April 23, 1929. H. R. LORANGER ET AL 1,709,944

THERMOSTAT

Filed June 2, 1924

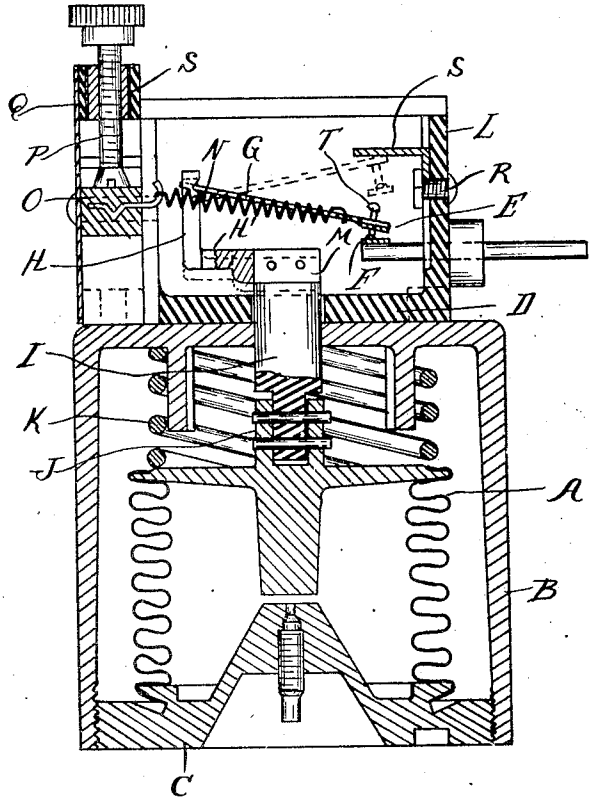


Fig. 1.

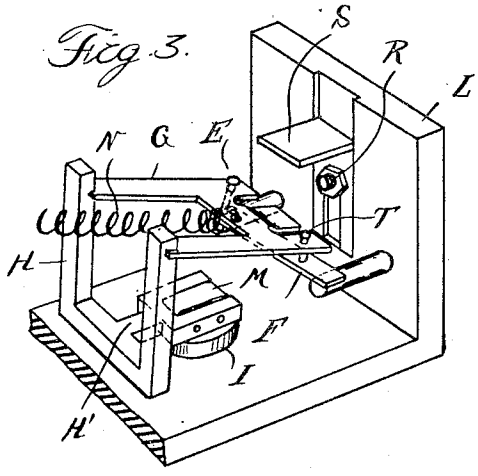


Fig. 3.

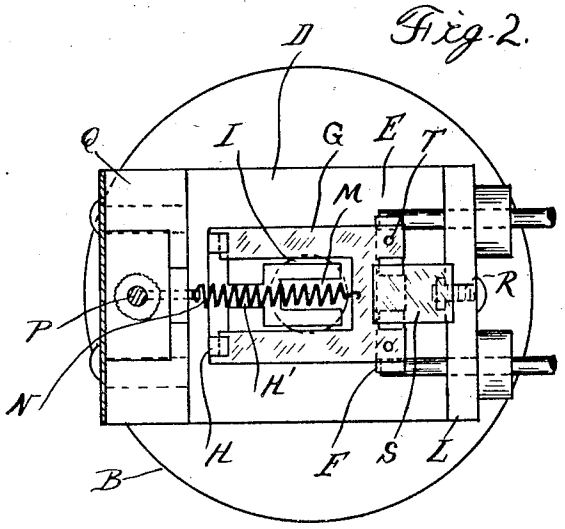


Fig. 2.

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UNITED STATES PATENT OFFICE.

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THERMOSTAT.

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The invention relates to thermostats more particularly designed for use in controlling the operation of motor driven refrigerating apparatus.

It is the object of the invention to obtain a construction which may be used with small installations, such as an ordinary household refrigerator, and which will maintain a substantially uniform temperature without over sensitiveness, which would cause too frequent starting and stopping of the motor. To this end the invention consists in the construction as hereinafter set forth.

Another object is to provide an improved form of thermostatically controlled switch together with means for regulating the response thereof to the controlling thermostat.

In the drawings:

Figure 1 is a vertical central section through the thermostat;

Figure 2 is a top plan view thereof;

Figure 3 is a perspective view of some of the operating parts.

