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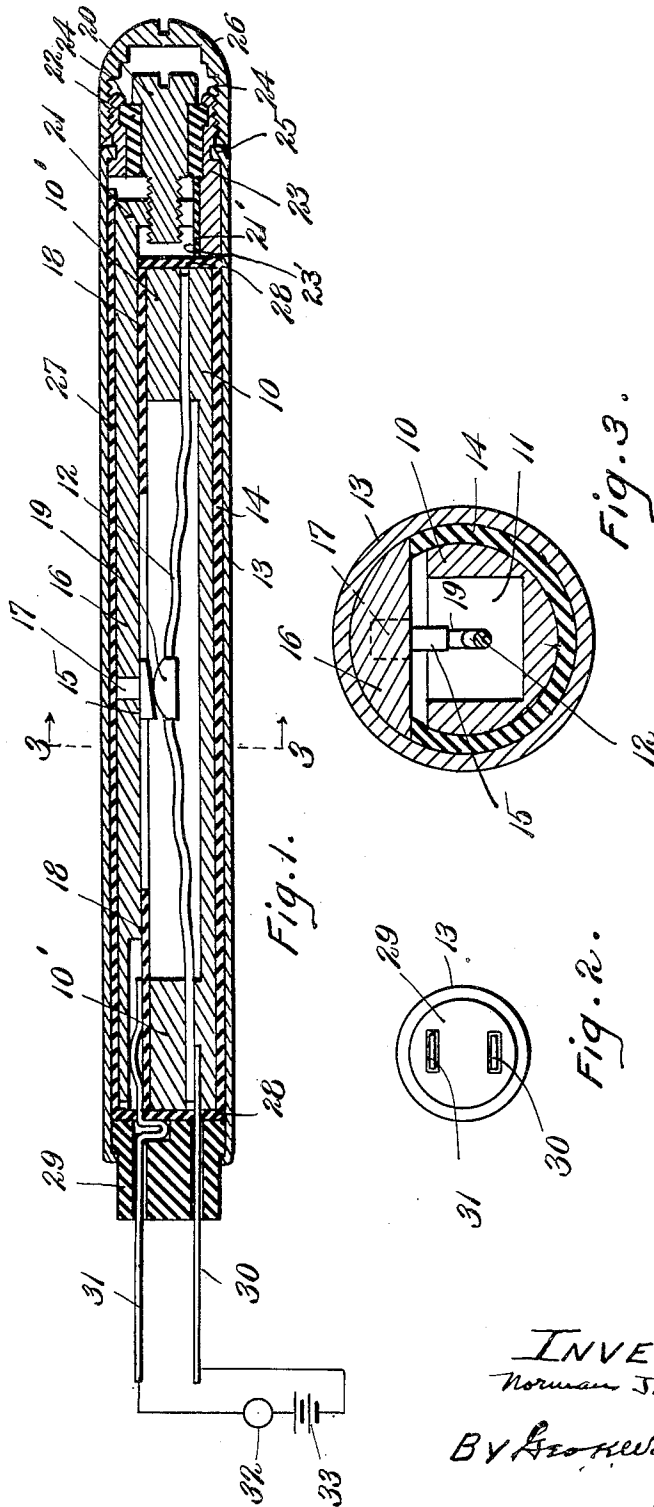
N. J. SMITH

