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1,999,191

DEFROSTING

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Fig. 1.

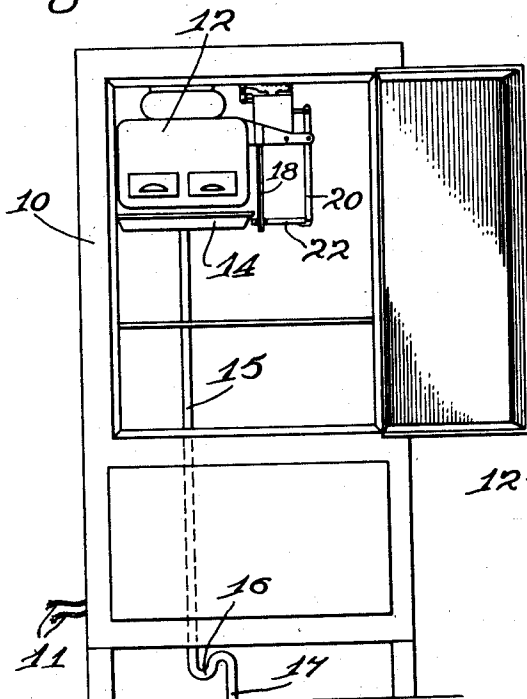


Fig. 2.

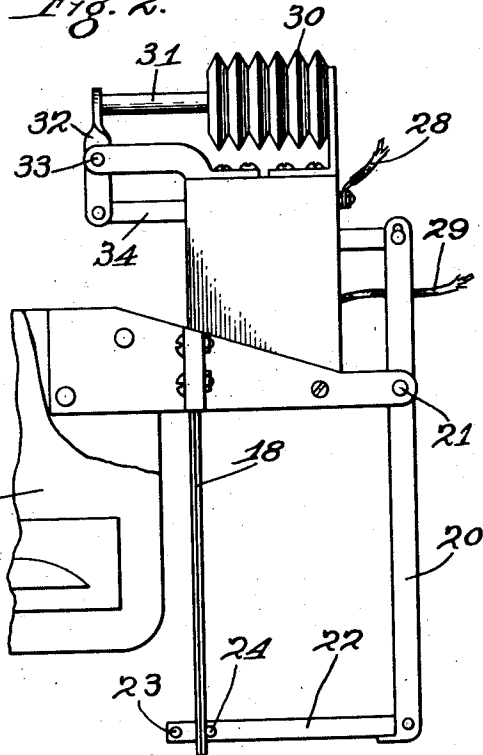


Fig. 3.

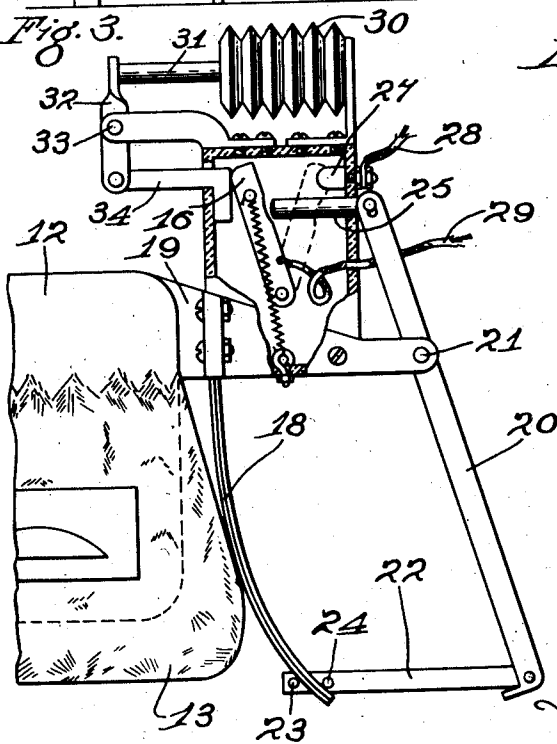
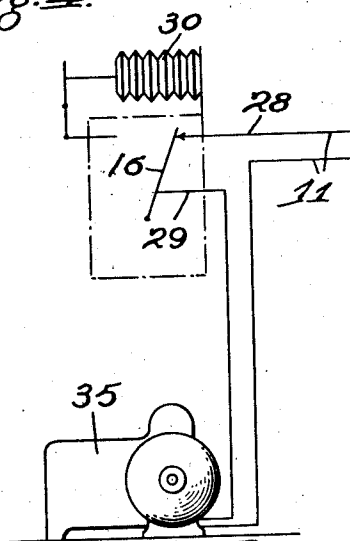


