Sept. 12, 1939. R. AMSLER 2,172,527

THERMOSTATIC TEMPERATURE CONTROLLING MEANS

Filed June 19, 1936

Fig. 1.

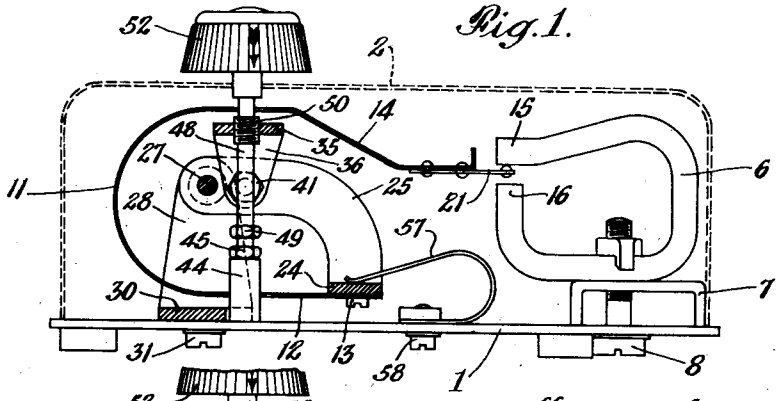


Fig. 2.

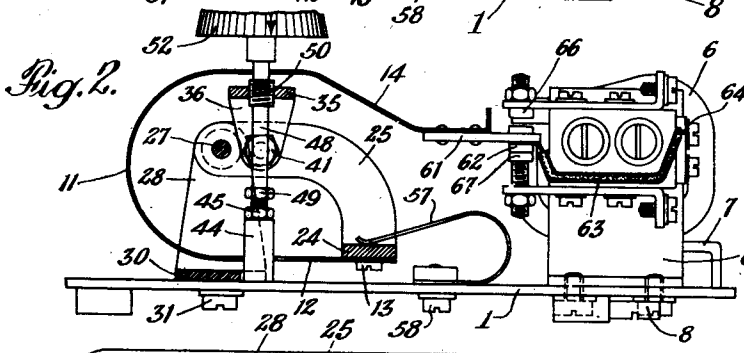
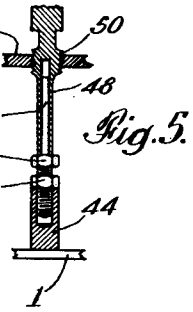


Fig. 5.



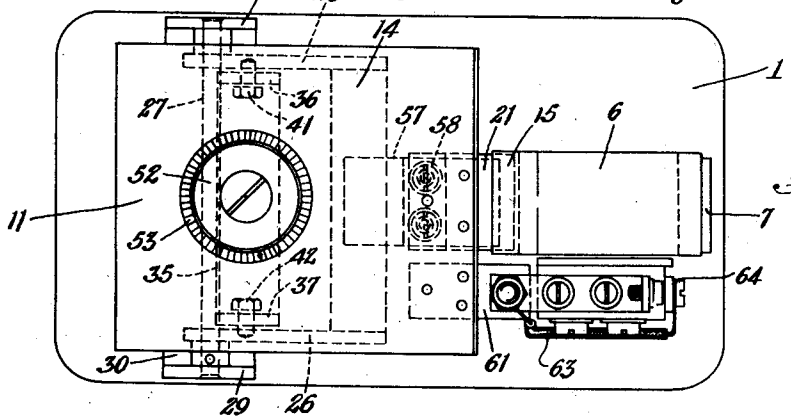
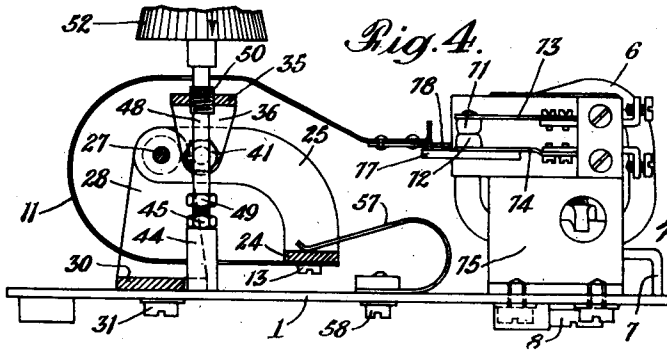


Fig. 3.

