May 23, 1939. L. M. PERSONS 2,159,342

COMPENSATED SWITCH

Original Filed May 11, 1936

Fig. 1.

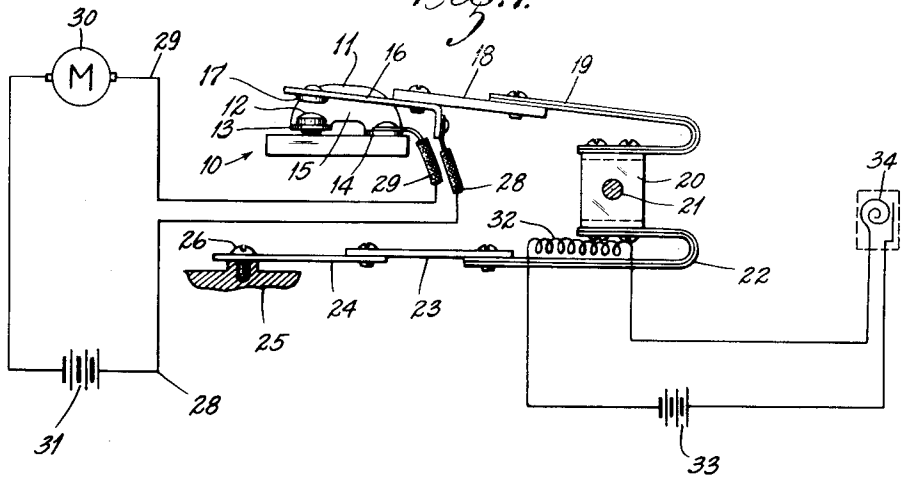


Fig. 2.

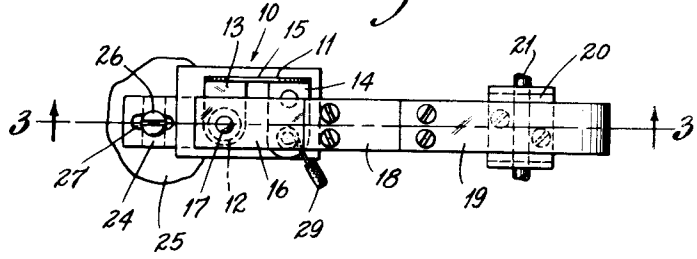
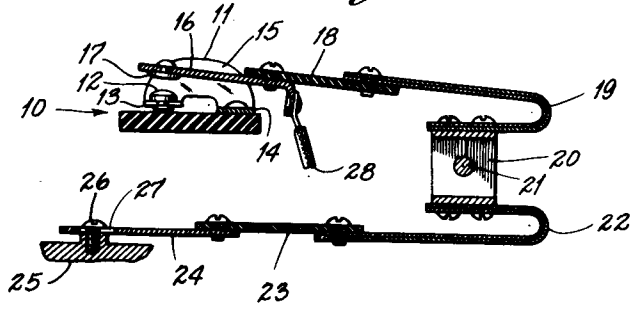


Fig. 3.



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COMPENSATED SWITCH

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Application May 11, 1936, Serial No. 79,053
Renewed April 3, 1939

3 Claims. (Cl. 200—122)

The present invention comprises a thermally-operated cut-off operable by applied heat, together with compensating means to overcome the effect of extrinsic heat. The mechanism is shown in connection with an electric switch, although it will be understood to be of broader application.

In general, therefore, it may be said that an object of the invention is to provide a cut-off of this type having means for compensating the effects of heat other than that directly applied to the instrument.

It is a further object of the invention to provide such a structure having the compensating means an integral part thereof.

Referring to the drawing—

Fig. 1 shows a side view of the switch with electrical connections shown diagrammatically.

Fig. 2 is a plan view of the device.

Fig. 3 is a sectional view thereof on the line 3—3 of Fig. 2.

The switch comprises a relatively fixed contact 10 which includes a flexible switch plate element of generally U-shaped configuration having a contact 12 on one of the legs 13 thereof, the other leg 14 thereof being fixed to a suitable base. The connecting member 15 of the U-shaped plate is turned up at right angles to the legs thereof for purposes to be described. A switch blade 16 having a contact 17 thereon is designed to be brought to the contact 12 to establish the circuit. To the switch blade 16 is fixed an insulating member 18 and, in turn, to the insulating member 18 is secured one leg of a U-shaped bimetal element 19. The other leg of this bimetal element is attached to a pivot block 20 pivoted at 21 for oscillation. Oppositely secured to the pivot block 20 is a second U-shaped bimetal element 22 having at its opposite end an insulating member 23 beyond which is an element 24 fixed to a base 25 by means of a screw 26 operating in a suitable slot 27.

The switch circuit includes a lead 28 connected to the switch blade 16, and a lead 29 connected to the leg 14 of the plate 11. This switch may be interposed in any suitable circuit and, for illustrative purposes, it is here shown as controlling a motor circuit having a motor 30 therein and a power source 31. The motor may, for example, comprise a furnace blower to be operated in response to temperature changes in the room heated by the furnace.

The bimetal 22 constitutes the operating member of the switch. It is heated by a heating coil 32 heated from a power source 33, in circuit with which is a room thermostat 34 adapted to close when the temperature of the room drops to a predetermined minimum.

