July 13, 1954 W. A. RAY ET AL 2,683,789

THERMOSTAT

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Fig. 1

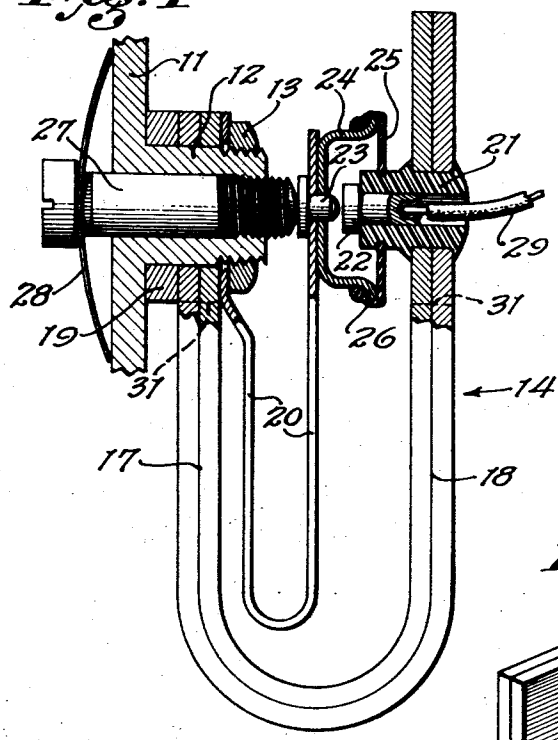


Fig. 2

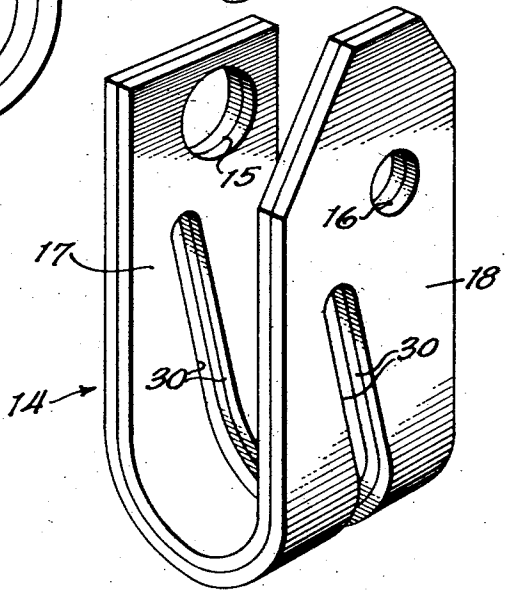
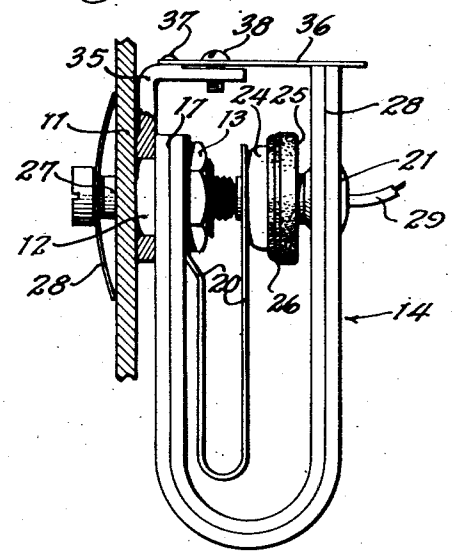


Fig. 3



Inventors

WILLIAM A. RAY

WILBERT C. BUESCHER

By John H. Rouse,

Attorney

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THERMOSTAT

William A. Ray, North Hollywood, and Wilbert C. Buescher, Alhambra, Calif., assignors to General Controls Co., Glendale, Calif., a corporation of California

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The invention relates to electrical devices of the circuit-controlling type, and more particularly to bimetallic thermostats.

One object of the invention is to provide means for sealing the contacts of a thermostat or similar control device from dust or other foreign matter. This is of special importance in connection with a device wherein the interengagement of the contacts occurs gradually, as in a thermostat of the floating-contact type, as distinguished from one which employs snap-action to effect abrupt closing and opening of the contacts. As is brought out in the Ray Patent No. 2,274,938 issued March 3, 1942: in a thermostat of the floating-contact type the contact resistance, even across contacts having clean unoxidized faces, may have considerable influence on the operation of a circuit controlled by the contacts if the total resistance of the circuit is relatively low. It follows that any foreign matter between the contacts would further affect the contact resistance and cause erratic operation of such a circuit.

