

Aug. 19, 1924.

P. H. BUCH ET AL

1,505,370

THERMOSTATIC SWITCH

Original Filed April 20, 1920

2 Sheets-Sheet 1

Fig. 1.

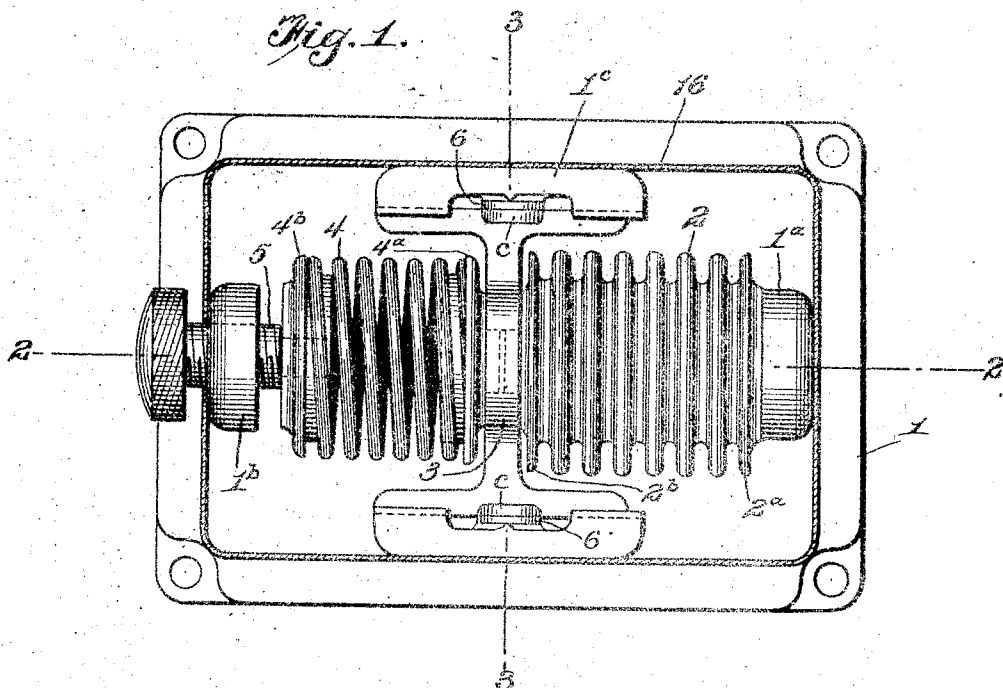
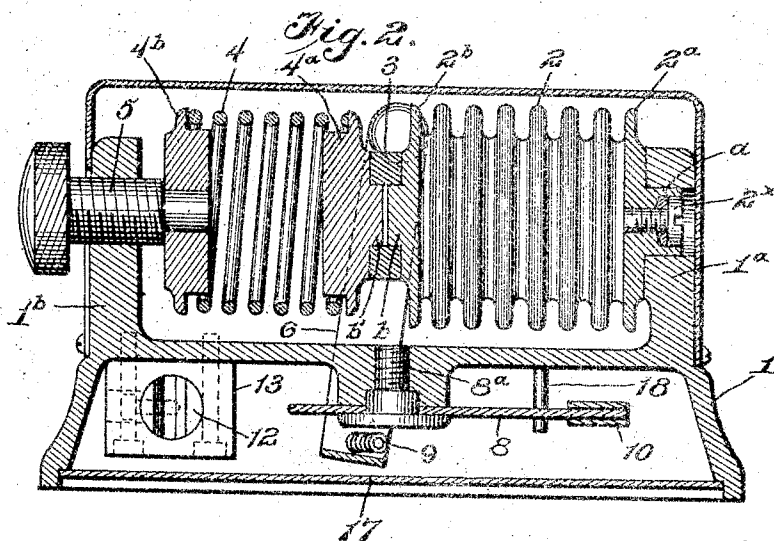


Fig. 2.



