July 10, 1934. P. F. SHIVERS 1,966,106

MAGNET THERMOSTAT

Filed April 23, 1931

Fig. 1.

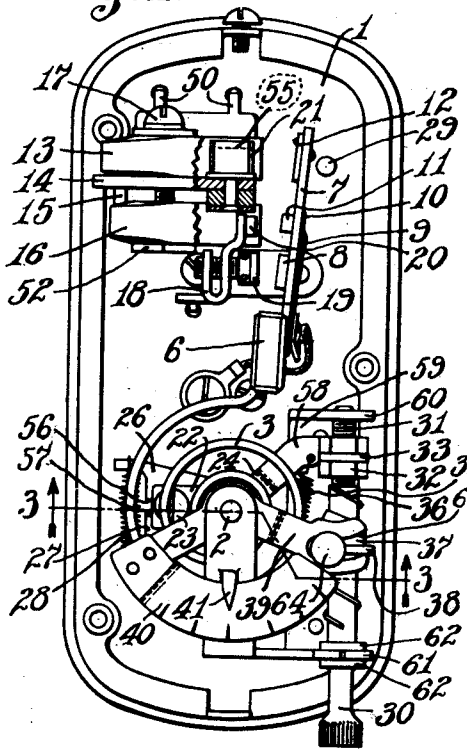


Fig. 2.

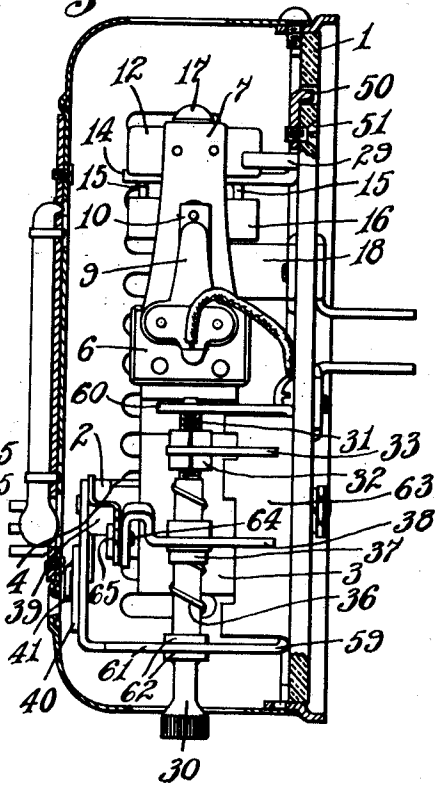


Fig. 3.

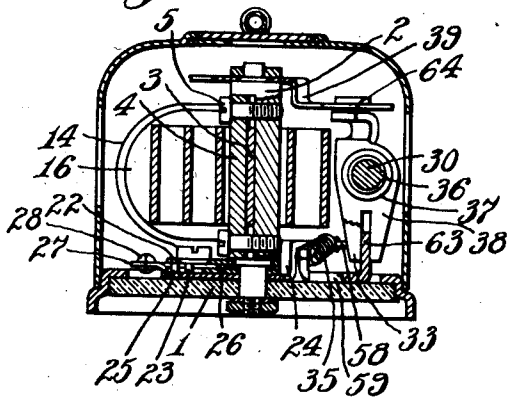
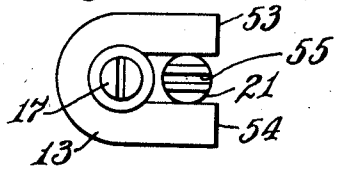


Fig. 4.



Inventor

Paul F. Shivers,

By Hood & Hahn.

Attorneys

Patented July 10, 1934 1,966,106

UNITED STATES PATENT OFFICE

1,966,106

MAGNET THERMOSTAT

Paul F. Shivers, Wabash, Ind., assignor to Minneapolis-Honeywell Regulator Company, Wabash, Ind., a corporation of Delaware

Application April 23, 1931, Serial No. 532,139

5 Claims. (Cl. 200—139)

The present application relates to that type of thermostat wherein a magnet is provided for cooperation with an armature carried by the thermostatic element adjacent the free end thereof for effecting a snap action of said thermostatic element in making and breaking the controlled circuits. In this type of instrument, the same magnet may be utilized, or a second magnet may be provided, for blowing out the arc which occurs upon breaking of the contacts.

The objects of the invention are to improve the operation and adjustment of thermostats of this general type. A more specific understanding of the objects will be obtained as the description proceeds.

To the accomplishment of the above and related objects, my invention may be embodied in the form illustrated in the accompanying drawing, attention being called to the fact, however, that the drawing is illustrative only, and that change may be made in the specific construction illustrated and described, so long as the scope of the appended claims is not violated.

