Sept. 22, 1970 C. J. HIRE 3,530,419

THERMOSTAT

Filed March 21, 1968

FIG. 1

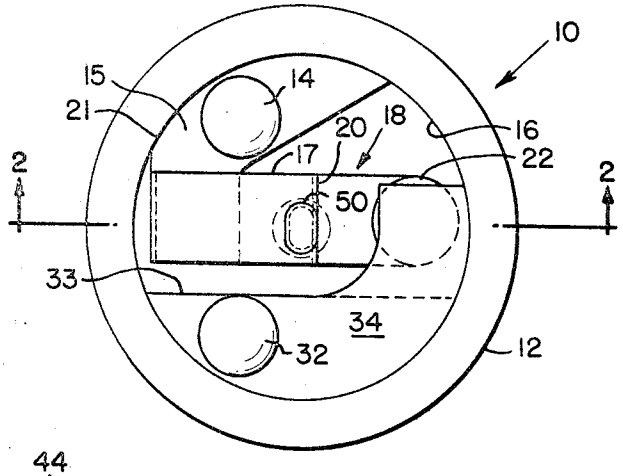


FIG. 2

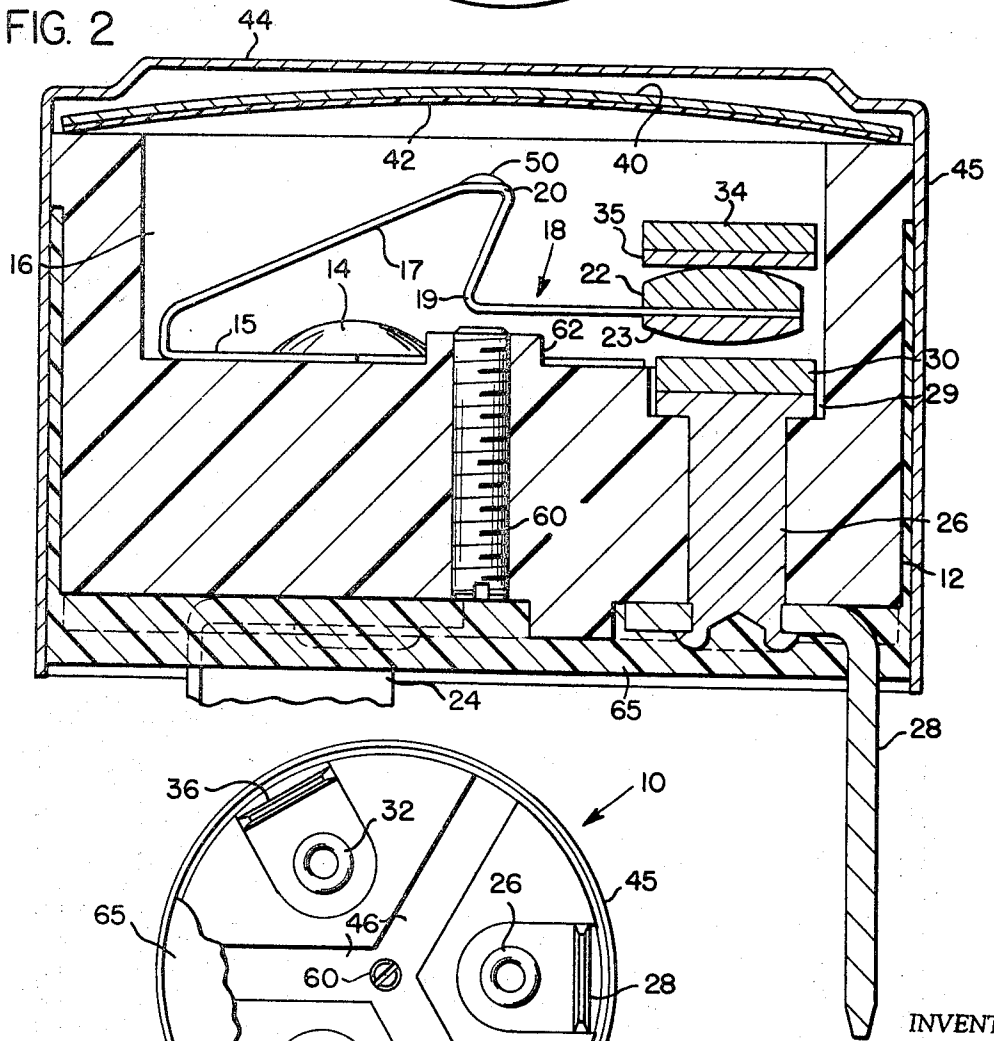


FIG. 3

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United States Patent Office 3,530,419 Patented Sept. 22, 1970

3,530,419

THERMOSTAT

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Filed Mar. 21, 1968, Ser. No. 714,934
Int. Cl. H01h 37/54, 37/72
U.S. Cl. 337—365 1 Claim

ABSTRACT OF THE DISCLOSURE

This thermostat is operated by a bimetallic disc secured, by a cover over a recess in a base, to flex suddenly, when the ambient temperature varies from a predetermined value. An electrically-conductive switch arm is laterally offset at one end and secured in the recess. It is flexible, and extends diametrally across the recess beneath the disc between two spaced electrical contacts. The switch arm is medially bent for engagement by the disc when it flexes. The thermostat can be calibrated by a screw adjustable in the base, or by altering the pressure exerted by the cover on the disc. The base may be sealingly secured in the cap or cover by an epoxy resin cement.

