Aug. 15, 1950 G. W. CRISE 2,519,025

HERMETICALLY SEALED THERMOSTATIC SWITCH

Filed March 29, 1946

Fig. 1.

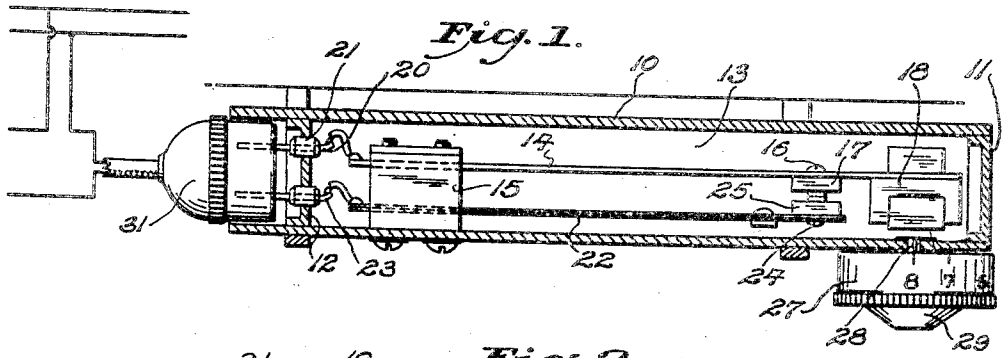


Fig. 2.

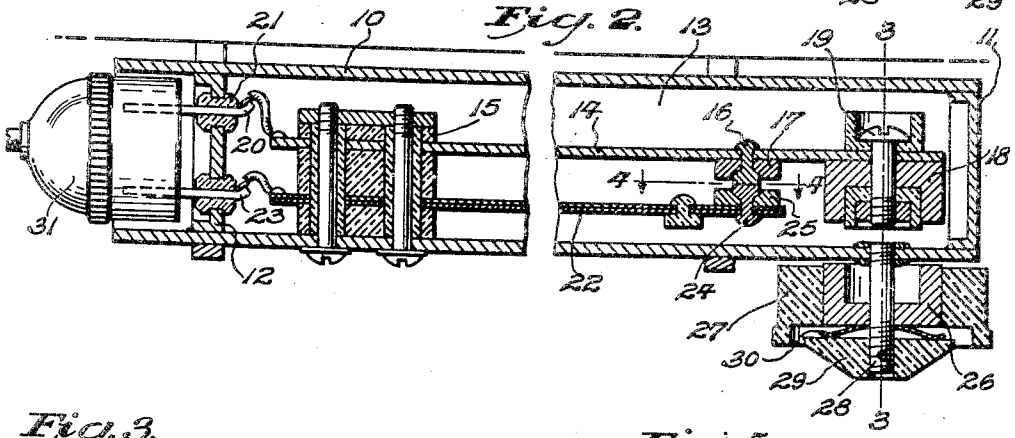


Fig. 3.

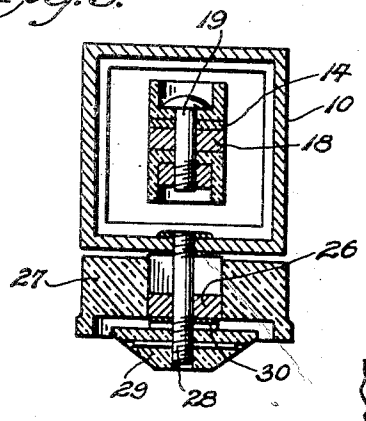


Fig. 5.

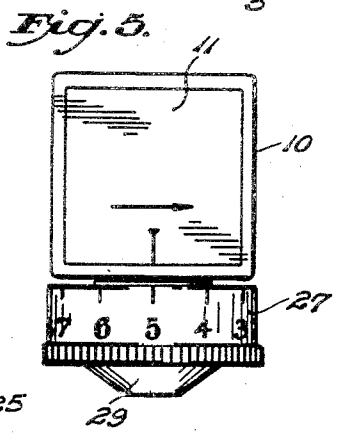
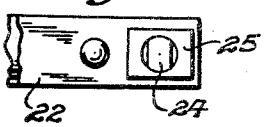


Fig. 4.