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THERMOSWITCH

Filed Dec. 31, 1943

2 Sheets-Sheet 1



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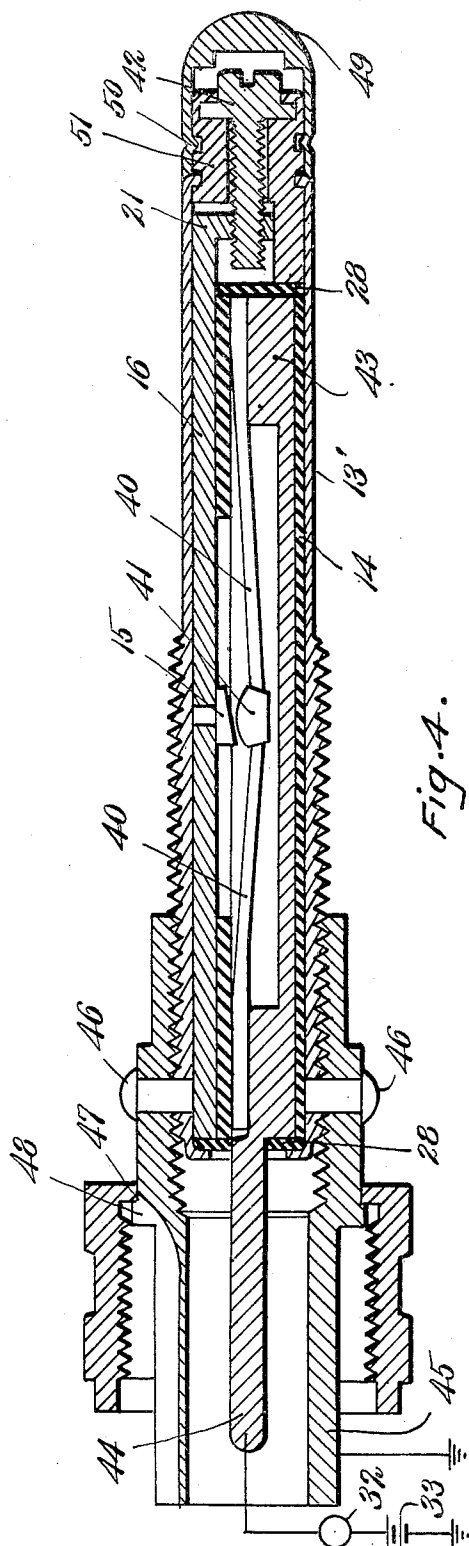
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UNITED STATES PATENT OFFICE

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THERMOSWITCH

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10 Claims. (Cl. 200—137)

This invention relates to circuit controlling thermostats whereby apparatus in circuit with the switch may be controlled to regulate the temperature of a device, such as the engine of an airplane.

The principal object of the invention is to provide a midget thermostat which may be preset at the factory to respond to a given temperature and cannot thereafter be adjusted by the user, or which may be adjusted at will by the user.

My invention comprises a stretchable element and a strut, the ends of which are secured to said element, said strut and element having different coefficients of expansion, and a sliding element arranged for co-operation with a contact on the strut for adjusting the switch to respond to any desired temperature.

In the accompanying drawings,

Figure 1 is a central longitudinal section of a thermostat embodying that form of my invention wherein the switch may be adjusted by the user, the scale being four times actual size.

Fig. 2 is an end view.

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 1, the scale being eight times actual size.

Fig. 4 is a central longitudinal section of an embodiment of my invention wherein the switch is preset at the factory and cannot thereafter be adjusted by the user.

In the particular drawings selected for more fully disclosing the principle underlying the invention and which are to be considered as illustrative, merely, and not restrictive, 10 is a stretchable member consisting in the present instance of a block of suitable metal having a relatively high coefficient of expansion, such as brass, which has been milled out to provide a rectangular trough 11 within which is disposed a strut 12 of invar, or other suitable material, having a very small or practically zero coefficient of expansion.

In the present instance, the outer wall of the member 10 is arcuate to facilitate its insertion in the cylindrical casing 13 between which and said member is interposed a sheet of insulation 14.

In any suitable manner, such as by soldering or electric welding, the ends of the strut are rigidly secured to the respective ends of the stretchable member 10.

Disposed above the strut is a longitudinally movable cam contact member 15, shown in the present instance as attached to the underside of a slidable bar 16 by the pin 17, said bar resting on the strips of mica or other suitable insula-

tion material 18 which lie on the flattened end portions 10' of the member 10.

The slidable contact member is disposed for co-operation with the contact member 19 secured to the mid portion of the strut, and, in the present instance, the under surface thereof is inclined to the axis of the switch. While any suitable means may be employed for moving the bar longitudinally and thereby changing the relative positions of the two contact members, I have shown in the present instance a screw 20 having threaded engagement with a flange 21 integral with the bar and disposed at right angles thereto. The screw is rotatable within the insulation collar 22 around one end of which is spun the end of the hollow plug 23 as indicated at 24, and the right-hand end of the casing 13 is pressed into a peripheral groove in said plug, as shown at 25. The end of the flange is guided by the flat 21' formed on the lower wall of the plug 23 and is insulated therefrom by the strip 23'. A cap 26 is threaded to the plug 23 to afford ready access to the screw 20 and protect the same after adjustment thereof.

