March 22, 1932. J. A. SPENCER 1,850,360

THERMOSTATIC SWITCH

Filed Feb. 16, 1931

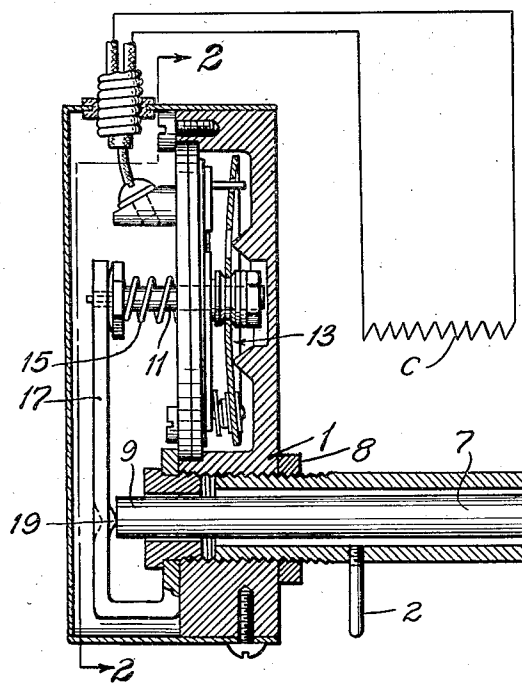


Fig. 1.

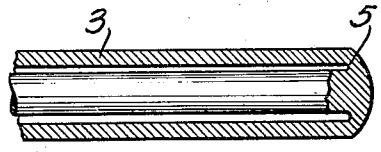
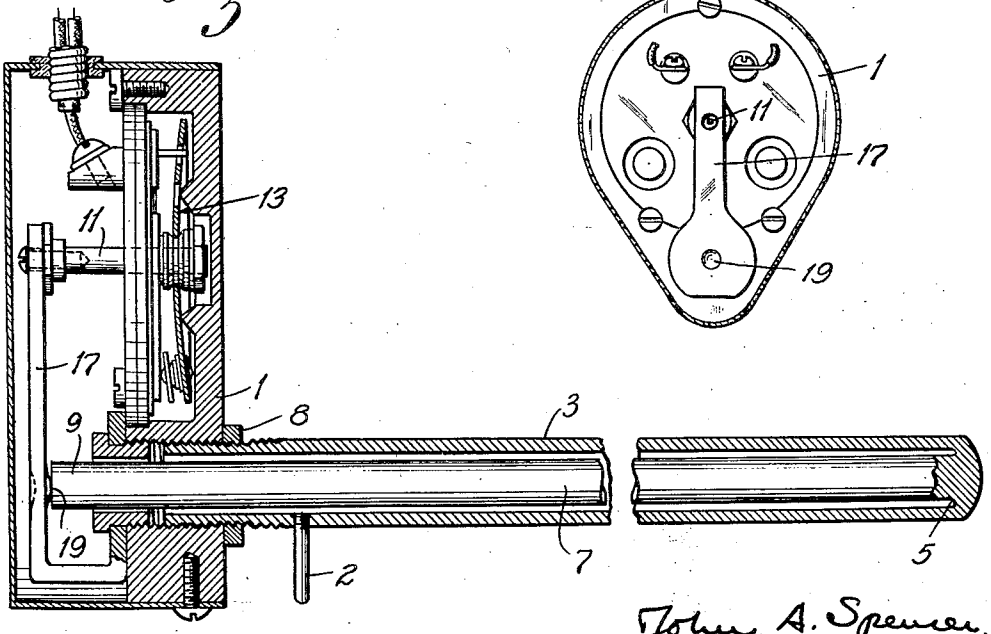


Fig. 2.

Fig. 3.



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UNITED STATES PATENT OFFICE

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THERMOSTATIC SWITCH

Application filed February 16, 1931. Serial No. 516,044.

This invention relates to thermostats, and with regard to certain more specific features, to thermostats in which relatively slow moving thermal elements drive an overcentering device through a suitable connecting linkage.

Among the several objects of the invention may be noted the provision of apparatus of the class set out in which said connecting linkage is positively limited in its movement to a predetermined amount, so that the overcentering device will not be injured by excessive temperature change, yet which does not subject said linkage to stresses which are above its elastic limit. Other objects will be in part obvious and in part pointed out hereinafter.

The invention is an improvement upon the invention set out in my copending United States patent application, Serial No. 479,859, filed Sept. 5, 1930.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which are illustrated two of various possible embodiments of the invention,

Fig. 1 is a cross section showing the invention;

Fig. 2 is a cross section, on a reduced scale, taken on line 2—2 of Fig. 1; and,

Fig. 3 is a detail showing an alternative form of the invention.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now more particularly to Fig. 1, there is shown at numeral 1 a body to which is affixed at one of its ends a metal cylinder 3 of relatively high coefficient of thermal expansion. The other end of the cylinder 3 is made fast (as at 5) to a stem 7 of relatively lower coefficient of expansion. The rod or stem 7 passes through the cylinder or pipe 3 and through the body 1. From this, it will be seen that if the temperature of the members 3, 7 be changed, the former will change length faster than the latter and cause the unfixed end 9 of the rod 7 to move.