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HERMETICALLY SEALED THERMOSTATIC SWITCH

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8 Claims. (Cl. 200—138)

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My invention relates to thermostatic switches and, more particularly, to thermostatic switches of the type incorporating magnets as the adjusting means for varying the range of temperature control.

The general object of my invention is to provide a thermostat in which the circuit closure contact elements are hermetically sealed within a body of non-oxidizing gas to prevent oxidation or pitting of the elements, and to provide external manually operable means for varying the range of temperature control of such a mechanism.

It is another object of my invention to provide a thermostat, especially adapted for use with electrical refrigerators, which contains relatively few and simple movable parts, and which may be readily installed or removed from a refrigerator by simply attaching or detaching same from a single electrical circuit plug.

For a further understanding of my invention, reference is made to the following description and appended drawings, wherein:

Fig. 1 is a side elevational view, partially in vertical section, of my improved thermostat formed in accordance with the present invention.

Fig. 2 is an enlarged transverse sectional view thereof.

Fig. 3 is a vertical sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary elevational view taken along the line 4—4 of Fig. 2.

Fig. 5 is an end elevational view disclosing the manually operated dial of the thermostat.

With reference to the drawings, it will be seen that my improved thermostat embodies a tubular casing 10 which is filled with a non-oxidizing gas such as nitrogen or any of the so-called inert gases. The casing is enclosed by an outer end plate 11 and an inner end plate 12, said plates serving to hermetically seal the gas within the casing, thereby forming an internal chamber 13.

The thermostatic unit comprises a deflectable arm 14 held internally of the chamber by means of an insulated support 15. A contact point 16 is located on the deflectable arm 14 and serves to support a snap-action magnet 17. A fixed magnet 18 is attached to the outer end of the deflectable arm 14 by an insulated screw 19. The inner end of the deflectable arm is electrically connected, by means of a wire, to a plug prong 20 which extends externally of the chamber 13. The prong is supported by the inner end plate 12 and is insulated therefrom by a glass to metal air-tight seal 21.

A bimetallic element 22 is mounted on the insulating support 15 in the same manner as the deflectable arm and is substantially adjacent thereto. The bimetallic element is connected with a plug prong 23 in the same manner as the connection between the deflectable arm is accomplished. Another contact point 24 having a snap-action magnet 25 is situated at the outer end of the element 22 in registration with the like contact point 16. The bimetallic element 22 is situated so that heat will tend to deflect same in an upward manner.

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Located externally of the chamber 13, and in registration with the fixed magnet 18, is a manually rotatable magnet 26, this magnet being rigidly held within a circular dial 27 and is rotatably supported by a fixed shaft 28 having a flanged head 29. A leaf spring 30 is interposed between the flanged head and the rotatable magnet so as to apply friction to the rotation of the dial 27.

The purpose of the snap-action magnets disposed on the two contact points is to produce a fixed temperature differential and to magnetically dampen an electrical arc between the points. The magnetic attraction of the magnets having their opposite poles adjacent produces an accelerated movement of the contact points into and out of engagement.

It will be noted that the action between the rotatable magnet 26 and the fixed magnet 18 is such as produces either an attraction or a repulsion between the two. Thus it will be manifest that a maximum degree of attraction will be had when the opposite poles of the magnets are exactly adjacent to one another, and a maximum degree of repulsion may be had when the like poles are adjacent one another, and varying degrees of attraction and repulsion may be accomplished by the rotation of the dial 27. Thus by placing the rotatable magnet in a position such that its poles are adjacent to the opposite poles of the fixed magnet, the spacing between the contact points will be decreased. Conversely, as the rotatable magnet occupies a position with its poles adjacent to the like poles of the fixed magnet, the deflectable arm and its attached contact point will be moved away from the bimetallic element and its associated contact point, thus increasing the spacing between the contact points and raising the operating emperature of the thermostat.

