Aug. 28, 1928. 1,682,401

A. J. MOTTLAU

THERMAL RELAY

Filed Dec. 8, 1925 2 Sheets-Sheet 1

Fig. 1.

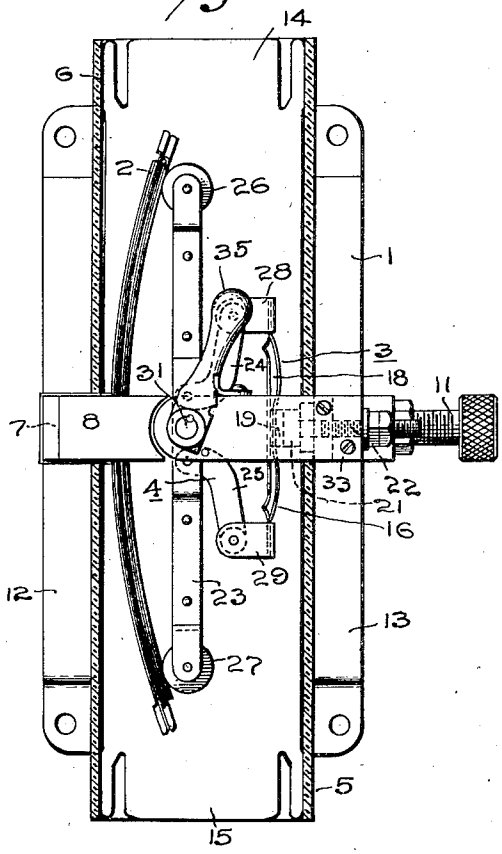


Fig. 2.

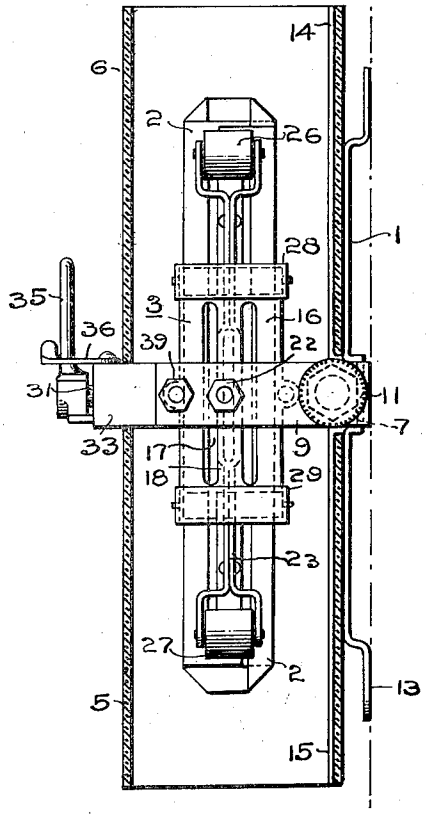
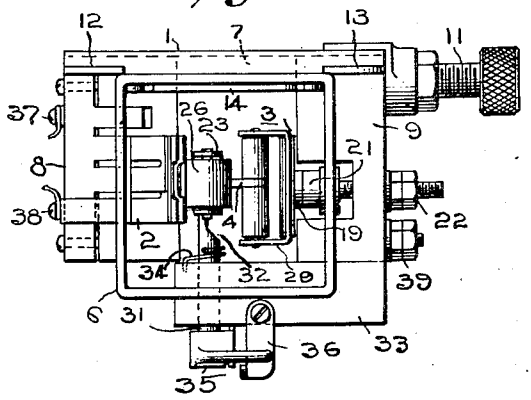


Fig. 3.



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Filed Dec. 8, 1925 2 Sheets-Sheet 2

Fig.4.

