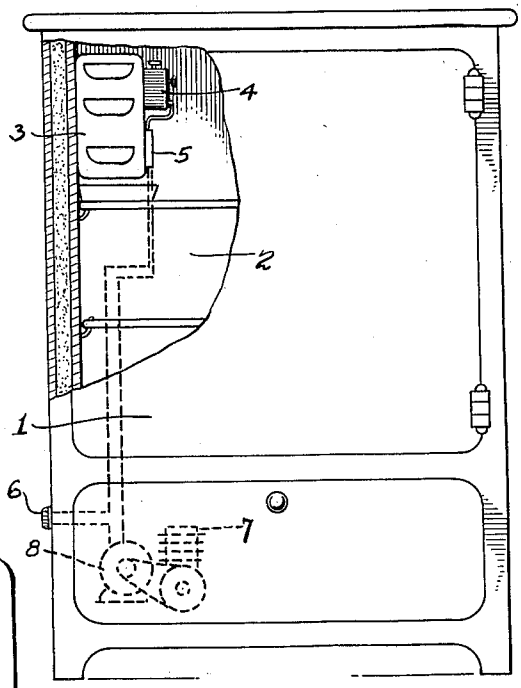
Nov. 7, 1933. L. E. BAUER 1,933,580

DEFROSTING OF MECHANICAL REFRIGERATORS

Filed March 10, 1932

Fig. 1.



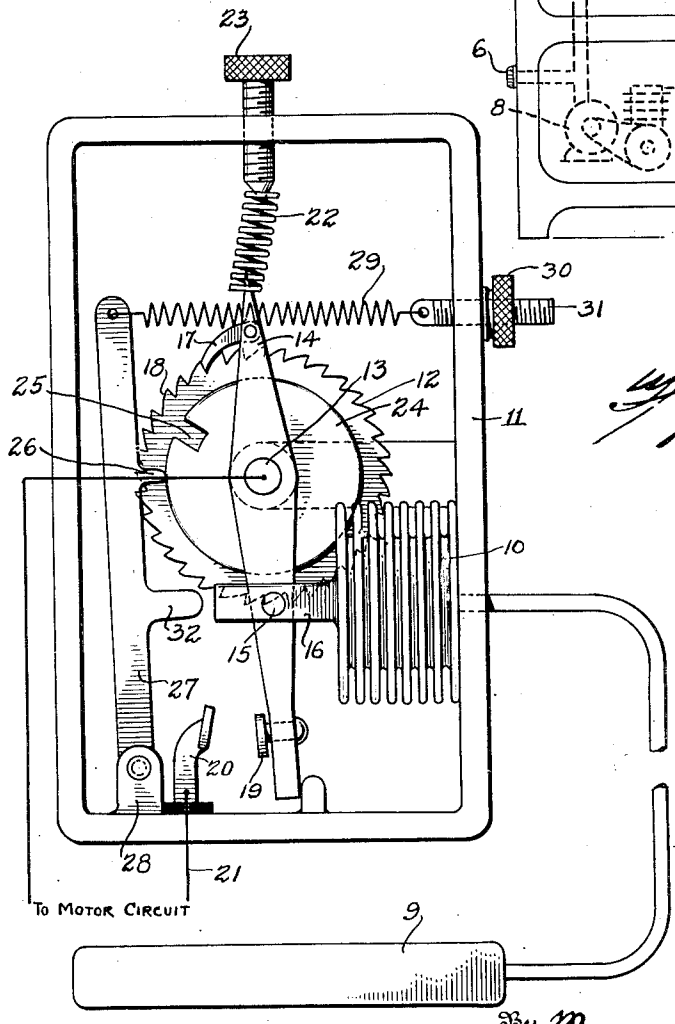


Fig. 2.

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DEFROSTING OF MECHANICAL REFRIGERATORS

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9 Claims. (Cl. 62—4)

This invention relates to the defrosting of mechanical refrigerators.

In apparatus of this type the temperature of the refrigerated chamber is kept within the desired range by thermostatic control of the circuit of the motor which runs the compressor, the thermostat starting the motor when the temperature reaches the height of its range and stopping the motor when the temperature has been reduced to its low limit. By the time the compressor has operated a plurality of times, from one to two weeks, for example, the coils of the refrigerator will have accumulated an insulating layer of frost. This is generally removed by pulling the plug which feeds current to the motor so that the compressor remains inoperative for a period of several hours, the refrigerated chamber warming up until the frost is melted. If one forgets to re-establish the motor circuit at the end of this period, the food chamber of course, warms to the outside temperature and the foods stored therein may begin to spoil. On the other hand, since the public has been educated to regard electrical appliances as being entirely automatic, and supplanting the need for any personal attention, defrosting is apt to be neglected until the coils become so insulated as decidedly to impair the refrigerative efficiency of the apparatus.

The object of the present invention is to provide for automatic defrosting after a definite number of operations of the compressor.