A more specific object is to provide a seal or dust-shield for the contacts which can be readily opened and reclosed for inspection of the contacts; this object being accomplished by means of a diaphragm, of material such as rubber, extending across, and elastically gripping, the open end of a cup-shaped contact-confining member.

As was mentioned hereinabove, the contact resistance of a thermostat of the floating-contact (non-snap-action) type may be a significant factor in the control of an electric circuit whose total resistance is relatively low; the contact resistance upon initial engagement of the contacts being so high that the voltage across the load device (such as a gas valve) is then insufficient to effect its operation. With gradual increase of contact pressure the contact resistance is reduced until operation of the control device results. During the period while the contacts are interengaged but their effective resistance is high, the thermostat, when it is of the usual bimetallic type, is very sensitive to ordinary sound waves which cause variation of the contact pressure and resistance so that intermittent false operation of the control device may occur. It is another object of this invention to minimize the effect of sound waves on the thermostat; this object being accomplished (1) by providing an asymmetric slot in the bimetallic member so as to produce an unharmonious condition therein whereby microphonic action is dampened, or (2) by friction-

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producing means acting on the free end of the bimetallic member.

For full understanding of the invention, and further appreciation of its objects and advantages, reference is to be had to the following detailed description and accompanying drawing, and to the appended claims.

In the drawing:

Figure 1 is a side view, mainly in section, of a bimetallic thermostat embodying the invention;

Figure 2 is a perspective view, to slightly reduced scale, of the bimetallic member or strip shown in Fig. 1; and

Figure 3 is a side elevation of a modified form of bimetallic thermostat according to the invention.

In the drawing, the numeral 11 indicates a support for the thermostat, which support may be of any suitable shape and size; the fragmentary portion of the support shown in the drawing including a hollow cylindrical boss 12 which is externally threaded for a nut 13. Generally indicated by the numeral 14 is a U-shaped bimetallic strip or member, shown per se in Fig. 2, having openings 15 and 16 adjacent the ends of its respective side arms 17 and 18. The bimetallic member 14 is mounted by its side arm 17 on the support (opening 15 fitting the boss 12) with a spacer 19 between it and the support. Between the side arms of the bimetallic member is a U-shaped arm 20, of resilient metal, having an opening at one of its ends fitting the support-boss 12; the arm 20, as well as the bimetallic member, being clamped to the support by nut 13.

Secured in the opening 16 in arm 18 of the bimetallic member is a shouldered bushing 21 of thermoplastic insulating material; the outer end of the bushing having been headed-over by the application of heat and pressure. Pressed in the bore of bushing 21 is an electrical contact 22 which cooperates with another contact 23 mounted in an opening through the free end of the resilient arm 20. Secured, as by welding, to arm 20 is a cup-shaped member 24 having a central opening through which the tip of contact 23 protrudes. Covering the open end of cup-shaped member 24 is a diaphragm 25, of elastic insulating material such as rubber, having a beaded flange 26 which is snapped-over and tightly grips the flared rim of the cup. The diaphragm 25 has a central opening which fits a circumferential recess in bushing 21. A screw 27, threaded in an opening through the support and boss 12, is in engagement with the headed rear end of the normally-fixed contact 23 for adjusting the position

of the same relative to the movable contact 22; the resilient arm 20 being so flexed that contact 23 is thereby held in engagement with screw 27 in the normal range of adjustment of that contact. Between the support and the head of screw 27 is a friction-producing disk spring 28. For connecting the thermostat in an electric circuit a lead 29 is soldered to the outer end of the movable contact 22; the support 11, to which the normally-fixed contact 23 is electrically connected through arm 20, serving as the other connecting-point for the thermostat.

The cup 24 and diaphragm 25 together form a dust-tight compartment for the contacts 22 and 23. The diaphragm, because of its elasticity, does not appreciably impede normal movement of the bimetallic member in response to temperature changes. The diaphragm can be readily opened and reclosed, for inspection of the contacts, by stretching its flange 26 out of and into place on the rim of cup 24.

Referring now more particularly to Fig. 2, the numeral 30 indicates the sides of a slot cut in the bimetallic member 14 and extending from the crook of its U through both side arms of the member to the points indicated in Fig. 1 by the broken lines 31. The slot 30 extends generally lengthwise of the side arms but asymmetrically with respect to their axes. We have found that by slotting a bimetallic strip obliquely, in the general manner shown, an unharmonious condition is produced in the strip whereby microphonic action of the same under the influence of sound waves is greatly reduced; the disadvantage of such microphonic action, under certain conditions of a thermostat, having been described in the statement of invention.