It is desirable that said motion be transmitted and preferably multiplied in transmission to the button 11 of a snap-acting switch 13, the latter being held in said body 1 and adapted to make and break a suitable circuit C. The switch is of the class described in said application and, briefly, when the button 11 is pushed inwardly, changes the circuit with a quick action. When the button 11 is released, the circuit reverses condition quickly, a spring 15 effecting this action.

In said prior application a second class lever was used in one form of the invention for transmitting movement from the end 9 of the rod 7 to the switch 13. It was pivoted on one side of the rod 7 and pressed against the button 11 on the other side, the rod 7 engaging in between, whereby motion was transmitted. A limiting stop was put on the lever to prevent unlimited movement against the button 11, thus eliminating the possibility of breaking the switch 13 by excessive movement of the parts thereof. But there remained the possibility of straining the lever beyond its elastic limit by excessive motion of the rod 7, in turn caused by excessive heating of the device.

I overcome the above difficulties by fastening a spring or resilient arm 17 to the body 1 and extending from one side of the rod 7. This spring arm 17 arches over the end 9 of the rod 7 and reaches to the button 11 which it tends to press inwardly against the lighter action of spring 15. Normally it is prevented from pressing the button 11 and thus moving the switch 13, this being done by contact underneath the spring 17 of the rod 7, which, in its cold position is extended a greater amount from the tube 3 than in its hot position. Upon heating, the rod 7 retracts and permits the leaf spring 17 to travel away from its strained position in which it was held by the rod 7, and thus toward the switch button 11 to press the same against the reaction of spring 15. Thus heating effects movement of the barrier comprising rod 7 so that the initially strained spring 17 may move.

Upon the tube 3 again cooling, the rod 7 is forced against the spring 17 to bend the same outward so as to release the button 11, thus permitting the spring 15 to move the switch in reverse direction.

A suitable centering and anti-friction bearing 19 is placed between the leaf spring 17 and the rod 7.

It is to be understood that the principles herein set out may be applied to thermostats operating to open the switch upon heating or to close the same upon heating, or operating other devices such as valves and the like instead of switches, for broadly, the invention comprises stressing the spring when the thermal elements are in normal position and when said elements are in abnormal positions, permitting the spring to relieve itself of stresses and thus do work. Furthermore, the normal flexure of the spring when released is such that the switch or element to be moved is not driven beyond its limits.

At numeral 2 is shown a lever for adjusting the threading of the tube 7, into the body 1 to change the temperature at which the device will throw, the tube 3 being threaded into the body 1.

In Fig. 3 is shown a springless type of button 11 wherein a direct attachment is made to the end of the leaf spring 17 so that not only does the action of the spring 17 move the switch 13 in one direction, but the return movement of spring 17 (caused by pressure from rod 7 upon cooling) draws the switch to its opposite position. It is possible that excessive cooling might cause the spring 17 to pull the switch too far in the outward direction but this is a most remote contingency. Furthermore, the preferred form provides against it, because it will be seen that the spring 17 may leave the button 11 (Fig. 1).

It may be noted that adjustment for temperature of operation may be made by loosening the lock nut 8 and screwing in or out the tube 3.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A thermostat comprising relatively to be moved, a spring normally strained and movable thermal elements, a member adapted consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member.

2. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements.

3. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements and means for resetting said moved member when said thermal elements are again in normal position.

4. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal tlements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning towards its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements and a positive attachment between said spring and the moved member, whereby the latter is reset when said thermal elements are again in normal position.

5. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements, the final position of the spring being substantially unstrained when lost-motion occurs at said attachment.

6. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved,

said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements, the final position of the spring being substantially unstrained when lost-motion occurs at said attachment, and said lost-motion occurring only under substantial abnormal movements of said thermal elements.

7. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, a spring normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said spring upon temperature change, whereby the spring relieves at least some of its stresses by returning toward its unstrained position and causing operation of said member, said spring having a lost-motion connection with the thermal elements, the final position of the spring being substantially unstrained when lost-motion occurs at said attachment, said final positioning of the spring corresponding to a position of the moved element within its operating range.

8. A thermostat comprising relatively movable thermal elements, a member adapted to be moved, resilient means normally strained and consequently stressed by said thermal elements and engaging the member to be moved, said thermal elements being adapted to release said resilient means upon temperature change, whereby said resilient means relieves at least some of its stresses by returning toward it unstrained position and causing operation of said member.

In testimony whereof, I have signed my name to this specification this 30th day of January, 1931.

JOHN A. SPENCER.

CERTIFICATE OF CORRECTION.

Patent No. 1,850,360. **March 22, 1932.**

JOHN A. SPENCER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 59, claim 1, strike out the words "to be moved, a spring normally strained and" and insert them after line 60, of same claim; and line 100, claim 4, for "tlements" read elements; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of October, A. D. 1934.

Leslie Frazer

(Seal) Acting Commissioner of Patents.