Fig. 4.



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DEFROSTING

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8 Claims. (Cl. 62-4)

This invention relates to improvements in defrosting mechanism and, more especially, such mechanism adapted for use in connection with power refrigerating apparatus. For example, the invention is adapted for use in connection with refrigerating apparatus operated by electrical power or such apparatus where the power is derived from heat, as from a gas flame, or where the apparatus is operated by mechanical power.

Power refrigerating apparatus, regardless of the kind of power used, is ordinarily provided with a chilling unit which may be a coil, tank, or any other body which is cooled and thus serves to cool the air in the cooling compartment of the refrigerating apparatus.

In apparatus of this kind, the chilling unit in cooling the surrounding air usually causes condensation of water on said unit, which condensation freezes. There is accordingly built up on the chilling unit a coating of ice which keeps getting thicker until it interferes with the proper operation of the apparatus. Heretofore, when this occurred, it has been the custom to shut off the power, permitting the apparatus to warm up until the coating of ice melts off of the chilling unit. This is commonly referred to as defrosting.

One of the features of my invention is the provision of mechanism for automatically defrosting the chilling unit whenever the coating of ice reaches a pre-determined thickness.

I have also provided means for automatically turning on the power after the defrosting is completed.

The invention disclosed herein is an improvement on that shown in my co-pending application, Serial No. 374,134, filed June 27, 1929.

In that form of device embodying the features of my invention shown in the accompanying drawing,—

Figure 1 is a view in front elevation of a refrigerator; Fig. 2 is a similar enlarged view of the defrosting mechanism; Fig. 3 is a view similar to Fig. 2 showing parts in section; and Fig. 4 is a diagrammatic view.

Since my invention may be embodied in a variety of forms, it seems best to state at the outset the general features thereof. Broadly speaking, it may be stated that I make use of the formation of the ice on the chilling unit to shut off the power. When the power is shut off, the ice melts. After the last of the ice is gone, there will be a rather rapid rise of temperature in the refrigerating compartment and I make use of this, operating through a suitable temperature-controlled member, to again turn on the power. In this manner,

the defrosting is effected automatically whenever the ice in the chilling unit reaches a pre-determined thickness. After the ice has all melted off and the defrosting is completed, the power is automatically turned on again.

There are several ways in which the thickening coat of ice may be utilized to shut off the power. Broadly speaking, my invention contemplates the use of a control member adjacent the chilling unit, said member adapted to be engaged by the coating of ice forming on the chilling unit when said coating reaches a pre-determined thickness. There is also a connection between the control member and the power for the refrigerating apparatus, and means of some kind operated by engagement of the ice coat with the control member for shutting off said power.

Merely by way of example, and in order to show some particular apparatus embodying my invention, I have shown certain apparatus in the accompanying drawing. I shall describe such apparatus now more in detail.

As shown in Fig. 1, 10 may indicate an automatic refrigerator, here shown as the type operated by electricity, current therefor being supplied through the wires 11, 11. Numeral 12 indicates the chilling unit in the refrigerator. This is here shown as being box-shaped and is of a type now in common use in small domestic refrigerators. The mechanism inside of the box need not be shown as this is well known in the art. It will suffice to say that the box 10 contains some suitable mechanism by which current supplied through the wires 11, 11 will keep the chilling unit 12 cold so that the air in the refrigerator 10 is kept cold. I am referring to apparatus of this kind, in which the chilling unit 12 is cold enough to freeze condensation of water on it so that there is built up on it an ice coating.

