Aug. 10, 1948. J. E. SHERLOCK 2,446,961

THERMOSTATICALLY OPERATED ELECTRICAL SWITCHING DEVICE

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Fig. 1.

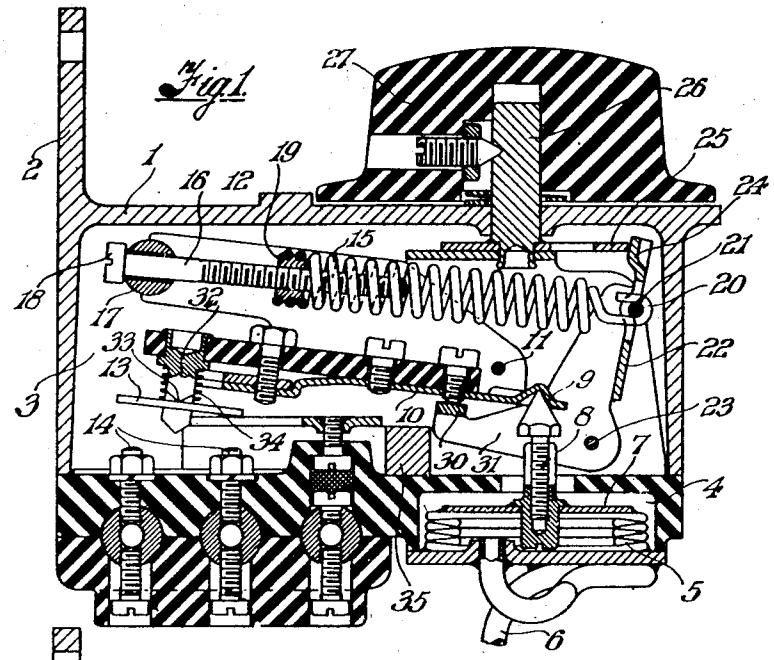

Fig. 2.

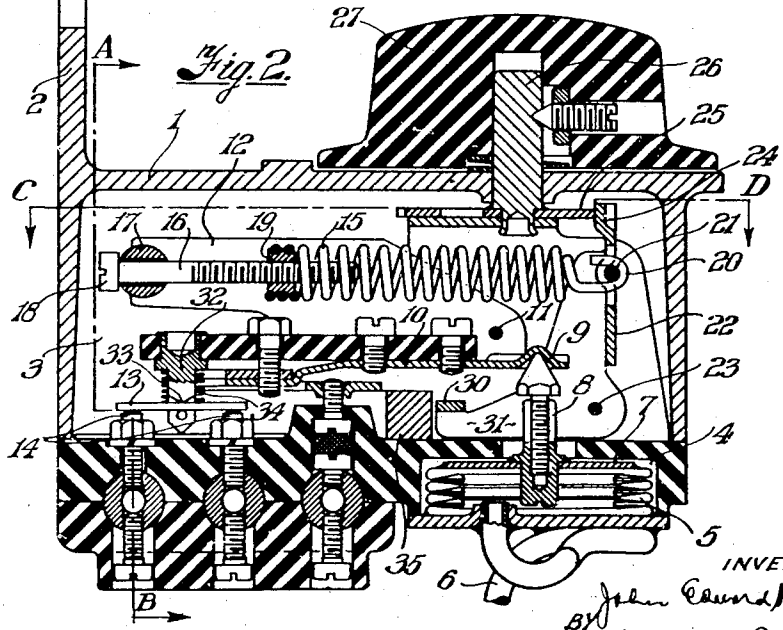

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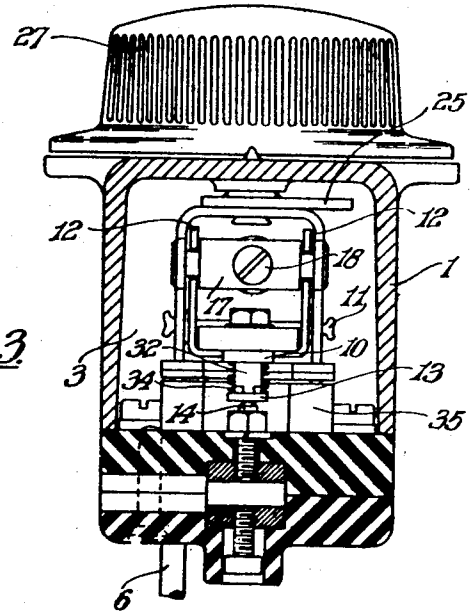
Fig. 3.