Inventors
Paul H. Buch
Howard M. Groff

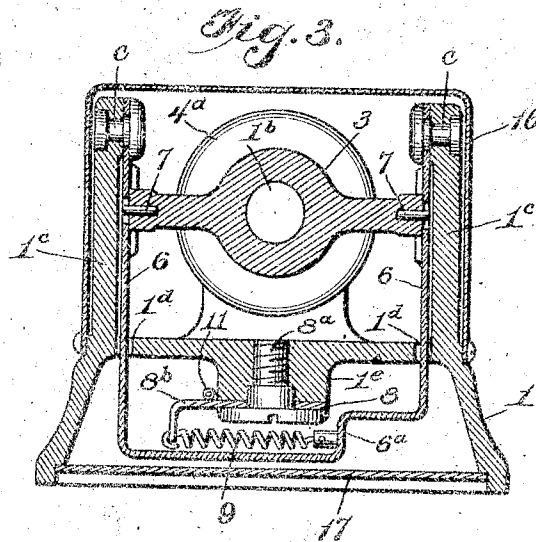
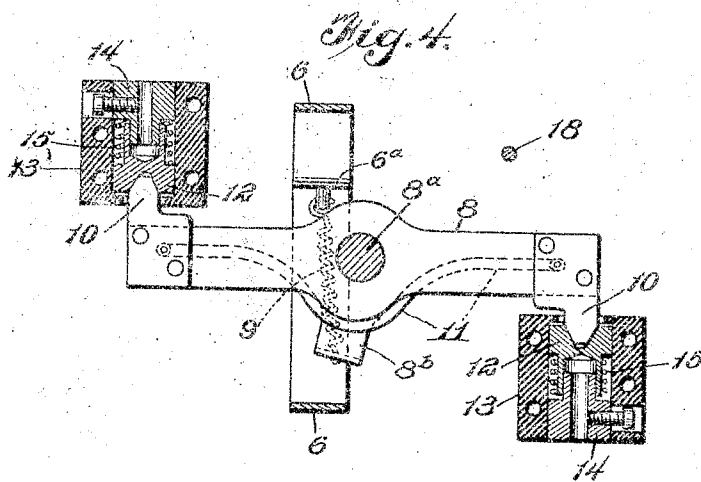
By *Spencer Middleton Donaldson & Hall*
Attorney

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F. H. BUCH ET AL
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Inventors
Paul H. Buch
Howard M. Croff

By *Charles Middleton Donaldson & Hall*

Attorney

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UNITED STATES PATENT OFFICE.

PAUL H. BUCH AND HOWARD M. GROFF, OF WATERBURY, CONNECTICUT.

THERMOSTATIC SWITCH.

Application filed April 20, 1920, Serial No. 375,225. Renewed January 8, 1924.

To all whom it may concern:

Be it known that we, PAUL H. BUCH and HOWARD M. GROFF, citizens of the United States, and residents of Waterbury, State of Connecticut, have invented certain new and useful Improvements in Thermostatic Switches, of which the following is a specification.

Our present invention relates to improvements in thermostatic electric switches intended for use in apparatus or devices requiring the control of temperature where an electric current is used to insure the execution of such control.

One object of the invention is to provide a simple and efficient device in which an expansible fluid is used as a thermostatic medium, and means are provided to secure ready and accurate adjustment.

Another object is to provide a construction in which a simple arrangement of amplifying means is used whereby a small movement of the expansible element will result in an amplified movement of the switch, thereby making the apparatus very sensitive.

A further object is to provide a construction in which the actual movement of the switch arm or member in either direction will be effected by power stored in a spring, whereby the switch is moved with a quick and positive action.

Still another object is to provide a construction in which plug contacts are used to avoid sparking, and means are provided to equalize the contacts.

With these, and other objects in view, as will hereinafter appear, the invention includes the novel features of construction and arrangement and combination of parts hereinafter described, our said invention being defined by the claims appended hereto.

An embodiment of our invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view of the device with the cover in section;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 1, and

Fig. 4 is a detail view, partly in section, illustrating the switch arm and contacts.

Referring by reference characters to these drawings, the numeral 1 designates a frame or base which has a hollow portion for containing or enclosing the switch arm and

contacts hereinafter described, two upstanding posts or end member 1^a and 1^b, and two side posts or members 1^c.