As shown in Figs. 1 and 2 of the drawings, the plug prongs 20 and 23 are adapted to be inserted within an electrical plug 31 which may be connected with the compressor motor of a refrigerator, not shown. Thus it will be seen that only

this simple attachment is necessary for the operation of the thermostat.

In view of the foregoing, it will be seen that my invention provides a hermetically sealed thermostat adapted for use with refrigerators. However, it will be manifest that with simple modifications within the bimetallic member, the thermostat may be adapted for use as a room thermostat or as a heating unit thermostat. It is my belief, that in providing means for hermetically sealing the contact mechanism of a thermostat the operating life of the contact points will be greatly increased. It will be seen that my invention provides means whereby the range of temperature control may readily be varied by a manually adjustable dial located externally of the sealed chamber. My invention is characterized by its few and structurally simple movable parts, its economy of manufacture, its ease of installation, and its utility.

By the expression "snap-action" as used herein, I refer to the condition whereby when magnets are mounted on free-acting springs and gradually brought together, the increasing attraction of the magnets builds up faster than the increasing resistance of the springs, until a point is reached at which the magnets suddenly rush together in an accelerated manner. Also, in the separation of magnets so mounted, the condition wherein the greatest pull or force is required when the magnets occupy their positions of closest relative proximity, so that once the magnets start to separate, they move apart suddenly, as a result of the spring tension stored in the spring mountings of the magnets.

While I have disclosed what I now deem to be a preferred form of my invention, it will be manifest that changes in design and various adaptations may be later accomplished without departing from the scope of the following claims.

I claim:

1. A thermostat comprising a casing having a closed chamber sealed to the atmosphere, a flexible bimetallic arm arranged in said chamber, a circuit contact and a permanent magnet mounted on said arm, a second flexible member mounted in said casing in spaced relationship to said bimetallic arm, a second contact and a second permanent magnet mounted on said flexible member in cooperative relation with said first-named contact and magnet, a third permanent magnet mounted on said flexible member, a fourth permanent magnet mounted outside the casing in magnetic relationship to said third magnet, and a support carried by said casing on which said fourth magnet is axially rotatable, rotational adjustment of said fourth magnet providing an attracting or repulsing magnetic field relationship between said third and fourth magnets.

2. In a hermetically sealed thermostatic switch; a sealed container; a switching structure sealed in said container, said switching structure comprising a resiliently flexible member and a thermally deflectible member carrying thereon relatively engageable circuit contacts; a bipolar permanent magnet carried on said resiliently flexible member in closely spaced relation to a wall of said container; a second bipolar permanent magnet disposed exteriorly of said container in closely spaced magnetic relation to said first-named magnet; and manually operable means mounting said second magnet on said container for pole to pole alignment with said first-named magnet and for rotation in a plane parallel to the poles of said first-named magnet, said second magnet being movable with said last-named means to selectively impart attraction or repulsion forces to said first-named magnet.

3. In a hermetically sealed thermostatic switch; a sealed container; a switching structure sealed in said container, said switching structure comprising a resiliently flexible member and a thermally deflectible member carrying thereon relatively engageable circuit contacts; a bipolar permanent magnet carried on said resiliently flexible member in closely spaced relation to a wall of said container; a second bipolar permanent magnet disposed exteriorly of said container; and manually operable means mounting said second magnet on said container for pole to pole alignment with said first-named magnet and for rotation in a plane parallel to the poles of said first-named magnet, said last-named means including means to indicate the relative position of the poles of said second magnet with respect to the poles of said first-named magnet.