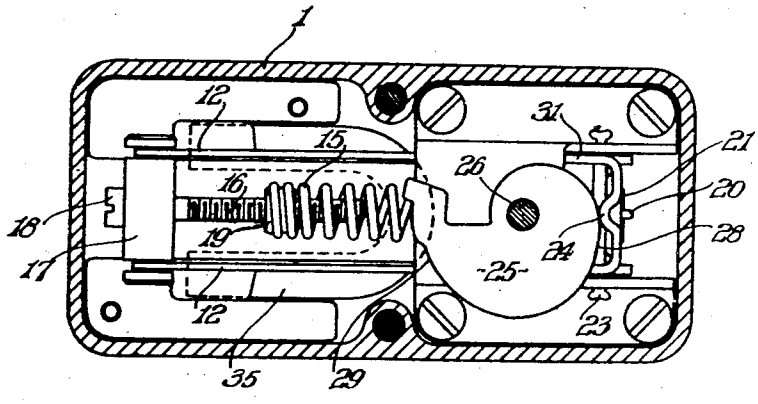


Fig. 4.

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THERMOSTATICALLY OPERATED ELECTRICAL SWITCHING DEVICE

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Application January 5, 1946, Serial No. 639,373
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3 Claims. (Cl. 200—140)

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This invention relates to thermostatically operated electrical switching devices and has for its object to provide an improved construction or arrangement of this character more particularly intended for the control of refrigerating apparatus and designed to provide a simple compact and reliable instrument capable of production at a small cost and characterised by ease of accessibility to the working parts for scaling and testing purposes.

According to the invention the improved thermostatically operated electrical switching device includes a movable switch component adapted to be operated against spring opposition by the movement of a flexible metallic bellows, hand control means for varying the resistance to the bellows movement and for providing an "off" position, and means for ensuring quick make-and-break movements of the said switch component.

According to the preferred form of the invention a thermostatically operated electrical switching device includes a fixed switch component, a pivotally mounted movable switch component, a flexible metallic bellows connected by a capillary tube to a phial exposed to the temperature to be controlled, means carried by said bellows to rock said movable switch component to switch closing position, a spring connected to said movable switch component and to an element normally stationary, and manually operated means for adjusting the position of said element to move said switch member to an "off" position.

Reference will now be made to the accompanying drawings which illustrate a thermostatically operated electrical switching device constructed according to the invention and wherein:

Fig. 1 is a sectional elevation showing the switch members open, and inoperative,

Fig. 2 is a sectional elevation showing the switch members closed,

Fig. 3 is a cross sectional elevation taken on the line A—B of Fig. 2, and

Fig. 4 is a sectional plan taken on the line C—D of Fig. 2.

In the construction illustrated and referring first to Fig. 1, the improved thermostatically operated electrical switching device is disposed within a casing 1 having an extension 2 by which it can be attached to a fixed support. Within this casing is a main compartment 3 which contains the switching and adjusting mechanism and a lower compartment 4 containing a flexible metallic bellows 5 connected by a capillary tube 6 to a phial exposed in the area where the temperature is to be controlled. The bellows is fixed at its

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base and has a movable upper end plate 7 to which is secured centrally a rod 8 abutting in a recess 9 formed at one end of a pivoted switch arm 10 whereby the movement of the bellows when expanding is transmitted to the arm. The switch arm 10 is movable about a fixed pivot 11 and is formed integral with or fixed to two vertical plates 12 (see Fig. 3).

