Jan. 12, 1943. N. J. SMITH 2,307,867

THERMOSTATIC SWITCH

Filed June 3, 1942 2 Sheets-Sheet 1

Fig. 1.

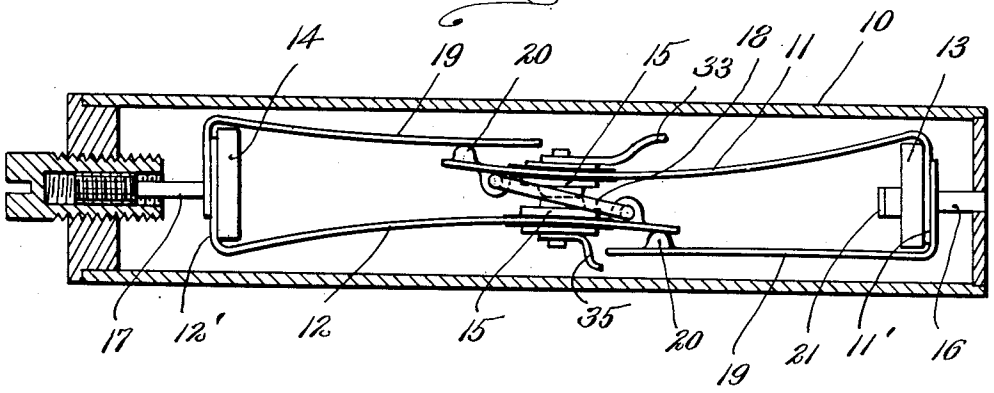


Fig. 2.

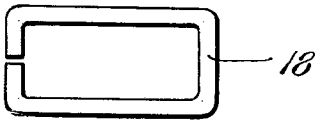
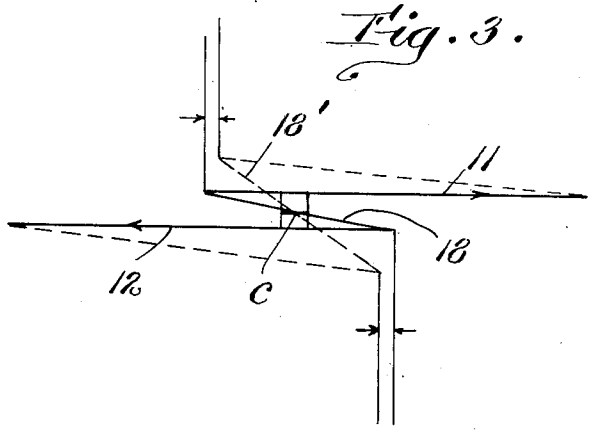


Fig. 3.



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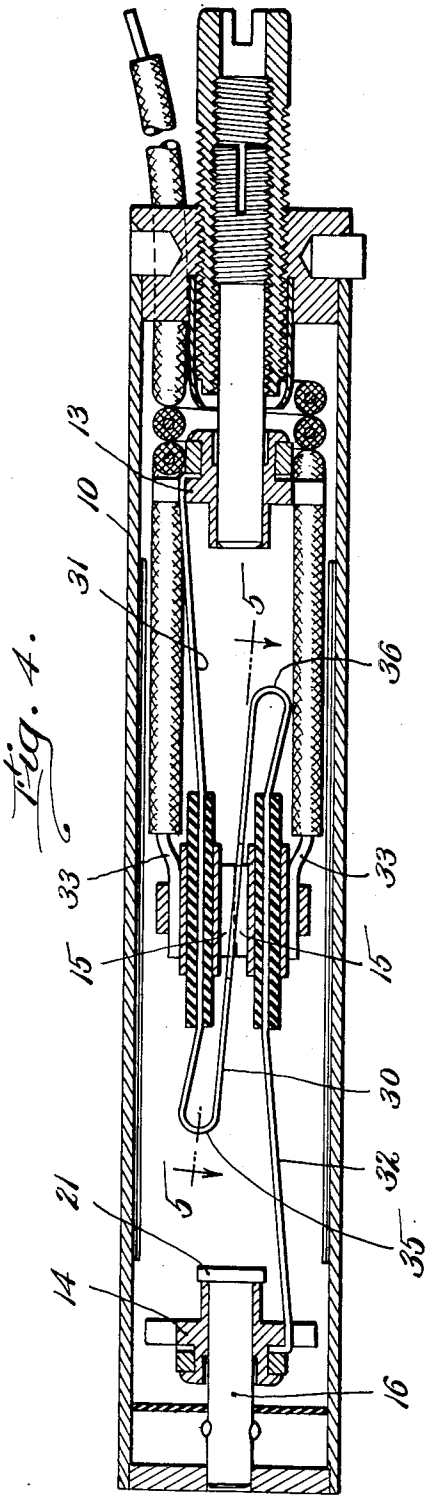


Fig. 4.