In Fig. 3, the chilling unit 12 is shown and the ice coating that builds up thereon in use is indicated by 13. The particular object of my invention is the provision of means for automatically shutting off the power when the ice coating 13 reaches a pre-determined thickness so that the apparatus will warm up and permit the ice coating to melt off of the chilling unit 12, thus defrosting the same. I preferably provide under the chilling unit 12 a drip pan 14 to receive the water from the ice cake 13 as it melts off. This water may escape from the pan 14 through the drain pipe 15 and I preferably provide thereon a suitable trap 16 to make a liquid seal in the pipe. The

end of the drain pipe 15, as indicated by 17, may lead to a sewer.

I shall now describe more in detail the mechanism for automatically defrosting the chilling unit 12, and point out the improvements over the mechanism shown in my co-pending application above referred to. In this case, I provide a control member adjacent the chilling unit adapted to be moved by contact or substantial contact of the ice with it; that is by the lowering of temperature when the ice touches it, or comes near it. The movement of the control member serves to shut off the power. It is to be noted, however, that even if the ice does not touch the control member, or, touching it, does not move it, the lowering of temperature in the vicinity of the control member by the approaching ice will shut off the power. In the case here shown, this shutting off of the power is effected by movement of the control member; but it is obvious that the real cause of the shutting off of the power is the lowering of temperature caused by the approaching ice. In the form here shown, the control member is indicated by 18 and the same is a bi-metallic strip adapted to be curved, as shown on Fig. 3, by a lowering of temperature. That is, at the ordinary temperature of the icebox, when the same is in use, but before there is any substantial amount of ice on the unit 12, the strip 18 may be substantially straight, as shown in Fig. 2. When the ice gets very close to it or even touches it, as shown in Fig. 3, the lower temperature caused by the proximity of the ice will cause the lever 18 to curve, as shown in Fig. 3. The lever is so arranged that a lowering of temperature causes it to curve away from the ice, as shown. Consequently, the ice will follow it as it thickens.

The upper end of the control member 18 is suitably supported in a bracket 19. Suitable mechanism is provided so that as the member 18 curves into the position shown in Fig. 3, it will shut off the power. This mechanism includes a lever 20 pivoted at 21 carrying a horizontal arm 22 provided with pins 23 and 24 between which the lower end of the bi-metallic control lever 18 lies. The upper end of the lever 20 is pivotally attached to a pin 25 adapted to engage a toggle switch lever 26. When the switch lever is in the dotted position shown in Fig. 3, it makes contact with the contact point 27, thus completing a circuit through the wires 28 and 29 which are a part of the power circuit, as shown in Fig. 4. When the bi-metallic member 18 bends into the position shown in Fig. 3 by the formation of ice, the lever 20 rocks to push the pin 25 against the switch arm 16 to throw it into the position shown by solid lines in Fig. 3, thus breaking the circuit and shutting off the power.

I may also provide means for automatically closing the switch after the defrosting has been completed. Such means, for example, may include a temperature-responsive element such as a diaphragm or siphon 30 with a projection 31 adapted to contact with the upper end of the lever 32 pivoted at 33. Rocking of the lever 32 will operate through the pin 34 to throw the switch 16 from its open position, as shown by the solid lines in Fig. 3, to its closed position, as shown by the dotted lines in Fig. 3. As long as there is any melting ice, the temperature in the refrigerator will remain relatively low. As soon as the last of the ice is gone, there will be a relatively rapid rise in temperature and the diaphragm or siphon 30 can be so adjusted that

shortly after this rapid rise commences, the same will expand to rock the lever 32 to close the switch 16.