Suitable insulation 27 is provided for preventing electrical contact between the casing and the arcuate sliding bar, and insulating discs 28 are placed between the ends of the thermostat element 10 and the parts adjacent thereto. The left-hand end of the thermostat is closed by the insulation plug 29 through which pass the lead wire tabs 30, 31, the former being electrically and mechanically connected in any suitable manner to the switch element 10, and a portion of the latter being bowed upwardly into engagement with the sliding bar 16.

An indicating or an actuating device 32 and battery 33 are shown in circuit with the lead wire tabs as indicative of a circuit controlled by the thermostat.

When the midget switch is used to control the temperature of the engines of a dive bomber, the element 32 will be a suitable device for actuating the louvers or other ventilators in the cockpit of an airplane.

It will be obvious that when the position of the slide 20 is adjusted to place the contact members 12 and 15 in the position shown, the circuit will be opened at a lower temperature than when the slide 16 has been moved to the right and that when the high point of the cam is in co-operation with the crown of the contact member 19, the thermostat will be set to open at the highest temperature within its range of operation.

In Fig. 4, I have shown the application of my improved thermostat adjusting means to an

inverse thermostwitch, whereby the circuit is closed when the temperature rises to a predetermined value. In this case, the strut 40 is bowed downwardly and provided with a contact member 41 disposed for co-operation with the movable cam contact member 15 attached, as above described, to the lower surface of the flanged longitudinally movable bar 16, the position of which is controlled by the screw 42. The expansible thermostwitch member 43 is insulated from the casing 13 and the ends thereof are insulated from the adjacent parts by the mica washers 28, as in the case of the direct thermostwitch described in connection with Fig. 1. There is, however, no insulation between the bar 16 and the casing. The left-hand end of the member 43 terminates in a contact making prong 44 which is enclosed within the metallic cylinder 45, the prong and cylinder forming a socket whereby the two thermostwitch elements are connected to the circuit which is to be controlled. The socket aforesaid may be threaded to the thermostwitch casing and held in position by the drive pins 46. An interiorly threaded coupler having a flange 47 engaging the shoulder 48 formed in said socket may be employed to secure said socket to the co-operating elements in which the ends of the controlled circuit terminate, said circuit being represented conventionally in the same manner as in Fig. 1; but, in the present instance, both terminals of said circuit are grounded, for example, on the body of the airplane engine or other apparatus the temperature of which is to be controlled.

In Fig. 4 the protecting cap 49 is permanently secured to the thermostwitch casing by rolling a peripheral portion 50 thereof into a co-operating groove in the end plug 51. The ends of the strut 40 are secured in any suitable manner to the respective ends of the thermostwitch member 43. It will be noted that said strut is in electrical contact with the prong 44 and that the slide bar 16 is in electrical contact with the socket 45 by way of the extension thereof which is threaded to the casing.

In Fig. 1, the expansible trough-shaped thermostatic member 10 having thickened end portions 10' and the strut 12 constitute a unitary preconstructed thermostatic element in which the ends of the strut supported by said end portions lie, after the insertion of said element in the casing 13, on the opposite side of the longitudinal axis of the casing from the cam contact member.

In Fig. 4, the expansible trough-shaped thermostatic member 43 and strut 40 constitute a unitary preconstructed thermostatic element in which the ends of the strut supported by the thickened end portions of said member lie, after the insertion of said element in the casing 13', on the same side of the longitudinal axis of the casing as said cam contact member.

In both cases, said preconstructed thermostatic element in combination with the enclosing casing from which it is insulated and with which is associated a contact member co-operating with that of the thermostatic element, constitute a thermostwitch of very small dimensions wherein the casing has no effect on the movement of the strut. By virtue of this arrangement, the assembly of the midget switch is greatly facilitated.

Having thus described illustrative embodiments of my invention without, however, limiting the same thereto, what I claim and desire to secure by Letters Patent is:

1. In a thermostwitch, comprising a stretchable element and a strut, said element and strut hav-

ing different coefficients of expansion, the ends of said strut being secured to the respective ends of said stretchable element, the combination of an enclosing casing, a contact member on said strut said strut being independent of said casing, a longitudinally movable cam contact member disposed for co-operation with the contact member on said strut means electrically connecting said strut and said stretchable element to one pole of an electric source, means electrically connecting said cam contact member to the other pole of said source, and means for varying the position of said cam contact member with respect to the contact member on said strut.