Generally described our improved thermostat comprises a sealed expansible metallic chamber or bellows arranged within a housing and operatively connected with an electric switch or circuit closer mounted on the housing and controlling the motor circuit. The expansible chamber A is of the usual type containing a suitable fluid, the vapor tension of which causes the expansion and contraction of the chamber corresponding to temperature changes. The member A is housed within a casing B, preferably formed of a material of relatively high thermal conductivity, such for instance as aluminum, and the walls of this housing are of sufficient thickness to provide for the desired heat storage capacity. The capacity is such that fluctuation in the atmospheric temperature, due to the opening or closing of the refrigerator door, will not effect the thermostat, inasmuch as a lag is produced in the passage of heat through the housing walls.

The housing B is preferably in cup form having its lower end closed by a cap C, preferably having a threaded engagement therewith. Upon the housing B is mounted an electric switch of the following construction: D is an insulator plate on the top of the cap C. E are electric contacts projecting upward from the plate D, and F is a bridge contact member for forming electrical connection between the contacts E. The bridge F is loosely supported by a lever member G which is preferably bifurcated and has the ends of its furcations fulcrumed in a bifurcated member connected to a plunger I passing through a central aperture in the plate D and cap C. The plunger I is adjustably connected by a rod J with the expansible chamber A, which latter is resiliently held in place by a spring K thereabove within the housing B.

As specifically shown, the bifurcated member H is not rigidly attached to the plunger I, but is in the form of a lever having a laterally extending portion H′ above the plunger I fulcrumed to a post L between the contact members E. The portion H′ is connected to the plunger I by a pivotal link M, which translates any vertical movement of the plunger into a rocking movement of the lever H′ and the raising or lowering of the fulcrum for the lever member G. N is a spring arranged between the furcations of the lever G, being connected to said lever at its forward end and at its rear end to an adjustable anchor O, preferably engaging a screw P which is mounted in a bracket bearing Q upon the plate D. The arrangement is such that by adjusting the screw P, the anchor block O may be raised or lowered with respect to the fulcrum for the member G on the member H. Thus if the member O is below said fulcrum, the tension of the spring will cause a downward pressure on the lever G, thereby holding the bridge contact F against the contacts E. On the other hand, if the member O is above the fulcrum for the lever G, the tension of the spring will cause the upward movement of said lever G and the separation of the bridge contact F from the contact member E. The amount of this upward movement is limited by an adjustable stop R, preferably a screw which engages a strap or other frame member S mounted on the plate L and embracing the levers G and H′. The bridge member F is preferably attached to the member G by slidable headed pins T, which permit the bridge member to dwell upon the contacts after the lever G has started to rise.

With the construction as described the contacts E are suitably connected into the electric motor circuit (not shown) and the housing B is placed within the refrigerator, preferably resting directly on the top of the brine tank (not shown). In this position any

change of temperature in the brine will be communicated directly by conduction into the housing B and by radiation from the latter into the expansible chamber A. This will cause either the raising or the lowering of the plunger I, which, through the link M, will rock the lever H′ and raise or lower the fulcrum for the lever G. Whenever the temperature is sufficiently low, the plunger I and connected parts will be so positioned that the fulcrum of the lever G is below the anchor O, and consequently the tension of the spring N will hold the lever in its raised position against the stop R and will separate the bridge contact F from the contact members E. The upward movement of the plunger I, due to a rise in temperature, will not effect the closing of the switch until the fulcrum for the lever G rises above the anchor O, whereupon the spring N will cause a sudden downward movement of the lever G and the pressing of the bridge F against the contacts E. On the other hand, if the circuit is closed and the temperature is falling, this will produce a lowering of the plunger I and connected parts until the fulcrum for the lever G drops below the anchor O, at which time the tension of the spring N will cause a quick upward snapping of the lever G and the sudden removal of the bridge F from the contacts E, therefore avoiding arcing.

To set the device so as to operate at any desired temperature, it is only necessary to adjust the screw P, which, by raising or lowering the anchor O, will change the point at which the snapping of the lever G occurs. Also by adjusting the stop R, the degree of movement of said lever is controlled. Therefore, the regulation of the temperature becomes a very simple matter, while the construction of the switch is such that it will remain operative under all conditions of adjustment.