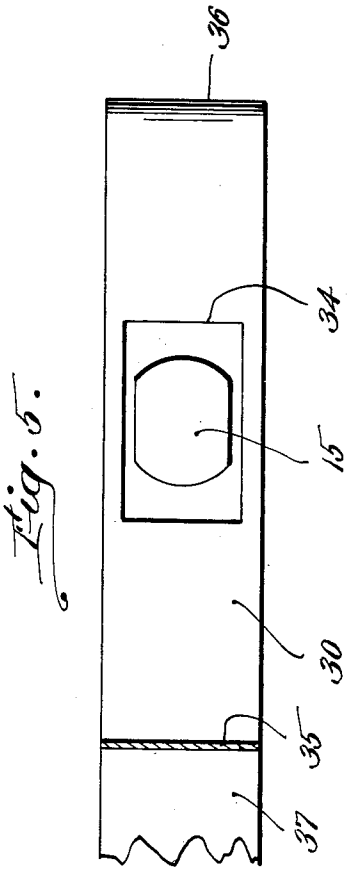


Fig. 5.

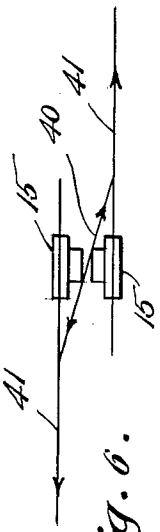


Fig. 6.

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UNITED STATES PATENT OFFICE

2,307,867

THERMOSTATIC SWITCH

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Application June 3, 1942, Serial No. 445,679

10 Claims. (Cl. 200—137)

This invention relates to thermostatic switches, and more especially to such switches in which one of the elements is of shell form and encloses the other element which is longitudinally adjustable.

The general object of the invention is to improve the construction of thermostatic switches in the manner hereinafter more fully set forth. Particular objects of the invention are to provide a thermostatic switch in which the separating action of the spring members is more positive than when such members extend from end to end of the casing and make contact at or near their central portions, and wherein the contacts carried by the spring members separate with a slight wiping action whereby the weld sometimes formed by the arc when said contacts are separated, is sheared off.

In the accompanying drawings,

Figure 1 is a central longitudinal section of a direct acting thermostatic switch embodying my invention.

Fig. 2 is a plan view of a detail construction.

Fig. 3 is a diagram hereinafter used in explanation of the operation of the switch.

Fig. 4 is a central longitudinal section of another form of direct acting thermostatic switch embodying my invention.

Fig. 5 is a section taken on the line 5—5 of Fig. 4, and

Fig. 6 is a conventional showing of another embodiment showing the application of my invention to an inverse acting thermostatic switch.

In the particular drawings selected for disclosing the principle of my invention, and which are illustrative, merely, 10 is a tubular casing of brass or other suitable material having a relatively high coefficient of expansion. My improvement is applicable to direct acting thermostatic switches, such as shown in the patents to W. J. Turenne, No. 2,257,990, October 7, 1941, and No. 2,090,407, August 17, 1937, in which the switch is normally closed and opens when the temperature to which it is subjected exceeds the temperature for which it is set; and also to inverse acting thermostatic switches, an example of which is shown in the patent to T. L. Fenn and W. J. Turenne, No. 2,185,433, January 2, 1940, in which the switch is normally open and closes when the temperature exceeds that for which the thermostat is set.

In Fig. 1, which shows an application of my improvement to a thermostat of the direct acting type, there are enclosed within said casing a pair of oppositely disposed and oppositely extending struts 11, 12, having a relatively low coefficient of expansion, said struts being formed, for example, of invar, the coefficient of expansion of which is practically zero. The said struts are suitably secured at their outer ends to the heads 13, 14, respectively. In the embodiment of the invention illustrated, each strut is L-shaped and the shorter legs 11', 12', thereof abut the heads 13, 14, respectively, and are rigidly secured thereto. The inner ends of the struts overlap, and each strut is so disposed as to make electrical contact with the other at a point intermediate the ends thereof.

Preferably, each strut is provided near its inner end with an insulated contact member 15, which may be a disc of any suitable material commonly employed for this purpose. The heads 13, 14, are anchored to the casing and while any suitable means may be employed for this purpose, I have shown merely for illustration an anchor pin 16, such as disclosed in Patent No. 2,257,990, for the head 13 and an adjusting screw 17 of any suitable description for the head 14.

A link 18, which may be a rectangular frame, as shown, is pivotally connected to the struts at or near the inner or free ends thereof.

In order to render the struts insensitive to vibration of the switch, resilient strips 19, 19, which bear against the inner ends of the struts, may be provided. In the present instance, the elastic members also are L-shaped and the shorter legs thereof are firmly secured to the respective heads. Buttons 20, 20, may be affixed to the inner or free ends of the struts to afford bearing points for said elastic members.