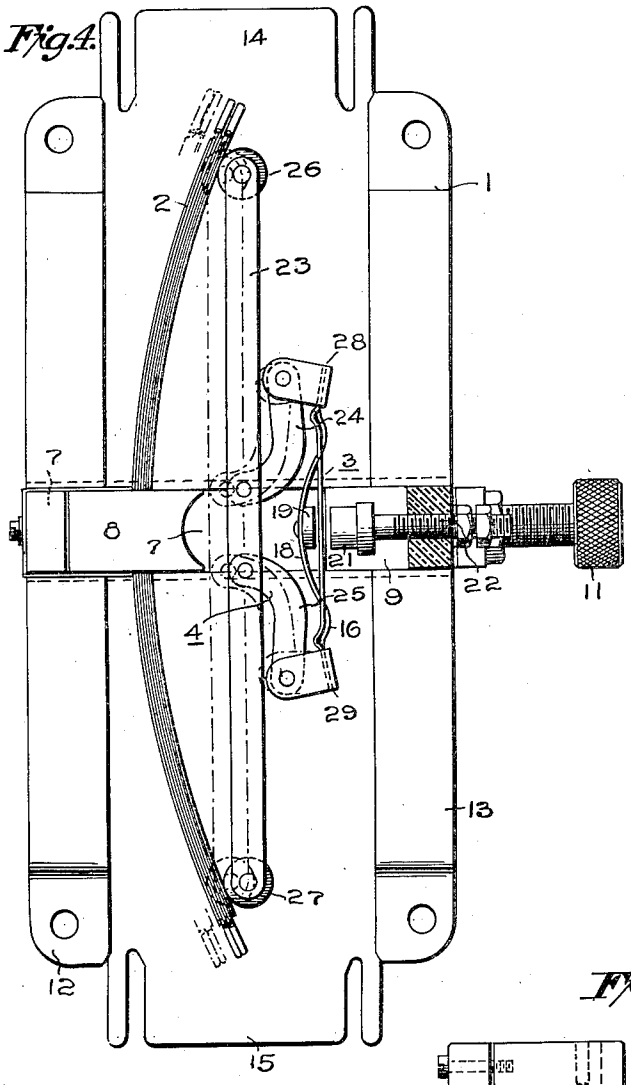


Fig.5.

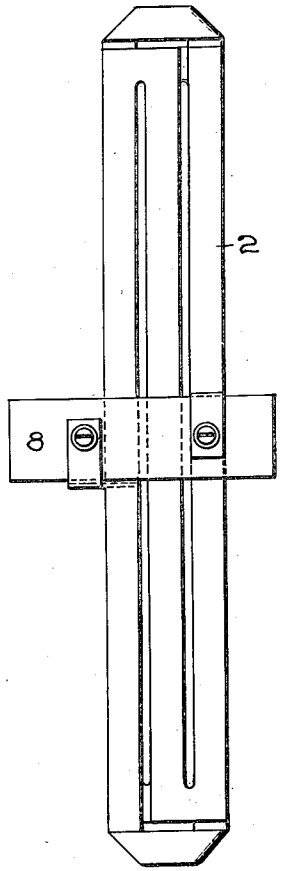
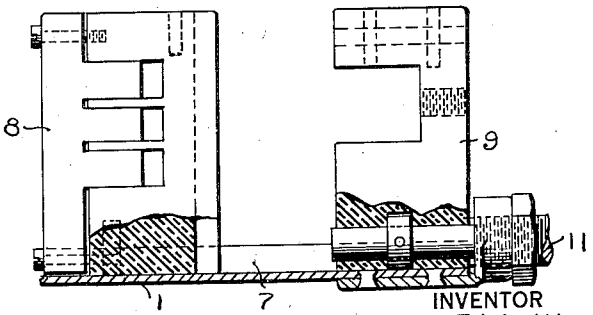


Fig.6.



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UNITED STATES PATENT OFFICE.

AUGUST J. MOTTLAU, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

THERMAL RELAY.

Application filed December 8, 1925. Serial No. 74,026.

My invention relates to switching devices and particularly to thermal relays.

One object of my invention is to provide a sensitive thermostatic regulator that shall operate on small temperature changes and be capable of quickly making or breaking an electrical circuit.

Another object of my invention is to provide a thermal relay that shall be quickly cooled after opening the circuit and thereby permit its being quickly reset.

Another object of my invention is to provide a thermally actuated unit that shall be simple to construct and rugged in operation and in which the ratio of mechanical strength or rigidity to electrical resistance may be made relatively high or low depending upon the operating conditions to be imposed thereon.

These and other objects that shall be made apparent in the following specification are accomplished in the device embodying my invention that comprises a supporting frame having mounted thereon a thermally responsive unit, a quickbreak mechanism, means for mechanically connecting the two devices, and means for protecting the mechanism and inducing ventilating convection currents therethrough.

An embodiment of the invention is illustrated in the accompanying drawings wherein:—

Figure 1 is a side view, partially in elevation and partially in section, of a thermostatic regulator embodying my invention.

Fig. 2 is a plan view, partially in section, of the thermostatic regulator shown in Fig. 1.

Fig. 3 is an end elevational view of the thermostatic regulator shown in Figures 1 and 2.

Fig. 4 is an enlarged side elevational view of the regulator with the casings removed.

Fig. 5 is a plan view of the thermally responsive device embodied in the regulator.

Fig. 6 is an end view, partially in section and partially in elevation, of the supporting frame for the regulator embodying my invention.

My invention comprises, in general, a supporting member 1 upon which is mounted a thermally responsive unit 2, a quick-break mechanism 3, a link mechanism 4 between the unit 2 and the mechanism 3 and casings 5 and 6 surrounding the same.

The supporting member 1, which is preferably of sheet metal, has a groove 7 stamped therein in which are mounted insulating blocks 8 and 9, the block 9 being adjustable by means of a screw 11. The block 8 is of two parts suitably shaped for clamping the thermally-responsive unit 2 therebetween. The supporting member 1 is of channel shape having side flanges 12 and 13. The base portions 14 and 15 of the member 1 are separated from the side flanges by slots which are of such size as to receive the walls of the casings 5 and 6 to retain them in position.

