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2,192,633

SURFACE THERMOSTAT

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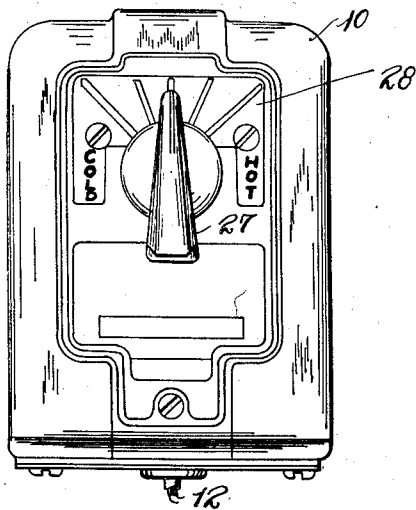


FIG. 1

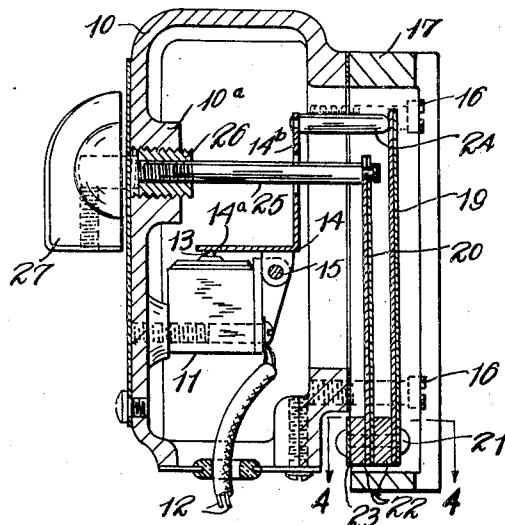


FIG. 2

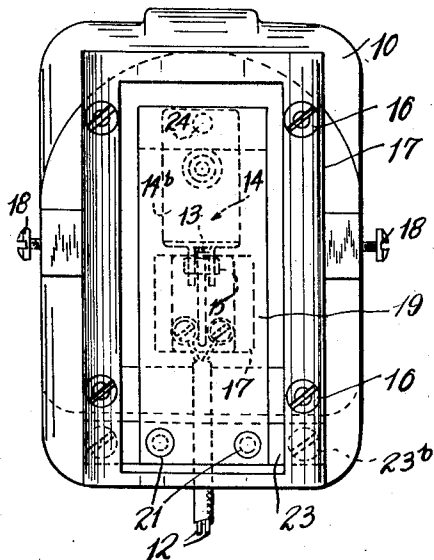


FIG. 3

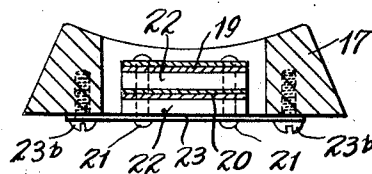


FIG. 4

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SURFACE THERMOSTAT

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4 Claims. (Cl. 200—139)

This invention relates to a thermostat and especially to a thermostat of the surface type adapted to be clamped or otherwise positioned in proximity to a pipe or other member conveying or containing water or the medium whose temperature is to be controlled.

The principal object of the invention is to provide a thermostat of the type mentioned which is highly efficient but simple in construction, rugged, and easily applied to a hot water pipe or similar member.

The invention may be further briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheet of drawings,

Fig. 1 is a front view of a thermostat embodying my invention;

Fig. 2 is a vertical sectional view of the same; Fig. 3 is a rear view of the same; and

Fig. 4 is a detail sectional view substantially along the line 4—4 of Fig. 2.

In this instance, the thermal responsive means consists of two bi-metal thermal elements which are arranged and which function in a novel manner to operate a switch which can function in different ways, as, for example, to control a valve which supplies gas or other fuel to the heating equipment.

In this case, the device includes a housing 10 in which is supported a suitable switch 11 adapted to control a circuit represented by conductors 12 which are shown as extending into the bottom of the housing. The switch members located in the case but not shown are operated through the medium of a vertically movable pin 13 extending up through the top of the case of the switch 11. A switch of simple construction may be employed, such switch consisting of a movable contact blade engaged by the pin 13 and adapted to be moved toward or from a stationary contact. Generally the switch is biased toward closed position and is opened by the depression of the pin 13, this method of operation being utilized when the switch is employed for the purpose of controlling a valve which in turn controls the supply of fuel to the burner or burners of the heating equipment. However, there may be employed a reverse action switch normally biased toward open position and closed by the depression of the pin 13. A thermostat with a switch of this kind may be utilized, for example, in a unit heater to start a fan at a predetermined high temperature or to

open the fan circuit when the temperature drops to a predetermined point.

The pin 13 is operated through the medium of a bell crank 14 pivoted at 15 on a suitable part of the switch and provided with an arm 14a extending horizontally over the pin 13 and with an arm 14b extending vertically.

The rear of the housing 10 is open and secured to it by screws 16 or otherwise is an adapter block 17 constituting in effect a part of the housing, the outer face of the adapter block being rounded or otherwise shaped so as to engage the pipe or other heated member to which the device may be secured by a strap (not shown) which may be attached to the adapter by any suitable means such as screws 18 engaging tapped holes in opposite sides of the adapter.