Fig. 4.



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THERMOSTATIC TEMPERATURE CONTROLLING MEANS

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3 Claims. (Cl. 200—139)

The invention relates to new and useful improvements in thermostatic controlling devices and more especially to such improvements especially adapted to control electrical circuits carrying relatively large amounts of energy.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates one embodiment of the invention, and together with the description, serve to explain the principles of the invention.

Of the drawing:

Fig. 1 is a side elevation of a mechanism embodying the invention but omitting any circuit controlling devices;

Fig. 2 is a view similar to Fig. 1 and showing also a reversing switch operated by the thermostatic device;

Fig. 3 is a plan view corresponding to Fig. 2;

Fig. 4 is an elevation showing the thermostat controlling a circuit opening and closing device; and

Fig. 5 is a sectional fragmentary detail.

Objects of the invention are to provide a thermostatic control, for use as a room temperature regulator or otherwise, which is simple, strong, inexpensive and reliable, and which possesses high sensitivity; and has the capability of controlling large currents; to provide in such a mechanism a bi-metallic element which has relatively a great area of exposure to the atmosphere as compared to its mass, and has resultantly relatively small thermal inertia and also great stiffness of the bi-metallic strip on a free limb thereof, thereby rendering available a relatively large force or power to operate the switch.

As preferably embodied, the invention is applied to that type of mechanism wherein a permanent magnet is employed to furnish at least a portion of the energy for actuating the switch, or other circuit or temperature controlling device; that is, a magnetically attracted member is carried by the bi-metallic strip and is maintained at one pole of the magnet, and the temperature induced movement of the strip begins to move the member across the gap and from a median point in the movement the other pole of the magnet imparts a quick and relative powerful movement to the magnetically attracted member, and effects most or all of the circuit changing movement, as the initial movement of the member across the gap may be idle so far as the switch actuation is concerned. Referring now in detail to the embodiment of the invention illustrated by way of example in the accompanying drawing, the mechanism is mounted on the back or frame plate 1, and is enclosed within a casing 2. Mounted within the casing is a permanent magnet 6 held in position on a bracket 7, mounted on the frame plate 1, by means of a screw bolt 8. The thermostatic element consists of a bi-metallic strip or sheet 11 which is of very great width as compared to its thickness, as will be seen from comparison of Fig. 3 with the other figures. The sheet 11 as embodied is bent in a general U-shape or hook shape, and comprises a relatively short arm 12 which is fixed at its end to a support by suitable means such as screws 13. The other arm 14 of the bi-metallic sheet 11 is much longer and terminates adjacent to the poles 15 and 16 of the permanent magnet 6. Fixed to the end of the free arm 14 of the bi-metallic sheet is a magnetically attracted member 21, such as an iron plate, and this magnetically attracted member is located between the poles 15 and 16 of the magnet 6.

The means for setting the mechanism for a desired temperature comprises devices for placing the bi-metallic sheet 11 under initial spring stress so as to resist to a predeterminable degree the movement of the sheet due to certain temperature changes. As embodied, the support for the end of the short arm 12 of the mi-metallic sheet 11 comprises a cross bar 24, to which said arm is fastened by the screws 13. At either end thereof the bar 14 is formed into curved outwardly extending arms 25 and 26, which arms at their ends are mounted pivotally on a rod 27. The rod 27 is mounted in arms 28 and 29 integral with and extending outwardly from a plate 30, which is attached to the frame plate 1 by screws 31. The shaft 27 is approximately in a plane passing between the poles of the magnet and perpendicular to its field. The embodied means for variably positioning the support for the thermostatic element comprises a bar 35 having right angled arms 36 and 37 extending outwardly at either end thereof, and the arms are pivotally connected at their outer ends to median points on the arms 25 and 26 by suitable means, such as pivot screws 41 and 42.