There is a diagrammatic view of the wiring in Fig. 4, in which it will be seen that the power wires 11, 11 lead through the switch 16 on their way to the compressor and other refrigerating mechanism in the box. The details of this need not be shown, but all of this apparatus is indicated, in general, in Fig. 4 by the numeral 35.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as permissible, in view of the prior art. What I regard as new, and desire to secure by Letters Patent, is:

1. In an electrical refrigerator having an evaporator, means for circulating a refrigerant through the evaporator including a motor, a switch in the current supply line to said motor, a bracket carried by the evaporator, a housing for the switch carried by said bracket, a bimetallic member carried by the bracket adjacent the evaporator, means operatively connected with the free end of the bimetallic member and actuated thereby to open said switch, and a thermal responsive element mounted on said housing and operatively connected to the switch to close the same upon a rise in temperature.

2. In an electrical refrigerator, the combination with the evaporator of a bracket mounted on said evaporator, a switch housing carried by the bracket, a spring-tensioned switch member mounted in the housing, a line wire terminal carried by the housing for said spring-tensioned switch member and an electrical connection for said spring tensioned switch member, a bimetallic actuator for the switch adapted to open the same upon the occurrence of predetermined ice conditions at the evaporator, a thermal responsive element mounted on said housing and operatively connected with said spring-tensioned switch member to bring the same to a closed position upon a rise in temperature.

3. In an electrical refrigerator, an evaporator, motor driven means for circulating a refrigerant in the evaporator, defrosting means including a switch in the current supply line to said motor driven means, a bimetallic switch actuator spaced from the evaporator and directly exposed to the ice formation thereon to be energized by the propinquity of said ice formation to open said switch.

4. In an electrical refrigerator, an evaporator, motor driven means for circulating a refrigerant in the evaporator, and defrosting means for the evaporator including a switch in the current supply line to the motor, a bimetallic member mounted at one end in a fixed position with reference to the evaporator and having its free end directly exposed to and adapted to be energized by propinquity of the ice formation on the evaporator, a connection between said member and said switch, and a thermal-responsive element effective upon a rise in temperature to close said switch.

5. In an electrical refrigerator, an evaporator, motor driven means for circulating a refrigerant through the evaporator, and defrosting means for the evaporator including a switch in the cur-

rent supply line to said motor driven means, and control means for said switch; said control means including a temperature responsive actuator element for opening said switch, said element being located adjacent the evaporator whereby it may be energized by lowering of its temperature due to the proximity of ice forming on the evaporator, and said element being so arranged that movement resulting from its energization by the approaching ice will be away from the evaporator to insure full operating movement of the element.

6. In an electrical refrigerator, an evaporator, motor driven means for circulating a refrigerant through the evaporator, and defrosting means for the evaporator including a switch in the current supply line to said motor driven means, and control means for said switch; said control means including a temperature responsive actuator element for opening said switch, said element being located adjacent the evaporator whereby it may be energized by lowering of its temperature due to the proximity of ice forming on the evaporator, and said element being so arranged that movement resulting from its energization by the approaching ice will be away from the evaporator to insure full operating movement of the element; and thermal responsive means for returning the switch to closed position.

7. In an electrical refrigerator, an evaporator,

motor driven means for circulating a refrigerant through the evaporator, and defrosting means for the evaporator including a switch in the current supply line to said motor driven means, and control means for said switch; said control means including a temperature responsive actuator element for opening said switch, said element being located adjacent the evaporator whereby it may be energized by lowering of its temperature due to the proximity of ice forming on the evaporator, and said element being so arranged that movement resulting from its energization by the approaching ice will be away from the evaporator to insure full operating movement of the element; and thermal responsive means responsive solely to temperature conditions at the evaporator for returning the switch to closed position.

8. In a control for refrigerators having a cooling unit operated between predetermined temperature limits, means responsive to temperature changes adjacent the cooling unit for modifying one of said temperature limits to produce a temperature at the cooling unit above the melting point of ice to effect defrosting of the cooling unit, and a thermal bellows responsive solely to temperature conditions manifested adjacent the cooling unit to restore the same to operation within predetermined temperature limits after defrosting.

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