Although in some instances a single bi-metal thermal element may answer the requirements by providing sufficient movement to actuate the switch, it is desirable, for obvious reasons, to have the thermostat small in size, in which event a single long bi-metal thermal element is not feasible. I obtain compactness and the desired small size and still secure the required switch operating movement without complicated movement magnifying means by utilizing two bi-metal elements which operate in a manner such that the effect of the movement of one is to enhance the movement of the other. These two bi-metal elements are shown at 19 and 20 respectively in substantially parallel relation within the adapter 17. At their lower ends these elements are riveted or otherwise secured at 21 (Fig. 3) to a support consisting in this instance of two blocks 22 one of which spaces the elements apart, and the support or blocks 22 are in turn connected to the adapter by a thin metal torsion strip 23 fastened between its ends by the rivets or screws 21 to the support 22 and at its ends fastened by screws 23b to opposite sides of the adapter.

The upper end of the rearmost and longer thermal element 19 bears against the rear end of a pin 24 which is secured to the upper end of arm 14b of the switch operating bell crank 14. The upper end of the inner and shorter thermal element 20 is normally held stationary, being connected to the forward end of an adjustable shaft 25 screwed into or otherwise fixed in a shaft 26 which is in threaded relation with the boss 10a on the front wall of the housing 10 and provided at its outer end with a suitable adjusting knob 27 cooperating with a dial or scale 28 (Fig. 1). The shaft 25 extends freely through a hole in the upright arm 14b of the bell crank 14 and its inner

or rear end may be connected to the upper end of the thermal element 20 in any suitable way, but in this instance the upper middle part of the thermal element has a notch constituting a yoke 5 which fits into an annular groove near the rear end of shaft 25. By turning the knob 27, the shafts 25 and 26 are turned and moved endwise, thus rocking the thermal element assembly to the right or left to a position at which it will 10 function to actuate the switch at a different temperature than that at which the switch is operated with the thermal element in a different position corresponding to a different position of the adjusting knob 27. A sufficiently coarse pitch thread is employed on the shaft 26 and in the boss 10a so that with a limited movement of the 15 adjusting knob 27, a sufficient endwise movement is imparted to the shaft 25 to give the thermostat a substantial operating range.

20 In operation, when the device is clamped to a pipe, such as a hot water pipe, substantially the temperature of the pipe is transmitted to the two thermal elements by conduction and convection. As the temperature rises, the upper 25 end of the thermal element 19 is moved to the left as the same is viewed in Fig. 2, and this movement is imparted to the pin 24. At the same time the inner element 20 is flexed, but since its upper end is normally held stationary by the shaft 25, the effect of the flexing of this element is to rock the thermal element 30 assembly (this being permitted by the torsion strip mounting thereof) so as to increase the inward movement of the upper end of the thermal element 19. The two increments of movement, 35 one due to the flexing of the element 19 by its temperature rise and the other due to the rocking of the assembly by the flexing of the element 20 by reason of its temperature rise, are sufficient to move the pin 24 inwardly far enough 40 to rock the bell crank 14 to open the switch 11 (or to close it as the case may be). As the temperature falls and the thermal elements 19 and 20 are cooled, the reverse action takes place.

45 To adjust the temperature at which the switch 11 is tripped, the knob 27 is turned to the right or left, depending upon whether the switch is to function at a higher or a lower temperature, the adjustment of the knob serving to rock the 50 thermal element assembly and thus vary the normal position of the upper end of thermal element 19 with respect to the pin 24.

Thus it will be seen that the objects of the invention are attained to a high degree. Additionally, it might be mentioned that the thermostat may be mounted in any desired position as it functions in precisely the same manner 5 regardless of how it is positioned, which is not the case with other surface thermostats in use at the present time employing mercury switches and therefore required to be very carefully and accurately mounted in either a horizontal or a 10 vertical position.

While I have shown the preferred construction, I do not desire to be confined to the precise details shown and described but aim in my claims to cover all modifications which do 15 not involve a departure from the spirit and scope of the invention.

Having thus described my invention, I claim:

1. A thermostat comprising a housing, a thermal element, a torsion strip support therefor, a 20 switch in said housing, and means for transmitting movement from the thermal element to the switch.

2. A surface thermostat comprising a housing having a portion adapted to be clamped to 25 a pipe or the like, a thermal element adjacent said portion, a torsion strip support therefor, a switch in said housing, means for transmitting movement from the thermal element to the switch, and adjustable means for varying the 30 normal position of the thermal element.

3. In a thermostat of the character described, a housing, a circuit controlling switch therein, and a thermal element assembly comprising a 35 base, a torsion strip supporting the same, two bi-metal thermal elements projecting from the base and having corresponding ends fixed thereto, switch operating means between the free end of one of said elements and the switch, and normally stationary but adjustable means engag- 40 ing the second thermal element.

4. In a thermostat of the character described, a housing, a circuit controlling switch therein, a 45 bi-metal thermal element, a torsion strip mounted at its ends only in said housing, said bi-metal thermal element being attached to said torsion strip intermediate the ends thereof, and means between the free end of said thermal element and said switch for actuating the switch. 50

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