Fig. 1 is a front elevation of a device constructed in accordance with my invention;

Fig. 2 is a longitudinal section therethrough;

Fig. 3 is a horizontal section taken substantially upon the line 3—3 of Fig. 1 and looking in the direction of the arrows; and

Fig. 4 is a top plan view of a detail.

Referring more particularly to the drawing, it will be seen that I have illustrated an instrument comprising a base 1 of bakelite, or other similar insulating material, in which is mounted for oscillation a spindle 2. The spindle 2 is formed with a flat side to which is clamped one end of a bi-metallic thermostatic strip 3, a clamping plate 4 cooperating with said strip end and being secured to the spindle 2 by means of screws 5, or the like.

The thermostatic strip 3 is, according to usual practice, formed with a helical portion, and the free end thereof carries a block 6 of insulating material to which is secured a contact carrying arm 7. The main contact element 8 is secured to said arm 7 at a point intermediate the ends thereof. The arm 7 likewise carries a pair of spring fingers 9 and 10, the finger 10 carrying adjacent its extremity a supplemental contact element 11, said element extending through an aperture suitably formed in the arm 7.

Adjacent its free end, the arm 7 carries an armature 12 of magnetic material, and it may be here noted that the arm 7, contact 8, spring fingers 9 and 10, and contact 11 are all formed of non-magnetic material. A permanent magnet, which preferably takes the form of the usual horseshoe 13, is mounted upon a bracket 14 suitably secured, as by ears 50 and screws 51, to the base 1. The bracket 14 is preferably provided with a plurality of downwardly extending lugs 15 against the under surface of which may be secured a second magnet 16, a bolt 17 and nut 52 clamping the two magnets 13 and 16 to the bracket 14. The bracket 14, and the bolt and nut 17 and 52 are preferably formed of non-magnetic material.

A non-magnetic bracket 18 suitably secured to the base 1 adjustably carries a contact element 19 for cooperation with the contact element 8, and likewise carries a second contact element 20 for cooperation with the contact element 11, it being understood that the contact element 11 makes contact with the element 20 before the element 8 contacts the element 19, and that contact between the elements 11 and 20 is not broken until after the contact between the elements 8 and 19 is broken, so that any arcing takes place between the elements 11 and 20, and under the influence of the magnet 16.

Referring more particularly to Fig. 4, it will be seen that an element 21 is positioned between the poles 53 and 54 of the magnet 13. The element 21 is formed of magnetic material and is mounted in the bracket 14 for oscillation about a vertical axis. That portion of the element 21 which is positioned within the air gap between the poles 53 and 54 is substantially rectangular in cross section, and said element is preferably provided with a kerf 55 whereby said element may be oscillated. It will be obvious that, as the element 21 is oscillated from the illustrated position, the effective air gap between the poles 53 and 54 is reduced, thus reducing the effect of the magnet 13 on the armature 12. This adjustment permits a very delicate adjustment of the magnetic differential of the instrument.

A crank arm 22 is secured to the spindle 2 adjacent the base 1 and carries a pin 23. A lever 24 is pivotally mounted for oscillation about the axis of the spindle 2, and said lever carries a pin 25 adjacent the pin 23 and parallel therewith. A pair of scissor arms 26 and 27 are mounted for oscillation about the axis of the spindle 2, and a spring 28 connects the free ends of said arms, urging said ends toward each other, and urging the adjacent edges 56 and 57 of said arms into contact with opposite faces of both pins 23 and 25. The lever 24 is provided with a finger 58 to which is connected a spring 35 urging said lever

toward rotation in a clockwise direction as viewed in Fig. 1. It will be seen that the elements 23 to 28 inclusive comprise a strain release mechanism, the function of which is to prevent damage to the parts in case of continued movement of some of the parts after the arm 7 has come into contact with the contact element 19 on the one side or with the stop pin 29 on the other side.

A bracket 59 is mounted upon the base 1, said bracket being formed with an upper ear 60 and with a lower ear 61 parallel therewith. A spindle 30 has its lower end journalled in the ear 61, and is held against reciprocation therein by collars 62, said spindle having its upper end journalled in the ear 60. Adjacent its upper end, the spindle 30 is formed with a short pitch thread 31. A nut 32 is mounted on said threaded portion 31, and an arm 33 is connected to said nut. The arm 33, adjacent its free end, is bifurcated to straddle a flange 63 which may be formed as a part of the bracket 59, whereby said arm 33, and consequently said nut 32, are held against rotation with the spindle 30. The finger 58 of the lever 24 bears upon the upper surface of the arm 33, and it will be obvious that reciprocation of the arm 33 in response to rotation of the spindle 30 will result in corresponding movement of the lever 24.

