shown in Figs. 4, 5, and 6 which illustrate a thermostat built up in accordance with a second embodiment of our invention.

The switch shown in these figures is fundamentally the same as that shown and described in connection with Figs. 1, 2, and 3, it comprising a base member 10' through which the stud 14 extends to support at one end thereof the bimetallic disc 17. Stationary contact members 22' to 25', inclusive, are mounted upon insulating material 20' carried by the base member and are disposed to be engaged by the movable contact members 26, which are actuated by the disc 17.

These movable contact members 26 are carried by a ring assemblage comprising two cooperating portions 50 and 52 which are suitably disposed to encircle the bimetal disc 17. On the inner periphery of each ring portion an off-set is made in such manner that there is formed an annular groove 54 in which the rim of disc 17 fits in the manner shown. The mechanical connection of ring assemblage 50-52 with the disc is, therefore, equivalent to that of ring 28 which is effected through the medium of studs 33.

To maintain the ring assemblage 50-52 in proper alignment with respect to the stationary contact members carried by switch base 10', screw members 40' may be utilized. These members may serve the additional purpose of restricting the outward movement of the disc to a predetermined limit.

It will be seen that the operation of the second embodiment of our invention, in which the contact-carrying ring is disposed to surround the snap-acting disc, is identical with that of the first

described embodiment in which the contact-carrying ring is mounted between the disc and the switch base, the movable contact members being moved in straight lines through a distance which is equal to the axial travel of the disc rim.

It will be observed that the second form of construction just described in no way increases the axial dimensions of the thermostatic switch to which it is applied, although it does somewhat increase the diameter of the switch assemblage.

Although we have shown and described certain specific embodiments of our invention, we are fully aware that many modifications thereof are possible. Our invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the scope of the appended claims.

We claim as our invention:

1. In a temperature-responsive switch, the combination of a base, contact members insulatedly fixed thereon, a stud extending through said base, a snap-acting bimetallic disc centrally mounted at one end of said stud, a ring member supported from the rim of said disc at a plurality of peripherally-spaced points, contact members mounted upon said ring member and adapted to cooperatively engage said first-mentioned contact members, and means adapted to directly act upon said ring member for restricting the distance which said member may be moved by said disc away from the switch base.

2. Temperature-controlled apparatus comprising, in combination, a base member, separated contact members insulatedly mounted upon said base member, a snap-acting thermostatic disc, a mechanical connection between the center of the disc and the base member, an auxiliary member supported from the rim of said disc, contact members mounted upon said auxiliary member and adapted to electrically connect with said first-mentioned contact members, and means adapted to directly act upon said auxiliary member for restricting the distance which said member may be moved by said disc away from said base member.

3. A temperature-responsive switch comprising a base, contact members fixed thereon, a stud extending through said base, a snap-acting bimetallic disc centrally mounted at one end of said stud, means for adjusting the distance from the base at which said stud maintains the disc center to thereby adjust the temperature-response characteristics of the switch, an auxiliary member supported from the rim of said disc at a plurality of peripherally-spaced points, contact

members mounted upon said auxiliary member and adapted to cooperatively engage said first-mentioned contact members, and means adapted to directly act upon said auxiliary member for restricting the distance which said member may be moved by said disc away from the switch base, the effect of said restraint being to maintain substantially constant the temperature-differential of the switch for differing adjustments in the said response characteristics thereof.

4. A temperature-responsive switch comprising a base, contact members fixed thereon, a stud extending through said base, a snap-acting bimetallic disc centrally mounted at one end of said stud, means for adjusting the distance from the base at which said stud maintains the disc center to thereby adjust the temperature-response characteristics of the switch, an auxiliary member adapted for disposition intermediate the disc and the base member, means for supporting said auxiliary member from the rim of the disc at a plurality of peripherally-spaced points, contact members mounted upon said auxiliary member and adapted to cooperatively engage said first-mentioned contact members, and means adapted to directly act upon said auxiliary member for restricting the distance which said member may be moved by said disc away from the switch base, the effect of said restraint being to maintain substantially constant the temperature-differential of the switch for differing adjustments in the said response characteristics thereof.

5. A temperature-responsive switch comprising a base, contact members insulatedly fixed thereon, a stud extending through said base, a snap-acting bimetallic disc centrally mounted at one end of said stud, means for adjusting the distance from the base at which said stud maintains the disc center to thereby adjust the temperature-response characteristics of the switch, an auxiliary member adapted to surround the disc, means for supporting said auxiliary member from the rim of the disc at a plurality of points, contact members mounted upon said auxiliary member and adapted to cooperatively engage said first-mentioned contact members, and means adapted to directly act upon said auxiliary member for restricting the distance which said member may be moved by said disc away from the switch base, the effect of said restraint being to maintain substantially constant the temperature-differential of the switch for differing adjustments in the said response characteristics thereof.

EDWARD BLETZ.

LEWIS J. GREENAWALT. 55