Screw-threaded means are provided, engaged with the bar 35, to impose the desired or predetermined spring pressure on the thermostatic

member. As embodied, a rod 43 is screw-threaded into a stud 44 fixed to and projecting from the frame plate 1. A lock nut 45 holds the rod 43 in adjusted position. Enclosing the rod 43 is a hollow sleeve 48, the lower end of which rests upon a nut 49, likewise screw-threaded on the rod 43, and constituting an adjustable support for the sleeve 48. Sleeve 48 has an enlarged, externally screw-threaded cylindrical portion 50, which has screw-threaded engagement with the cross bar 35. The member 48 extends through an opening in the casing 2, and on the outside a knob or turning handle 52 is fixed to the outer end of member 48. The temperature-indicating means comprises a scale 53 on the casing 2, and an arrow or other indicator 54 on the knob cooperating therewith. By turning the knob 52 the bar 35 may be either raised or lowered so as to swing the support 24 for the bi-metallic strip around its axis 27, thereby placing initial spring tension on the magnetically attracted member 21 located in the air gap of the magnet and thereby varying the degree of pressure exerted by the member 21 against the magnet pole. If desired, a suitable spring 57 may be used to prevent loose motion or back lash and a curved spring 57 is shown fastened at 58 to the frame plate 1 with its free end bearing on the bar 24 and exerting pressure oppositely to the support or pull of the member 48.

The circuit controlling means moved or governed by the bi-metallic sheet may be of various forms. As shown in Figs. 2 and 3, a circuit or pole reversing device is provided, in which an insulated plate 61 is fixed to the free end of the arm 14 of the bi-metallic sheet alongside the plate 21. This insulated plate carries a conducting contact piece or pin 62, to which is attached one end of a circuit wire 63, fixed at its other end to a circuit terminal 64, carried on the bracket 65, which is supported on the frame plate 1. The contact piece 62 is moved by the bi-metallic sheet between pole pieces 66 and 67, and by passing from contact with one into contact with the other reverses the circuit. In Fig. 4 a circuit opening and closing device is shown, and comprises two spring contact pieces 71 and 72 impelled together in circuit closing position by their springs 73 and 74, which are mounted on a support 75, carried by the frame plate 1. Fixed to the spring arm 74 is a plate 77 of insulating material which extends into the pathway of a contact piece 78, which is fixed on and extends from the end of the free arm 14 of the bi-metallic sheet alongside the plate 21. Through the temperature controlled movement of the arm 14, the piece 78 moves plate 77, and the circuit is opened and closed at the contacts 71 and 72, and the preliminary movement of piece 78 across the gap may be idle, and it can engage plate 77 only when the magnetic pull is exerted on it. The two forms of circuit controlling means are illustrative and as such are not a part of the invention, as the thermosatic control may be applied to other controlling means of known or suitable form, such as multiple reversing and make and break switches as well as other forms may be employed.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. A thermostatic device comprising a generally U-shaped bimetallic sheet, having a short arm and a long arm, circuit making and breaking means cooperating with the free end of the long arm, variably positionable means for holding the short arm in a normally fixed, but variably settable position, said bimetallic sheet being of great breadth, but very thin, for presenting a very large, heat-exchanging surface for contact with the surrounding air, such sheet having a low thermal inertia whereby it is very sensitive to temperature changes, the great breadth of the sheet also providing a strong effective force at the free end of the long arm for operating said circuit making and breaking means.

2. The combination as claimed in claim 1, said variably positionable means including a bar extending transversely across and secured to the short arm of the sheet at the end thereof, a pair of arms secured to the respective ends of said bar and extending toward the bight of the U-shaped sheet, means for pivotally supporting the ends of said arms, and manually settable means for variably positioning and holding said arms in any desired adjusted position.

3. The combination as claimed in claim 1, wherein the width of the bimetallic sheet is approximately one-third of its total length.

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