4. In a hermetically sealed thermostatic switch; a sealed container; a plurality of relatively movable switch members sealed in said container and having circuit contacts thereon arranged for relative engagement, one of said members comprising a thermally deflectible element; a permanent bipolar magnet carried by one of said members within said container and having its poles disposed in closely spaced relation to one of the interior walls of said container; and a second permanent bipolar magnet mounted on said container exteriorly thereof for rotation in a plane parallel to a plane joining the pole faces of said first-named magnet, said second magnet being rotatable between positions providing for pole to pole alignment of the like poles of both of said magnets and for pole to pole alignment of the opposite poles of said magnets.

5. A hermetically sealed thermostat comprising a casing having a closed chamber sealed to the atmosphere; a thermally deflectible bimetallic arm arranged in said chamber; a circuit contact carried on said arm; a first permanent magnet carried on said arm and around said contact; a resiliently flexible arm arranged in said chamber in parallel relation to said bimetallic arm; a second circuit contact carried on said flexible arm in cooperative relation to said first-named contact; a second permanent magnet carried on said flexible arm around said second contact and in pole to pole alignment with said first-named magnet; a third bipolar permanent magnet carried on one of said arms and having the poles thereof disposed in closely spaced relation to a wall of said casing; a fourth bipolar permanent magnet arranged exteriorly of said casing; and means mounting said fourth magnet on said casing for pole to pole alignment with said third magnet and for rotation in a plane parallel to the poles of said third magnet, whereby the poles of said fourth magnet may be brought into alignment with either the like or unlike poles of said third magnet.

6. A hermetically sealed thermostat comprising a casing having a closed chamber sealed to the atmosphere; a thermally deflectible bimetallic arm arranged in said chamber; a circuit contact carried on said arm; a first permanent magnet carried on said arm and around said contact; a resiliently flexible arm arranged in said chamber in parallel relation to said bimetallic arm; a second circuit contact carried on said flexible arm in cooperative relation to said first-named

contact; a second permanent magnet carried on said flexible arm around said second contact and in pole to pole alignment with said first-named magnet; a third bipolar permanent magnet carried on one of said arms and having the poles thereof disposed in closely spaced relation to a wall of said casing; a fourth bipolar permanent magnet arranged exteriorly of said casing; and means mounting said fourth magnet on said casing for pole to pole alignment with said third magnet and for rotation in a plane parallel to the poles of said third magnet, whereby the poles of said fourth magnet may be brought into alignment with either the like or unlike poles of said third magnet, said last-named means including a calibrated scale for indicating the relative position of said third and fourth magnets.

7. In a hermetically sealed thermostatic switch; a casing provided with an internal chamber sealed to the atmosphere; a switch carried within the chamber of said casing and comprising a pair of relatively engageable circuit contacts, thermally-responsive means for moving one of said contacts upon change of ambient temperature and resiliently movable means connected with one of said contacts and operable to move the same independently of said thermally-responsive means; a permanent bipolar magnet carried on said resiliently movable means within the chamber of said casing; and a second permanent bipolar magnet rotatably mounted on said casing exteriorly of said chamber in closely spaced magnetic relation to said first-named magnet for constantly exerting magnetic forces upon said first-named magnet and thereby to influence the positions of said contacts independently of said thermally-responsive means.

8. In a hermetically sealed thermostatic switch; a casing provided with an internal chamber sealed to the atmosphere; a pair of relatively movable and engageable circuit contacts carried in the chamber of said casing; thermally-responsive means in said chamber connected with one of said contacts for moving the latter relative to the other of said contacts upon changes in ambient temperature; bipolar magnetic means carried within the chamber of said casing and connected with one of said contacts for moving the latter relative to the other of said contacts in response to the influence of a magnetic field; and a permanent bipolar magnet mounted on said casing exteriorly of said chamber in closely spaced magnetic relation to said bipolar magnetic means and selectively movable relative thereto for imparting attraction or repulsion forces to said bipolar magnetic means and thereby to cause relative movement between said contacts independently of said thermally-responsive means.

GEORGE W. CRISE.

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