The post 1^a has an opening or recess to receive the boss *a*, formed on the end plate or head 2^a of the expansible metal bellows or "siphon" 2, which, except as hereinafter described, may be of the ordinary or any desired construction. The fluid may be inserted in the bellows through an opening in head 2^a which is closed by screw plug 2^b. The head 2^b at the opposite end, which is the head or member which is moved by the expansion and contraction of the fluid, is provided with a boss or projection, *b*, which fits in an opening in a cross head or yoke, 3, which has its opposite ends connected to the movement amplifying lever hereinafter described and by which the movement of the movable part of the bellows is transmitted to effect the movement of the switch arm. The cross head or yoke has its ends slidably mounted in guides or grooves in the side posts 1^c, these side members having cutaway intermediate portions to receive the amplifying lever arms which are shown at 6.

Opposed to the bellows is a spring 4, which bears at one end on an end plate or head member 4^a which has a boss or projection *b'*, fitting in the opening in the yoke, and at the other end against an end plate or head 4^b, which is carried by an adjusting screw 5, threaded through the end post 1^b, whereby the resistance of the spring may be adjusted at will.

The movement amplifying lever 6 is preferably of substantially U-shape, having the arms of the U extended through slots 1^d in the base and pivotally connected at their upper ends to the upper ends of the side posts 1^c by the pivot pins or screws *c*.

The ends of the yoke may conveniently be connected to the arms by pins indicated at 7, engaging vertical slots in the lever arms 6. The horizontal portion of the frame 1 has a boss or projection 1^e, to which is pivoted the double armed switch member 8, by a pivot 8^a, preferably in the form of a screw as shown.

The switch member has a centrally arranged laterally extending projection 8^b, the end of which is turned down at an angle and connected by a tension spring 9 with a portion of the movement arm 6 on the opposite side of the switch pivot 8^a, the hori-

zontal portion of the movement arm being preferably provided with an angularly bent portion 6^a to facilitate the connection.

Upon a change in temperature taking place, the expansion or contraction of the fluid in the bellows, which may be ethyl chloride or other suitable agent, causes the movement amplifying lever to be swung in one or the other direction and thus cause the end of the spring attached to the movement lever to be carried to the opposite side of the switch pivot.

Supposing for example the parts are in the position shown in Fig. 4, and the switch in closed position where it is held by the tension of the spring, the contraction of the fluid in the bellows will swing the movement amplifying lever 6 to the right until the end of the spring attached to the movement amplifying lever is carried by or to the right of the axis of the switch, whereupon the tension of the spring will at once snap the switch open and hold it in its open position against the stop pin 18. Upon expansion of the fluid in the bellows the reverse action will take place.

The switch arm is preferably provided with two male contact plugs or terminals 10, which are thoroughly insulated from the switch arm but electrically connected to each other by insulated conductor wire 11.

On the under side of the horizontal portion of the frame 1 are located two female contact plugs 12, which are arranged to contact with the male plugs and which are slidably mounted in and insulated from the frame 1, by the housing 13. These plugs are in electrical connection with terminals 14 to which the lead in wires are connected, and the female plugs and connection terminals are provided with reduced telescoping portions which are encircled by springs 15, which tend to force the female plugs outwardly to the limits allowed by the housing. This makes the female plugs self-adjusting to the male plugs and compensates for any inequalities due to fitting or other causes.

The bellows and spring are protected by a cover 16, provided with perforations for free passage of air, and the switch is likewise protected by a cover plate 17.

From the foregoing description it is believed that the operation and advantages of this improved thermostatic switch will readily be apparent, but it may be added that in this arrangement of interposed amplifying lever with the yoke arms connected with the lever in relatively close proximity to the lever pivots, the movement is so amplified that a very slight expansion of the fluid in the expansible bellows is sufficient to actuate the switch member and the device may therefore be made extremely sensitive.

Furthermore, it will be noticed that the expansible vessel and amplifying lever are

not utilized as a positive or direct means for actuating the switch member, the spring being the direct actuating means. The spring is under tension at all times, so that it operates to keep the switch member in either open or closed position, and the thermostatic vessel and amplifying lever are used to change the position of the spring, this change in position resulting in first applying additional tension to the spring until the dead center is passed. When the spring serves to swing the switch member with a quick and positive action.