This invention relates to thermostats, and more particularly to thermostats of the type containing a snap-action switch for use in clothes driers, heaters, air conditioning and ventilating equipment, etc.

Thermostats are known in which a flexible switch arm is actuated by a reciprocable plunger or pin, which is mounted between the switch arm and a bimetallic disc. When the ambient temperature exceeds a predetermined value, the disc suddenly bends and shifts the plunger to open or close the switch, depending upon the initial position of the switch arm. When the temperature falls below the predetermined value, the disc bends back to its original position, thereby permitting the flexible switch arm to return to its original position.

Usually these thermostats are difficult to calibrate and for the job for which they are intended unproportionately large.

A primary object of the present invention is to provide a thermostat which is more compact than prior plunger actuated thermostats.

Another object of this invention is to provide a thermostat, which has fewer moving parts than prior thermostats, and consequently is less expensive.

Another object of this invention is to provide a thermostat, which may be readily and simply calibrated to operate at predetermined selected temperatures.

Another object of the invention is to provide a thermostat which may be adapted readily for use either as a single pole, single throw switch or as a single pole, double-throw switch.

A still further object of this invention is to provide a thermostat which is completely sealed against passage thereinto of liquid, moisture, and vapor or other gases.

Still another object of the invention is to provide a thermostat of the character described which is inexpensive, rapidly and easily sealed, and has a rugged construction that is not damaged by shock, vibration and normal temperature changes.

Other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claim, particularly when read in conjunction with the accompanying drawing.

In the drawing:

FIG. 1 is a plan view of a thermostat made in accordance with one embodiment of this invention, parts of the thermostat being removed to illustrate the switch arm contained in the thermostat;

FIG. 2 is a fragmentary sectional view taken along the line 2—2 in FIG. 1 looking in the direction of the arrows; and

FIG. 3 is a bottom view of this thermostat.

Referring now to the drawing by numerals of reference, 10 denotes a thermostat comprising a generally cylindrical base 12 made of a phenolic, ceramic or similar rigid, dielectric material. Mounted in a circular recess 16 formed in one side (the upper side in FIG. 2) of base 12 is a flexible, metal switch arm 18. This switch arm has an offset portion 15, which is fixed by a rivet 14 to the base 12 in the bottom of recess 16, and a movable portion 17, which extends from portion 15 diametrally across recess 16 above the bottom thereof. Portion 17 is inclined upwardly from portion 15 to approximately its midpoint, then is bent downwardly and slightly rearwardly, and then horizontally forwardly, so that substantially medially of its ends, the portion 17 of the arm is provided with reverse bends 19 and 20.

Laterally offset portion 15 has its outside edge 21 arcuately curved to follow the curvature of the adjacent inside wall of recess 16. The offset makes the whole thermostat more compact. Through this offset, the same travel of the switch arm can be obtained with a shorter arm. This means a smaller diameter recess 16 and base 12.

Secured to opposite sides of arm 18 at its free end are silver contacts 22 and 23.

Fixed to the underside of base 12 by rivet 14, which extends through the base, is one leg of a right angular metal terminal strap 24, the other leg of which projects downwardly from the housing. Arm 18 and rivet 14 are made of copper, or other electrically conductive material, so that the switch arm 18 and the terminal 24 are electrically connected one to another.

Secured to the underside of housing 12 by a copper rivet 26 in angularly spaced relation to the terminal 24, is a similar terminal 28. The upper or inner end of the rivet 26 is seated in a pocket 29 formed in base 12, and has brazed thereon a conventional silver contact 30, which is positioned beneath, and normally spaced from, the contact 23 on arm 18.

Fixed at one end thereof by a copper rivet 32 to a seat 33 (FIG. 1), which is formed at one side of base 12, and extending at its opposite or free end over contact 22 or arm 18, is a flexible, electrically conductive arm 34. Secured to the underside of arm 34 at its free end is a silver contact 35, which normally is engaged with contact 22 on arm 18. Also secured by the rivet 32 to the outside of base 12 is a rightangular terminal 36, which is similar to, and which is equiangularly spaced from the terminals 24 and 28.