The casings 5 and 6 are disposed around the thermal responsive unit 2 and the quick-break mechanism 3 in such manner that convection currents are induced therein for the purpose of cooling the thermal responsive unit to permit quick resetting of the device after it has operated by reason of excess temperature.

The thermally responsive unit 2 comprises a plurality of integral bimetal sections so folded that the respective metals occupy the same relative positions therein whereby the bending moments of the several layers incident to temperature changes act in the same direction as shown by the dotted lines in Fig. 4.

The method of constructing such thermally responsive devices is described in my copending application Serial No. 74,027, filed Dec. 8, 1925, and assigned to the Westinghouse Electric & Mfg. Co.

The adjustable block 9 supports the quick-break mechanism 3 which comprises a metal plate 16 having an aperture 17 therein and a movable bridging member 18 extending across the aperture, the bridging member and the sides of the plate being in different planes. A contact member 19, that is mounted on the bridging member 18, engages a stationary contact member 21 that is mounted on the block 9 and is adjustable by means of a screw 22. This mechanism is described in my copending application Serial No. 725,408, filed July 11, 1924, and assigned to the Westinghouse Electric & Mfg. Co.

The thermally responsive unit 2 operates the quick-break mechanism 3 through the link mechanism 4 comprising an equalizer bar 23 and links 24 and 25. The thermally responsive unit 2 bears upon rollers 26 and 27 that are mounted adjacent to the ends of the equalizer bar 23 and the force exerted thereby is transmitted through the links 24 and 25 to brackets 28 and 29 that are mounted on the

ends of the rectangular plate 16. The brackets exert both a direct thrust and a bending moment on the ends of the rectangular plate 16 in the normal operating direction thereof to cause the bridging member 18 to move with a snap action to quickly engage or disengage the contact members 19 and 21.

A shaft 31 having a notch 32 in one side thereof is caused to rotate in a depending portion 33 of the block 9 by a spring 34 when the equalizer bar 23 is raised out of the notch 32 thus presenting an unnotched portion to the equalizer bar 23 and preventing it from returning to its normal position and engaging the contact members 19 and 21. The contact members may then be closed manually by means of an insulating handle 35 that is mounted on the shaft 31 or the device may be made to close automatically by locking the handle 35 in the closed position by means of a catch 36 that is also mounted on the depending portion 33 of the block 9.

In operation, current enters the device through terminals 37 and 38 that are mounted on the block 8 and traverses the circuit formed by the folded bimetallic strip comprising the thermal responsive unit 2. In case of excessive current traversing the thermally responsive unit for a predetermined length of time, the ends thereof are caused to bend upwardly thus lifting the equalizer bar 23 and links 24 and 25, as shown in Fig. 4. The links 24 and 25 apply bending moments to the ends of the quick-break mechanism 3 to cause the contact members 19 and 21 to snap apart to open the control circuit connected to terminals 22 and 39.

The device is adapted to be mounted in a vertical position as shown in Figs. 1 and 2 so that convection currents are induced in the casings 5 and 6. The chimney effect thus secured serves to cool the thermally responsive unit 2 relatively quickly and allows the contacts 19 and 21 to engage, thus resetting the device.

I do not wish to be restricted to the specific arrangement of parts and circuits herein set forth, as various modifications may be made without departing from the spirit and scope of my invention. I desire therefor that only such limitations shall be placed thereon as are indicated in the appended claims.

I claim as my invention:

1. In a switch structure, a quick-break mechanism, an equalizer bar having a roller on each end thereof, and a bimetal strip having its ends bearing against the rollers and adapted to actuate the quick-break mechanism by means of the equalizer bar.

2. In a thermal relay, the combination with a circuit-controlling device comprising a metal plate having an aperture therein and a bridging member integral with the plate and extending across the aperture, of a bimetal unit and a force-multiplying link mechanism actuated by the bimetal unit to apply bending moments and direct thrusts to the ends of the plate in the direction of its normal movement.

3. In a thermal relay, the combination with a circuit-controlling device comprising a metal plate having an aperture therein and a bridging member integral with the plate and extending across the aperture, of a thermally responsive unit, and a link mechanism actuated by the thermally responsive unit to apply bending moments to the ends of the plate in the direction of the normal operative movement thereof.

4. In a thermal relay, the combination of a quick-break circuit controlling mechanism, a folded bimetal strip for actuating the same and means for selectively permitting the reoperation of the circuit controlling mechanism.

5. A thermal relay comprising a metal plate having an aperture therein, a bridging member integral with the plate and extending across the aperture, a folded bimetal strip and equalizing means connected to the ends of the plate, said folded bimetal strip having its ends bearing upon the ends of the equalizing means.

In testimony whereof, I have hereunto subscribed my name this 17th day of November, 1925.

AUGUST J. MOTTLAU.