The end of the switch arm remote from that engaged by the rod 8 carries a contact plate 13 adapted to be moved into and out of engagement with two stationary electrical contact terminals 14. The movement imparted to the switch arm 10 by expansion of the bellows 5 rocks it in an anti-clockwise direction to bring the plate 13 into contact with the terminals 14 to close the switch, this movement being opposed by a main spring 15, the tension of which is adjustable so that the temperature at which the bellows will overcome the resistance of the spring can be varied. One end of the spring 15 is adjustably anchored to the switch arm extension plates 12 by means of an adjustable screw-threaded rod 16 which passes freely through a socket 17 carried at one end of the plates 12, the head 18 of the rod abutting against the outer end of the socket. The screw-threaded portion of the rod 16 engages a nut 19 having a helical groove on its surface so that it engages and retains one end of the spring 15. Rotational movement imparted to the rod 16 will, therefore, alter the position of the nut 19 and increase or decrease the tension of the spring, but this adjustment is provided for initial setting purposes and is normally inaccessible. The opposite end of the spring is formed with a hook 20 which engages around a pin 21 carried by a vertical portion 22 of a two-armed lever 22—31 movable around a pivot 23 but held stationary during the normal operations of the instrument.

The two-armed lever 22—31 carries an extension in the form of a plate 24 which is engaged by the periphery of a cam 25 carried by a rotatable spindle 26 which projects through to the exterior of the casing 1 and is provided with a knob 27 for manual adjustment. The cam performs a double function in that during the first part of its rotational movement its edge 28, shown in Fig. 4, bears against the plate 24 and rocks the lever 22 about its pivot in a clockwise direction until the position is reached where the required load is imparted to the spring 15. When the spring has been adjusted to load the bellows to the extent required, the lever 22 remains stationary thereafter during the automatic operation of the instrument. During the second part of the cam

movement a ramp at 29 (Fig. 4) rocks the lever to an extent such that members 30 carried by its second arm 31 engage beneath the switch arm 10 and lift it to the inoperative position shown in Fig. 1. In this way a mechanical "off" position is provided, movement of the switch arm to this position interrupting the electrical circuit irrespective of temperature conditions.

The switch contact plate 13 is mounted over a stud 32 projecting downwardly from the switch arm, said stud being formed with a knife edge 33 bearing on the plate 13 which can therefore tilt slightly relatively to the stud so that with the assistance of a spring 34 disposed between the plate 13 and the under side of the switch arm the plate is rendered self-aligning with respect to the two stationary contact members 14. A quick make-and-break in the switch operations is obtained by the use of a permanent magnet 35 disposed immediately below the switch arm (see Fig. 4) and any lost motion is counteracted by the aforesaid spring 34 bearing on the contact plate 13 which ensures that any oscillatory movements of the said plate are damped out when the forces due to the bellows 5 and the main spring 15 are in equilibrium. The adjusting knob 27 disposed on the top of the casing 1 operates in conjunction with graduations or other markings to indicate to the operator the various operative positions and the "off" position.

I claim:

1. A thermostatically operated electrical switching device comprising, in combination, a pivotally mounted switch component, fixed switch components, a self-aligning contact element carried by said pivotally mounted switch component and cooperable with the fixed switch components, a flexible bellows movable in response to variations in temperature of the apparatus under control, means actuated by said bellows to rock the pivotally mounted switch component on its pivotal axis, a pivotally mounted two-armed lever, a spring connecting one arm of said lever to the pivotally mounted switch component at a point remote from its pivotal axis, means carried by the second arm of said lever and operative to lift the pivotally mounted switch component to an inoperative position, and a manually operable cam device for adjusting the position of said two-armed lever to vary the load imposed on the spring and for adjusting said lever to a further extent to lift the pivotally mounted switch component to an inoperative position.

2. A thermostatically operated electrical switching device as defined in claim 1, wherein said pivotally mounted switch component carries a contact plate engageable with said fixed switch components in self-aligning relation therewith under the influence of said spring, and being operative to damp out oscillatory movements when the forces due to said bellows and spring are in equilibrium.

3. A thermostatically operated electrical switching device as defined in claim 1, wherein said pivotally mounted switch component carries a contact plate engageable with said fixed switch components in self-aligning relation therewith under the influence of said spring, and being operative to damp out oscillatory movements when the forces due to said bellows and spring are in equilibrium, and including a permanent magnet disposed immediately beneath said pivotally mounted switch component and operative to effect a quick make-and-break operation thereof.

JOHN EDWARD SHERLOCK.

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