It will be noted that this adjustment of the switch is accomplished without in any way altering the tension of the spring K. The function of this spring K is to variably resist the expansion of the chamber A under the variable vapor pressures corresponding to temperature changes. This results in an exactly predetermined movement between high and low temperature points, which, however, would be changed with any variation in the tension of the spring. Therefore, one of the advantages of our construction is that the switch can be adjusted independently of the spring K so as not to disturb the normal functioning of the expansible chamber. This permits of more delicate adjustment of the switch and a greater accuracy in the governing action of the thermostat.

To avoid danger of injury to the thermostat through corrosion of parts, the entire assembly is formed of non-corrodible materials, such as brass, Monel metal, aluminum, nickel, silver, etc.

What we claim as our invention is:

1. In a thermostat, an electric switch comprising a stationary contact member, a stop spaced therefrom, a lever rockable between said contact and stop, a cooperating contact carried by said lever, a fulcrum for said lever, means actuated by thermal changes for raising or lowering said fulcrum, and tension means connected to said lever and extending in a plane which is crossed by said fulcrum during the movement thereof, whereby a snap movement of said lever between the contact and stop is effected.

2. In a thermostat, an electric switch comprising a contact member, a stop spaced therefrom, a lever rockable between said contact and stop, a cooperating contact carried by said lever, a fulcrum bearing for said lever, tension means connected to said lever, an anchor for said tension means adjustable to vary the plane of the latter between the limits of said contact member and stop, and thermally operated means for moving said fulcrum bearing to cross the plane of said tension means.

3. In a thermostat an electric switch comprising a contact member, an adjustable stop spaced therefrom, a bifurcated lever rockable between said contact member and stop, a cooperating contact carried by said lever, a tension device connected to said lever and extending between the furcation thereof, an anchor for said tension device adjustable between the limits of said contact and stop, a bifurcated fulcrum bearing for engaging the furcation of said lever, and means for thermally actuating said fulcrum bearing to move the same across the plane of said tension device.

4. In a thermostat an electric switch comprising a pair of spaced contact members, a bridge contact member for cooperating therewith, a lever carrying said bridge contact member, a stop for limiting the movement of said lever away from said contact members, a tension device connected to said lever, an anchor for said tension device adjustable between the limits of said stop and contact members, a fulcrum for said lever, and thermally operated means for moving said fulcrum across the plane of said tension device in various positions of adjustment of said anchor.

5. In a thermostat, an electric switch comprising a thermally operated member, a lever pivotally mounted upon said member, a contact engageable by said lever in one of its limiting positions, a coiled spring connected to said lever between its pivot and its free end, and extending substantially lengthwise thereof, and an anchorage member to which said spring is extended fixed with respect to travel of the thermally operated member.

6. In a thermostat, an electric switch comprising a thermally actuated member, a lever pivoted upon said member, a spring having one end engaged with said lever at a point intermediate the length thereof, an anchorage member for the other end of said spring, mounted independently of the thermally actuable member, and means for adjusting said anchorage member in substantial parallelism to the travel of the thermally actuable member.

7. In a thermostat, a thermally actuable member, a U shaped bracket carried by said member, a lever of substantially a U-shape having its spaced ends pivoted respectively upon the spaced ends of said bracket, a coiled spring secured to said lever within the central opening thereof, and extending through the central opening of said bracket, and an anchorage member for the other end of said spring, mounted independently of the travel of said thermally actuable member.

8. In a thermostat, a thermally actuable member, means for applying a predetermined resilient pressure opposing thermal actuation of said member, an electric switch comprising a lever operable by said member and pivotally mounted thereon, and means for regulating the responsive movement of said lever to said member without alteration of said member or resilient pressure.

9. In a thermostat, an electric switch comprising, a thermally operated member, a lever carried by said member, tension means for actuating said lever, and an anchor for said tension means adjustable in a plane substantially perpendicular to the plane of said tension means.

10. In a thermostat, an electric switch comprising a thermally operated member, a lever fulcrumed upon and operated by said thermally operated member, tension means for actuating said lever, an anchor for said tension means adjustable to vary the plane of the latter above or below the fulcrum for said lever.

In testimony whereof we affix our signatures.

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