Referring to Fig. 3, it will be observed that when the right-hand strut 11 is fixed, as by the flange 21 of the anchor pin, the expansion of the casing 10 will put such strut in a state of tension in the directions indicated by the arrows which will cause the link 18 to swing slightly on its hinged supports about a virtual center C, the tension exerted thereon by the struts putting the link in compression, and that this action will impart a side motion or separating action to the ends of the struts so that the contacts separate with a wiping action or slightly longitudinal movement of from one ten thousandth of an inch to one thousandth of an inch, thereby effectively shearing off any weld that may be formed by the arc created when the contact between the struts is broken. In like manner, they will close with a wiping action when the casing again contracts. This action is illustrated in greatly enlarged form in Fig. 3, wherein the dotted line 18' represents the posi-

tion of the link after the contact has been broken, and the distance between the arrowheads indicates the longitudinal motion of the contact discs.

In Fig. 4, which shows another form of direct acting thermostatic switch, the link 30 connects the inner ends of the strut members 31, 32, and is integral with the other portions thereof, the strut structure comprising a unitary continuous leaf spring of relatively low coefficient of expansion, the outer ends of which are secured, respectively, to the heads 13, 14; in other words, the strut structure is a Z-shaped unitary leaf spring.

Intermediate the ends of each strut member, electrical contact members 15 are secured thereto and insulated therefrom. Conductors 33, 33, are electrically connected to the respectively contact members. To permit the co-operation of the contact members, an aperture 34 is formed in the diagonal leg of the Z with which aperture the contact members are in register. The tension under which the strut members are placed may be regulated by adjusting the radius of curvature of the bends 35, 36—for example, the tension will be increased by bringing the ends adjacent said bends closer together, i. e., diminishing the radius of curvature of the bends.

As will be obvious, the mode of operation of the thermostat will be the same as that of the form shown in Fig. 1, wherein the link is not integral with the struts.

Manifestly, the unitary strut structure herein disclosed is not limited to use with thermostatic switches of the type shown in the patents hereinbefore referred to.

In Fig. 6, which shows a thermostatic switch of the inverse type, the ends of the link 40 are secured in any suitable manner to the struts 41 intermediate the ends of each, but differs from the arrangement shown in Fig. 1, in that the points of connection are intermediate the heads of the struts and the point at which each said strut makes electrical contact with the other. As will be obvious, the expansion of the casing will put the link and also the struts in a state of tension in the directions indicated by the arrows which, as before, will cause the link to swing slightly on its points of attachment to the struts about its virtual center, and that this action will impart the slight side motion above mentioned so that the contacts will close with a wiping action, and, in like manner, will separate with such action when the casing again contracts.

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. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing and a link pivotally connected to the inner ends of said struts.

2. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing, a link pivotally connected to the inner ends of said struts, and a pair of oppositely disposed and oppositely extending resilient members each bearing against the inner end of one of said struts.

3. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing, a link pivotally connected to the inner ends of said struts, and a pair of oppositely disposed and oppositely extending resilient members, the inner end of each of said members bearing against the inner end of one of said struts and the outer ends thereof being secured to said heads, respectively.

4. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing and a link connecting the inner ends of said struts.

5. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing and a link integral with said struts and connecting the inner ends thereof.

6. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a unitary strut structure of relatively low coefficient of expansion comprising two oppositely disposed and oppositely extending strut members overlapping at the inner end portions thereof, each said strut member being disposed to make electrical contact with the other at a point intermediate their ends, the mid portion of said strut structure being reversely bent with respect to the overlapping portions thereof and constituting a link connecting the ends of said overlapping portions, said mid portion being provided with an aperture, heads secured to the outer ends of said strut structure, means for anchoring said heads to said casing and contact members secured to the respective overlapping portions of said strut structure, said contact members being disposed to register with the aperture in said mid portion.

7. In a thermostatic switch, a unitary strut structure comprising a leaf spring of relatively low coefficient of expansion, the mid portion of said leaf spring being reversely bent with respect to each of the outer portions thereof and pro-

vided with an aperture, and contact members secured to the respective outer portions intermediate the ends thereof and registering with said aperture.

8. In a thermostatic switch, a Z-shaped unitary leaf spring of relatively low coefficient of expansion, the diagonal leg of the Z being apertured and a contact member secured to each of the other two legs thereof and registering with the aperture in said diagonal leg.

9. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing and a link having its ends connected to said struts intermediate the ends thereof.

10. A thermostatic switch comprising a casing of material having a relatively high coefficient of expansion, a pair of oppositely disposed and oppositely extending struts having a relatively low coefficient of expansion, a head secured to the outer end of each said strut, said struts overlapping at the inner end portions thereof and each being disposed to make electrical contact with the other at a point intermediate their ends, means for anchoring said heads to said casing and a link having its ends connected to said struts at points intermediate the heads thereof and the point at which each said strut makes contact with the other.

NORMAN J. SMITH.