2. In a thermostwitch, comprising a stretchable element and a strut, said element and strut having different coefficients of expansion, the ends of said strut being secured to the respective ends of said stretchable element, the combination of an enclosing casing, a contact member on said strut said strut being independent of said casing, a longitudinally movable cam contact member disposed for co-operation with the contact member on said strut means electrically connecting said strut and said stretchable element to one pole of an electric source, means electrically connecting said cam contact member to the other pole of said source, and means for varying the relative position of said contact members.

3. A thermostwitch, comprising in combination, an enclosing casing, a thermally responsive element, a strut independent of said casing and provided with a contact member, said strut having a coefficient of expansion different from that of said thermally responsive element, a longitudinally movable cam contact member disposed for co-operation with the contact member first mentioned, means electrically connecting said strut and said thermally responsive element to one pole of an electric source, means electrically connecting said cam contact member to the other pole of said source, and means for changing the position of said cam contact member with respect to the contact member co-operating therewith.

4. A thermostwitch, comprising in combination, an enclosing casing, two elements having different coefficients of expansion, means securing the ends of one of said elements to the respective ends of the other, a contact member on one of said elements, a slide disposed for longitudinal movement with respect to said contact member, a contact member secured to said slide and having a surface inclined to the axis thereof, said contact members being disposed for co-operation, each of said elements being independent of said casing, and means for moving said slide longitudinally.

5. A thermostwitch, comprising a unitary preconstructed thermostatic element consisting of an expansible trough-shaped thermostatic member having thickened end portions, a strut, the respective ends of said strut being supported on said end portions, and a contact member on said strut, in combination with an enclosing casing, and a longitudinally movable contact member co-operating with the contact member of said strut, said strut and trough-shaped member having different coefficients of expansion.

6. A thermostwitch comprising in combination, a unitary preconstructed thermostatic unit having a strut provided with a contact member intermediate the ends thereof, means securing the ends of said strut to the respective ends of said unit, insulation members disposed on the ends of

said unit, a longitudinally extending slide disposed on said insulation members, a cam contact member secured to said slide and disposed for co-operation with the contact member on said strut, an enclosing casing, screw means in threaded engagement with said slide for adjusting the longitudinal position thereof, a collar affording a bearing for said screw, and means securing said collar to said casing.

7. A thermoswitch comprising in combination, a unitary preconstructed thermostatic unit having a strut provided with a contact member intermediate the ends thereof, means securing the ends of said strut to the respective ends of said unit, insulation members disposed on the ends of said unit, a longitudinally extending slide disposed on said insulation members, a cam contact member secured to said slide and disposed for co-operation with the contact member on said strut, an enclosing casing, and means for moving said slide longitudinally of said strut, a collar supporting the means last named, and means securing said collar to said casing.

8. A thermoswitch comprising in combination, a unitary preconstructed thermostatic unit having a strut provided with a contact member intermediate the ends thereof, means securing the ends of said strut to the respective ends of said unit, insulation members disposed on the ends of said unit, a longitudinally extending slide disposed on said insulation members, a cam contact member secured to said slide and disposed for co-operation with the contact member on said strut, an enclosing casing, a flange on the end of

said slide disposed transversely of the axis of said casing, a screw in threaded engagement with said flange for adjusting the longitudinal position thereof, a collar affording a bearing for said screw, means securing said collar to said casing, and means for supporting and guiding the end of said flange.

9. A direct thermoswitch, comprising a unitary preconstructed thermostatic element consisting of an expansible trough-shaped thermostatic member having thickened end portions, and a strut, the respective ends of said strut being supported on said end portions, and a contact member on said strut, in combination with an enclosing casing, and a cam contact member co-operating with the contact member of said strut, the ends of said strut lying on the opposite side of the axis of said casing from said cam contact member, said strut and trough-shaped member having different coefficients of expansion.

10. An inverse thermoswitch, comprising a unitary preconstructed thermostatic element consisting of an expansible trough-shaped thermostatic member having thickened end portions, and a strut, the respective ends of said strut being supported on said end portions, and a contact member on said strut, in combination with an enclosing casing, and a cam contact member co-operating with the contact member of said strut, the ends of said strut lying on the same side of the axis of said casing as said cam contact member, said strut and trough-shaped member having different coefficients of expansion.

NORMAN J. SMITH.