Resting around its marginal edge on the upper side of base 12 is a disc 42 of flexible, dielectric material, such as "Mylar." Positioned over disc 42 coaxially thereof, and resting on disc 42 is a bimetallic disc 40 (FIG. 2), which has a diameter substantially equal to that of disc 42. The discs 40 and 42 are secured in position over the upper end of base 12 by a metal cap 44 having an annular wall portion 45, which fits snugly around the upper portion of base 12, and which extends downwardly beneath the lower side (FIG. 2) thereof.

The base 12 may be formed on its bottom, as shown in FIG. 3, with three integral intersecting ridges 46 for strength.

The thermostat 10 can be calibrated by pushing the cap 45 downwardly on base 12 until it engages the disc 40 to prestress the disc slightly, so that it will require a smaller increase in ambient temperature to cause disc 40 to pop or bend suddenly downwardly. Conversely the cover 44 may be backed off slightly from the housing 12 to disengage the disc 40, so that the latter will flex down-

wardly only after its ambient temperature has been increased to the temperature for which the bimetallic disc was designed. Thus by pressing the base **12** into the open end of housing **45** the thermostat can be adjustably calibrated to trip its switch at a predetermined critical ambient temperature. After calibration, the base **12** may be secured in place by a layer **65** of epoxy resin to provide a thermostat, which is sealed against passage of air, liquid moisture vapor and the like into its interior.

When the disc **40** flexes downwardly, it urges the dielectric shield or insulator disc **42** downwardly into engagement with the upper end of the bend **20** in the switch arm **18**, so that the free end of the latter is urged downwardly out of engagement with the contact **35**, and into engagement with the contact **30**. This interrupts whichever circuit was connected to the terminals **24** and **36**, and completes the circuit connected to the terminals **24** and **28**. When the ambient temperature of the disc **40** falls below its critical temperature, the disc flexes back to its original position, or upwardly in FIG. 2, thereby releasing the switch arm **18**, which returns into engagement with the contact **35**.

One of the principal advantages of the above-described thermostat is that the fixed end portion **15** of arm **18** is offset both vertically and laterally from its free portion **17**. Hence the housing **12** can be made relatively small without unduly restricting the length of the movable portion **17** of the switch arm. In other words for a given diameter of recess **16** the length of the free portion **17** of the switch arm is substantially greater than it would be if the arm were to be of the conventional, straight type. This feature permits reduction in the size of the thermostat without a corresponding loss in the flexibility of its switch arm.

The flexibility of the arm **18** is further enhanced by the use of the bends **19** and **20**. These bends contribute to the overall length of the arm, and also eliminate the need for employing a separate, reciprocable plunger for transmitting the movement of the disc **42** to the arm **18**. Since the disc **40** is metallic, and because current flows in the arm **18**, the dielectric shield or disc **40** is used to insulate the disc **40** from the arm **18**, when the former flexes downwardly. Alternatively, or in addition to the dielectric disc **42**, a dielectric pad **50** could be secured to the upper end of the bend **20** to insulate arm **18** from the disc **40**.

A further significant advantage of applicant's novel thermostat is that, for calibration, slight variations in the selected temperature at which the disc **40** will flex downwardly, can be achieved merely by varying the pressure with which the cover **44** engages the disc **40**. Although in the embodiment illustrated the annular wall portion **45** of the cover **44** is press fit onto the upper end of the housing **12**, it will be apparent that this portion could be threaded onto the housing to secure the cover **44** against undesirable shifting once the thermostat has been calibrated.

If desired, a calibrating screw **60** may be threaded centrally into the closed end of base **12** to engage the underside of arm **18** adjustably to limit its downward movement. Screw **60** threads through base **12** and a boss **62** which is integral with the base at the upper side thereof. If screw **60** is threaded back into the base, or is eliminated, boss **62** will act as a stop limiting downward movement of arm **18**.

By connecting electrical conductors to all these terminals **24**, **28** and **36**, the thermostat can operate as a single pole double throw switch. If electrical conductors are connected to only two of these terminals, the thermostat will operate as a single pole single throw switch.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification.

Having thus described my invention, what I claim is:

1. A thermostatic switch comprising

a base having a recess therein,

a temperature-responsive bimetallic element mounted on said base over said recess in spaced, confronting relation to the bottom of said recess,

at least two terminals connected to said base,

a first contact in said recess electrically connected to one of said terminals,

a flexible switch arm having a portion fixedly secured in the bottom of said recess in electrical connection with the other of said two terminals, and having a movable, free portion bent upwardly from said fixed portion and extending over a part of said fixed portion and transversely across said recess from adjacent one side of the recess to adjacent the other side thereof beneath said bimetallic element, and

a second contact secured to the free end of said free portion for movement thereby into and out of engagement with said first contact,

the fixed portion of said arm being offset laterally relative to said free portion,

the free portion of said arm having intermediate its ends a pair of spaced bends disposed one above the other in said recess, and

the uppermost of said bends being positioned to be moved by said bimetallic element upon flexation thereof in one direction, thereby to transmit movement to said free portion.

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U.S. Cl. X.R.

200—166; 337—354, 368