The operation of the device is as follows:

The operating thermal element 22 contracts upon heating, whereas the compensating thermal element 19 expands when heated. The two elements are designed to be equal and opposite in effect, so that the one contracts the same amount the other expands in response to a given temperature change. When the room thermostat closes and energizes the heater 32, heat is applied to the bimetal 22 which then contracts. In so contracting, it draws the pivot block 20 and the elements mounted thereon in a counter-clockwise direction which, therefore, closes the contacts 17 and 12. In this pivotal action of the block 20, the attaching element 24 is necessarily drawn to the left. This effect is permitted by the slot 27. At the same time the screw 26 prevents lifting of this end of the bimetal 22, so that its entire contraction is transmitted into the arcuate motion of the pivot block 20. The switch remains closed as long as the heater 32 remains hot. In the illustration given, this will be until the furnace motor brings the room up to the desired temperature so that the thermostat 34 opens. As soon as this occurs, the heater will cool, the bimetal 22 expand, and the switch open.

Necessarily, the bimetal 22 is subject to the effect of the temperature of the surrounding air. This temperature might be raised to such a point that the bimetal would contract to the same degree produced by the heater 32, or, of course, to any intermediate degree. Any change in the position of the bimetal 22, unless compensated, alters the spacing of the contacts, and time factor of the switch. Any change in spacing of the contacts prior to application of the direct heat affects the opening and closing operation of the switch, and may prevent the switch from opening. The compensating bimetal 19 overcomes the effect of the surrounding temperatures and preserves the proper positioning of the two contacts. It expands, in response to heat changes, the same amount that the bimetal 22 contracts. It is, of course, understood that the heater 32 is so positioned that it produces no substantial effect upon the bimetal 19. If desired, a baffle plate may be provided between the two. Therefore, if the surrounding atmosphere heats the bimetal 22 and contracts the same, at the same time, it expands the bimetal 19; so that, even though the pivot block 20 is shifted under the action of the bimetal 22, the contacts 12 and 17 are maintained at the same distance apart. The

heater 32 normally applies a much more intense heat to the bimetal 22 than that applied by the ambient atmosphere. Its effect, therefore, is superposed over that of the atmosphere and the resultant action of the switch is the same as if no atmospheric changes were produced.

As shown, closing of the switch is thus effected in response to drop in room temperature to a predetermined point. When the switch closes, it starts the motor 30 and thereby causes the furnace to supply more heat into the room.

The switch plate 11 is described in my co-pending application Serial No. 80,090, filed May 16, 1936. Its effect is to provide a floating contact that will break any weld that may occur when the switch is closed. When the contacts seek to part, if there has been a weld, the contact 12 will follow the contact 17 during the first part of its motion. A certain amount of lost motion is desired in order to give the switch what may be termed a running start. After this initial running start period, forces are set up in the plate that, in general, may be said to operate about a pivot at right angles to the pivot 21. The primary effect of the movement of the contact 12 is to lift its leg about the bend where the leg joins the connecting member 15 of the U-shaped plate. Clearly, then, if this bend constitutes the pivot of the motion, the lever arm about which the contact 12 moves is much shorter than that about which the switch arm moves, and at right angles thereto. This produces a wiping action laterally between the contacts. Also, as this pivotal action occurs, the leg 13 will bend relative to the connecting member 15, as noted. The joint being flexible, the connecting member 15 will turn to preserve its original relation. Said turning is resisted by the connection with the fixed leg 14. Hence, the result is that as the joint between the leg 13 and the connecting member tends to unbend, the joint between the leg 14 and the connecting member tends to bend further, in the same degree as the other is unbending. This preserves the original position of the contact 12 regardless of deformation in the plate 11.

Further details of this element are given in the co-pending application above referred to.

What is claimed is:

1. In a device of the kind described, a base, a pivoted element mounted for oscillation on said base, a first heat responsive means consisting of a reversely bent bimetallic element secured at one end of the pivoted element and abutting the base at its other end, whereby it acts to pivot said element upon heat changes, a second heat responsive means in the form of a bimetallic element attached at one end to said pivoted element, means attaching a contact at the other end of said bimetallic element, means for applying heat to one of said heat responsive means, whereby to shift the contact, the other of said heat responsive means acting oppositely to said first in response to heat changes whereby to compensate for the effect on said contact of ambient temperature changes.

2. In a device of the kind described, a base, a pivoted element mounted for oscillation on said base, a first bimetallic member attached at one end to the base and at the other end to the pivoted element whereby it may oscillate the pivoted element, a second bimetallic member attached at one end to the pivoted element and adapted to support a switch contact at its other end, means insulating said switch contact and its circuit from said bimetallic member, means to apply heat to one of said bimetallic members, and said members acting oppositely in response to heat changes.

3. In a device of the kind described, a base, a pivoted element mounted for oscillation on said base, a bimetallic element having a reverse bend therein, means attaching one end of said element to the base for limited movement in a plane parallel to the base but preventing movement away therefrom, the other end of the bimetal being attached to the pivoted element to oscillate the same upon changes in heat conditions, a second bimetallic element having a reverse bend therein, means securing to one end of the second bimetal a contact and insulating the same from the bimetal, the other end of the second bimetal being secured to the pivoted element, said bimetallic elements acting oppositely in response to heat changes, and means to apply heat to one of them.

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