The thermostat shown in Fig. 3 is the same as that of Fig. 1 except for the addition of frictional means for preventing vibration of the bimetallic member. This means comprises a resilient blade 36 secured by a rivet 37 to the horizontal arm of a right-angled bracket 35 which is mounted in place of the spacer 19 of Fig. 1. The blade 36 bears against the top edge of arm 18 of the bimetallic member; a screw 38, passing through an opening in the blade and threaded in the bracket, being provided for adjusting the force of the blade. A small amount of friction between blade 36 and the bimetallic arm 18 is effective to prevent microphonic action of the arm without impeding its normal thermostatic movement. In the arrangement of Fig. 3 it is not necessary to slot the bimetal.

The specific embodiments of our invention herein shown and described are susceptible of modification without departing from the spirit of the invention, and we intend therefore to be limited only by the scope of the appended claims.

We claim as our invention:

1. In an electrical control device: a support; means mounted on said support and movable in response to variations of a controlling condition; an electrical contact carried by said condition responsive means and movable therewith; a resilient arm mounted by one of its ends on said support; a normally-fixed contact carried by said arm and positioned for engagement by said movable contact; means mounted on said support for moving the free end of said arm to effect adjustment of said normally-fixed contact toward and away from said movable contact; and means forming a dust-tight compartment extending between, and secured to, said arm and said condition responsive means and spacedly-surrounding both of said contacts, a portion of said compartment-forming means being of rubber-like elastic material adapted to flex in relative movement of the arm and the condition responsive means, the border of said portion having an elastically gripping connection with the remainder of the compartment-forming means and being readily removable therefrom.

2. In a thermostat: a support; a U-shaped bimetallic member mounted by one of its side arms on said support; an electrical contact on the inside of the free arm of said bimetallic member and movable therewith; a U-shaped resilient arm mounted on said support, the free end of said arm extending adjacent said movable contact; a normally-fixed contact carried by said free end of said arm and positioned for engagement by said movable contact; means mounted on said support for moving said free end of said arm to effect adjustment of said normally-fixed contact toward and away from said movable contact; and means forming a dust-tight compartment extending between, and secured to, said arm and said bimetallic member and spacedly surrounding both of said contacts, a portion of said compartment-forming means being of rubber-like elastic material adapted to flex in relative movement of the arm and the bimetallic member, the border of said portion having an elastically gripping connection with the remainder of the compartment-forming means and being readily removable therefrom.

3. In an electrical control device: a support; means mounted on said support and movable in response to variations of a controlling condition; an electrical contact carried by said condition responsive means and movable therewith; a resilient arm mounted by one of its ends on said support; a normally fixed contact carried by said arm and positioned for engagement by said movable contact; means mounted on said support for moving the free end of said arm to effect adjustment of said normally-fixed contact toward and away from said movable contact; and means forming a dust-tight compartment extending between, and secured to, said arm and said condition responsive means and spacedly surrounding both of said contacts, said compartment-forming means comprising a rigid cup-shaped member secured to said arm and surrounding said normally-fixed contact, and a centrally-apertured flexible diaphragm, of rubber-like elastic material, covering the open end of the cup-shaped member and secured to said condition responsive means, said diaphragm having a flange portion elastically gripping the side wall of the cup-shaped member.

4. In a thermostat: a support; a U-shaped bimetallic member mounted by one of its side arms on said support; an electrical contact on the inside of the free arm of said bimetallic member and movable therewith; a U-shaped resilient arm mounted on said support, the free end of said arm extending adjacent said movable contact; a normally-fixed contact carried by said free end of said arm and positioned for engagement by said movable contact; means mounted on said support for moving said free end of said arm to effect adjustment of said normally-fixed contact toward and away from said movable contact; and means forming a dust-tight compartment extending between, and secured to, said arm and said bimetallic member and spacedly surrounding both of said contacts, said compartment-forming means comprising a rigid cup-

shaped member secured to said arm and surrounding said normally-fixed contact, and a centrally-apertured flexible diaphragm, of rubber-like elastic material, covering the open end of the cup-shaped member and secured to said bimetallic member, said diaphragm having a flange portion elastically gripping the side wall of the cup-shaped member.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
473,717	Varley	Apr. 26, 1892
1,141,605	Boekel et al.	June 1, 1915
1,987,166	Valverde	Jan. 8, 1935
1,987,167	Valverde	Jan. 8, 1935
2,202,207	Johnson	May 28, 1940
2,381,557	Ray	Aug. 7, 1945
2,407,378	Miller et al.	Sept. 10, 1946
2,419,180	Unger	Apr. 15, 1947
2,488,748	Tramontini	Nov. 22, 1949