Furthermore, by this arrangement of switch plugs operating in direct contact with terminals, sparking is eliminated, which occurs in connection with switches having sliding contacts, and furthermore, by insulating the male contacts from the switch member and connecting them by an insulated conductor, the passing of the electric current through any of the operating parts of the instrument is avoided.

Further, in this construction, the plugs of the switch arm are in direct contact with the terminals in one position, and entirely out of contact in the other position, and furthermore the terminals are self-adjusting to the plugs.

Again, the parts of this construction are all enclosed and protected and yet are easily accessible and the device as a whole is readily assembled and disassembled for cleaning or repairs.

While we have described our improved construction in considerable detail and illustrated but a single form thereof in the drawings, it will be readily apparent that various changes and modifications thereof might be made without departing from the spirit of our invention.

Having thus described our invention, what we claim is:—

1. An automatic switch comprising a pivoted switch member, a terminal, a substantially U-shaped amplifying lever pivotally supported at the ends of the arms of the U, a tension spring connected to the switch member on one side of its pivot and to the amplifying arm on the opposite side of said pivot, a yoke pivotally connected with the arms of said lever, and means for moving said yoke.

2. An automatic switch comprising a pivoted switch member, a terminal, a two-armed pivoted movement amplifying lever, a yoke having its ends connected to said arms, an operating device abutting against one side of said yoke, a spring exerting pressure on the opposite side of said yoke with means for varying the spring pressure, and means for causing said movement amplifying arm to actuate said switch member.

3. In combination, a frame having end and side members, automatic operating

means having an end plate detachably held by one of said end members, a substantially U-shaped movement amplifying lever pivoted to said side members, a yoke having its ends pivotally connected with said movement amplifying lever, said automatic operating means having an end plate detachably engaging said yoke, a spring bearing plate detachably engaging the opposite side of said yoke, a spring bearing plate adjustably carried by the other post a spring held under compression between said spring bearing plates, a terminal, and a coacting switch member and means whereby the movement of the amplifying lever effects actuation of the switch member.

4. In an automatic switch a frame or casing having a horizontal member and an upwardly extending portion, a switch member pivotally supported from said horizontal member, a terminal cooperating with said switch member, a lever having its upper end pivoted to one of said upwardly extending portions and having its lower end positioned adjacent the axis of the switch member, a spring connecting the lower end of said lever with the switch member, a horizontally movable slide connected to a portion of said lever intermediate its ends, and means for moving said slide.

5. In combination a frame including a horizontal portion and upstanding side posts, a substantially U-shaped lever having its arms passed through slots in said horizontal portion and pivoted at their upper ends to said posts, a pair of terminals secured to the under side of said horizontal frame portion, a switch member pivoted on a vertical axis to the under side of said horizontal portion and having electrically connected contacts cooperating with said

terminals, an actuating spring interposed between said U-shaped lever and switch lever, and means for operating said U-shaped lever.

6. In combination a frame including a horizontal portion and upstanding posts, a switch lever pivotally connected to said horizontal portion, terminals with which said switch lever cooperates, a substantially inverted U-shaped lever straddling said switch lever and having its arms pivotally connected to said posts, a spring connecting said U-shaped lever with the switch lever, and means for swinging said U-shaped lever.

7. In combination, a frame including a horizontal portion and upstanding side and end posts, a substantially U-shaped movement amplifying lever having its arms passed through slots in said horizontal portion and pivoted at their upper ends to said side members, a yoke having its ends pivotally connected with said arms of the amplifying lever, and actuating means operating against one side of said yoke, an adjusting spring bearing against the opposite side of said yoke, said vessel and spring being separated from said end members, a pair of terminals secured to the under side of said horizontal portion of the frame, a switch member pivoted on a vertical axis to the under side of the said horizontal portion and having electrically connected contacts cooperating with said terminals and an actuating spring interposed between said movement amplifying lever and said switch member.

In testimony whereof, we affix our signatures.

PAUL H. BUCH.
HOWARD M. GROFF.