More specifically, the object of the invention is the provision of means movable step by step responsive to successive operations of the compressor, and after cumulative movement of said means has taken place, corresponding to a predetermined number of operations of the compressor, means are automatically actuated for inhibiting further operation of the compressor for a defrosting period, after which the apparatus is freed from the domination of the inhibiting means and restored to its normal step by step cycle synchronous with the successive operations of the compressor.

A further object of the invention is the provision of an expansive thermostat responsive to temperature conditions in the refrigerated chamber, for periodically closing the motor circuit of the compressor at every heat peak of temperature of the refrigerated chamber, and simultaneously actuating an element which, in a certain position cumulatively reached after a predetermined number of actuations, imposes additional pressure on the thermostat which prevents its expanding to the degree necessary to close the motor circuit until the refrigerated chamber has remained warm long enough to melt the frost on the coils.

Other objects of the invention will appear as the following description of a preferred and practical embodiment thereof proceeds.

In the drawing which accompanies and forms a part of the specification, and throughout which the several figures designate identical parts:

Figure 1 is a front elevation partly in section of a mechanical refrigerator embodying the principles of the present invention; and

Figure 2 is a front elevation of the device of the present invention.

Referring now in detail to the several figures, the numeral 1 represents a mechanical refrigerator having the food chamber 2 and the refrigerated coil 3. The defrosting device is shown at 4 including a thermostat 5 exposed to the atmosphere of the refrigerated chamber, the defrosting device being connected by circuit wires shown in broken lines with the motor 8 which runs the compressor 7 and with the power line represented by the socket 6.

Figure 2 shows the details of construction of the defrosting device including an expansive thermostat, the capsule 9 of which contains a volatile liquid, the gas from which expands in the sylphon 10, the latter being secured to the frame 11 which supports the elements of the device. A ratchet wheel 12 is mounted on a horizontal shaft 13, and on said shaft is freely mounted a lever 14 pivotally secured as at 15 to a stem 16 secured to and extending from the sylphon 10. A pawl 17 is pivotally secured to the opposite end of the lever 14 and engages the teeth 18 on the ratchet wheel 12.

A grounded switch contact 19 is carried by the lower end of the lever 14 which cooperates with an insulated terminal 20. The terminal 20 is connected by the wire 21 with one side of the motor circuit while any part of the metal of the defrosting device, for example, the shaft 13 may be connected to the other side of the motor circuit. Thus when the switch contacts are in engagement, the motor circuit is closed.

It will be understood each time the temperature of the air in the refrigerated chamber rises to the point at which the compressor should begin to operate, the fluid within the capsule 9 will have expanded, producing a pressure in the sylphon expanding the same and rocking the lever 14 in a clockwise direction until the switch contacts 19 and 20 come together, and the pawl 17 falls be-

tween adjacent teeth of the ratchet wheel. The motor circuit being thus closed, the compressor 7 operates, cooling the refrigerated chamber down to the point at which the compressor should stop working. At this point, the condensation of the fluid within the thermostat will have contracted the sylphon 10 so as to separate the switch contacts 19 and 20 whereupon the motor which operates the compressor will cease. As the lever 14 rocks in a circuit opening direction, the pawl 17 pushes against the abrupt face of the ratchet tooth which it contacts, and rotates the ratchet wheel through an arc equal to the length of one of the ratchet teeth.

In order to insure a quick and positive opening of the circuit and a positive actuation of the ratchet wheel 12, the upper end of the lever 14 is preferably provided with a spring 22 which snaps it over dead center in either direction. The tension of this spring 22 can be adjusted by means of the thumb screw 23.

The ratchet wheel 12 is provided on one face with a disk 24 having a depression 25 formed at one point in its periphery. This depression is arranged to receive a projection 26 formed on an auxiliary lever 27 pivotally mounted in a lug 28 on the base of the frame 11. The auxiliary lever is normally biased in a direction toward the sylphon by means of the spring 29, the tension of which can be adjusted by means of a nut 30 on a screw 31 slidably mounted in the frame and to which one end of the spring 29 is anchored.

The auxiliary lever 27 is provided with a projection 32 adapted to push against the stem 16 with the pressure of the spring 29 when the support which the disk 24 affords to the projection 26 is removed by said last named projection entering the depression 25 in said disk.

In operation, the ratchet wheel 12 carrying the disk 24 advances a distance equal to the distance of one tooth for each operation of the thermostat, and corresponds to each operation of the compressor. When the ratchet wheel has made one complete revolution, the depression 25 comes into registry with the projection 26 of the auxiliary lever so that the latter falls forward under the pull of the spring 29 bringing the projection 32 against the stem 16 of the sylphon imposing the pressure of the spring 29 against said sylphon and resisting its expansion to circuit closing position. The motor circuit therefore, will not be closed until the refrigerated chamber has remained warm long enough to induce a pressure in the sylphon sufficient to overcome the additional pressure of the spring 29 and to bring the circuit contacts together. This period is assumed to be sufficiently long for all of the frost to be melted from the coils 3 and the length of said period may be accurately adjusted, to suit the frost conditions by creating greater or less tension in the spring 29 through the thumb nut 30.