The lower portion of the spindle 30 is formed with a long pitch thread 36, the thread 36 being, in the illustrated embodiment, of the opposite hand with respect to the thread 31. A nut 37 cooperates with the thread 36 and has secured thereto an arm 38. One end of the arm 38 is bifurcated to straddle the flange 63, and the opposite end of said arm carries a pin 64 received in a slot 65 formed in an arm 39 integral with or connected to, a graduated sector 40, said sector being mounted for oscillation about the axis of the spindle 2, and cooperating with a stationary indicator 41.

As will be obvious, rotation of the spindle 30 in a clockwise direction as viewed from the bottom will result in downward movement of the nut 32 and arm 33 to effect clockwise movement of the lever 24, crank 22, and spindle 2; and will result also in upward movement of the nut 37 and arm 38, and in counter clockwise oscillation of the arm 39 and scale 40. It will also be obvious that the degree of movement of the graduated scale 40 will be greater than, but directly proportional to, the degree of movement of the spindle 2. Of course it is highly advantageous, in an instrument of this type, in which very slight movements of the spindle 2 are desired, to provide for movement in a much larger degree, but in direct proportion thereto, of the indicating device, whereby it becomes possible to use relatively large graduations on the indicating device, and whereby the movement of the graduated device is clearly apparent to the operator.

I claim as my invention:

1. In combination, an oscillable member, means for indicating the position of said member, said means being movable with respect to said member, a spindle, a short-pitch thread formed on a portion of said spindle, a nut threaded thereon, means coupling said nut to said member and holding said nut against rotation, whereby reciprocation of said nut results from rotation of said spindle and results in oscillation of said member, a long-pitch thread formed on a portion of said spindle, a nut threaded thereon, and means coupling said last-named nut to said indicating means and holding said last-named nut against rotation, whereby reciprocation of said last-named nut results from rotation of said spindle and results in oscillation of said indicating means in greater degree, but in direct proportion to such oscillation of said member.

2. In combination, an oscillable member, means for indicating the position of said member, said means being movable with respect to said member, a spindle, a short-pitch thread formed on a portion of said spindle, a nut threaded thereon, means coupling said nut to said member and holding said nut against rotation, whereby reciprocation of said nut results from rotation of said spindle and results in oscillation of said member, a long-pitch thread formed on a portion of said spindle, said long-pitch thread being of opposite hand with respect to said short-pitch thread, a nut threaded thereon, and means coupling said last-named nut to said indicating means and holding said last-named nut against rotation, whereby reciprocation of said last-named nut results from rotation of said spindle and results in oscillation of said indicating means in greater degree, but in direct proportion to such oscillation of said member.

3. In combination, an oscillable member, means for indicating the position of said member, said means being movable with respect to said member, a spindle, a short-pitch thread formed on a portion of said spindle, a nut threaded thereon, an arm connected to said nut and holding said nut against rotation, strain release means coupling said arm to said member, whereby reciprocation of said nut results from rotation of said spindle and results in oscillation of said member, a long-pitch thread formed on a portion of said spindle, a nut threaded thereon, and means coupling said last-named nut to said indicating means and holding said last-named nut against rotation, whereby reciprocation of said last-named nut results from rotation of said spindle and results in oscillation of said indicating means in greater degree, but in direct proportion to such oscillation of said member.

4. In combination, a thermo-responsive element, a contact carried adjacent one end of said element, a stationary contact associated with said first-named contact, an oscillable member, said element having its opposite end anchored to said member, means for indicating the position of said member, said means being movable with respect to said member, a spindle, a short-pitch thread formed on a portion of said spindle, a nut threaded thereon, an arm connected to said nut and holding said nut against rotation, strain release means coupling said arm to said member, whereby reciprocation of said nut results from rotation of said spindle and results in oscillation of said member, a long-pitch thread formed on a portion of said spindle, a nut threaded thereon, and means coupling said last-named nut to said indicating means and holding said last-named nut against rotation, whereby reciprocation of said last-named nut results from rotation of said spindle and results in oscillation of said indicating means in greater degree, but in direct proportion to such oscillation of said member.

5. In combination, a thermo-responsive element, a contact carried adjacent one end of said element, a stationary contact associated with said first-named contact, an oscillable member, said element having its opposite end anchored to said member, means for indicating the position of said member, said means being movable with respect to said member, a spindle, a short-pitch thread

formed on a portion of said spindle, a nut threaded thereon, an arm connected to said nut and holding said nut against rotation, a crank secured to said member, a pin projecting from a face of said crank, a lever mounted for oscillation about the axis of said member, a pin projecting from a face of said lever and parallel with said first pin, a pair of arms pivotally mounted at their one ends for oscillation about the axis of said member, means urging the free ends of said arms toward each other, and urging the adjacent edges of said respective arms into contact with opposite sides of said two pins, and a finger on said lever cooperating with and movable by said first-named arm.

PAUL F. SHIVERS.