At the termination of the defrosting period when the expansion of the sylphon has overcome the pressure of the spring 29, the stem 16 of the sylphon forces back the auxiliary lever 27 releasing the projection 26 from the depression 25 and closing the circuit contacts 19 and 20. This leaves the ratchet wheel 12 free to resume its step by step rotation just as soon as the refrigerated chamber has cooled off sufficiently to condense the gas within the thermostat.

It is obvious that it is more or less immaterial at what point in the refrigerated chamber the defrosting device of the present invention shall be located and that no especial structural provision need be made in the refrigerator for its reception but that it may be readily installed in any refrigerator by simply disconnecting the wires of the motor circuit from the existing thermostatic control and connecting them to the circuit terminals provided by the contacts 19 and 20 in the present device.

It is also to be understood that the details of construction as shown and described, and the specific mechanical movements employed in the embodiment of the invention as illustrated and described, are merely by way of example, and not to be construed as limiting the scope of the invention as claimed.

What I claim is:

1. Thermostatic controlling device comprising a thermostat and a switch closed by the movement of said thermostat, and means independent of the operative connection between said thermostat and switch for opposing resistance to the circuit closing movement of said thermostat responsive to the cumulative effect of a definite plurality of completed circuit closing movements of said thermostat.

2. Thermostat controlling device comprising a thermostat having a range of movement responsive to progressive temperature variation, and a switch closed by the movement of said thermostat, means independent of the operative connection between said thermostat and switch for opposing resistance to the circuit closing movement of said thermostat at an intermediate point in its range of movement, responsive to the cumulative effect of a definite plurality of completed switch closing movements of said thermostat, the value of such resistance being such as to be overcome by said thermostat within the range of its movement.

3. Defrosting device for mechanical refrigerators of the compressor type comprising a thermostat having a range of movement responsive to temperature variations in a refrigerated chamber, and a switch closed by the movement of said thermostat adapted to be intercalated in the circuit of a compressor operating motor, means independent of the operative connection between said thermostat and switch for opposing resistance to the circuit closing movement of said thermostat at an intermediate point in its range of movement, responsive to the cumulative effect of a definite plurality of completed switch closing movement of said thermostat for prolonging the open period of said switch, the value of such resistance being such as to be overcome by said thermostat within the range of its movement.

4. Defrosting device for mechanical refrigerators of the compressor type comprising a thermostat having a range of movement responsive to temperature variations in the refrigerated chamber and a switch closed by the movement of an element of said thermostat, said switch being adapted to be intercalated in the circuit of the motor which runs the compressor, means independent of the operative connection between said thermostat and switch for opposing resistance to the switch closing movement of said thermostat at an intermediate point in its range of movement responsive to the cumulative effect of a definite plurality of completed switch closing movements of said element, the value of such resistance being such as to be overcome by said element within the range of its movement.

5. Defrosting device for mechanical refrigerators of the compressor type comprising a thermostat

including a sylphon diaphragm, having a range of movement responsive to pressure variations in the refrigerated chamber, a switch having one of the contacts thereof operatively associated with said sylphon diaphragm for closing said switch upon expansion of said diaphragm, said switch being adapted to be intercalated in the circuit of the motor which runs the compressor, a lever independent of the operative connection between said thermostat and switch having a portion thereof adapted to engage said sylphon diaphragm in a direction to oppose its expansion, said lever being normally out of engagement with said diaphragm, and means responsive to the cumulative effect of a definite plurality of completed switch closing movements of said diaphragm for actuating said lever to engage said diaphragm at an intermediate point in its range of expansion, for inhibiting the closing of said switch, the value of the resistance imposed upon said sylphon diaphragm by said lever being such as to be overcome by said sylphon diaphragm within the range of its further expansion.

6. Defrosting device for mechanical refrigerators of the compressor type comprising a thermostat adapted to respond to temperature variations in the refrigerated chamber including a sylphon diaphragm, a switch adapted to be intercalated in the circuit of the motor which runs the compressor, closed by the expansive movement of said sylphon diaphragm, a ratchet wheel mounted for uni-directional movement, having a plurality of teeth, a pivoted lever connected to said sylphon diaphragm and movable therewith, a pawl on said lever engaging the teeth of said ratchet wheel for advancing the latter a step for each operation of the compressor, an auxiliary lever engageable with said sylphon diaphragm at an intermediate point in its range of expansion, a spring for biasing said lever in a direction toward said sylphon diaphragm, means carried by said ratchet wheel normally holding said lever out of engagement with said sylphon diaphragm, said means being formed to release said lever after a predetermined angular advance of said ratchet wheel, permitting said lever to engage said sylphon diaphragm with the pressure of said spring, inhibiting the closing of said switch for a defrosting period, the value of said pressure being determined so as to be overcome at the end of the defrosting period by the pressure built up in said sylphon diaphragm.

7. Defrosting device as claimed in claim 6, the movable switch contact being carried by the pawl lever.

8. Defrosting device as claimed in claim 6, including a toggle spring for imparting snap action to said pawl lever.

9. Defrosting device as claimed in claim 6, including means for adjusting the tension of the spring which biases said auxiliary lever.

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