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REFRIGERATOR DEFROSTING DEVICE

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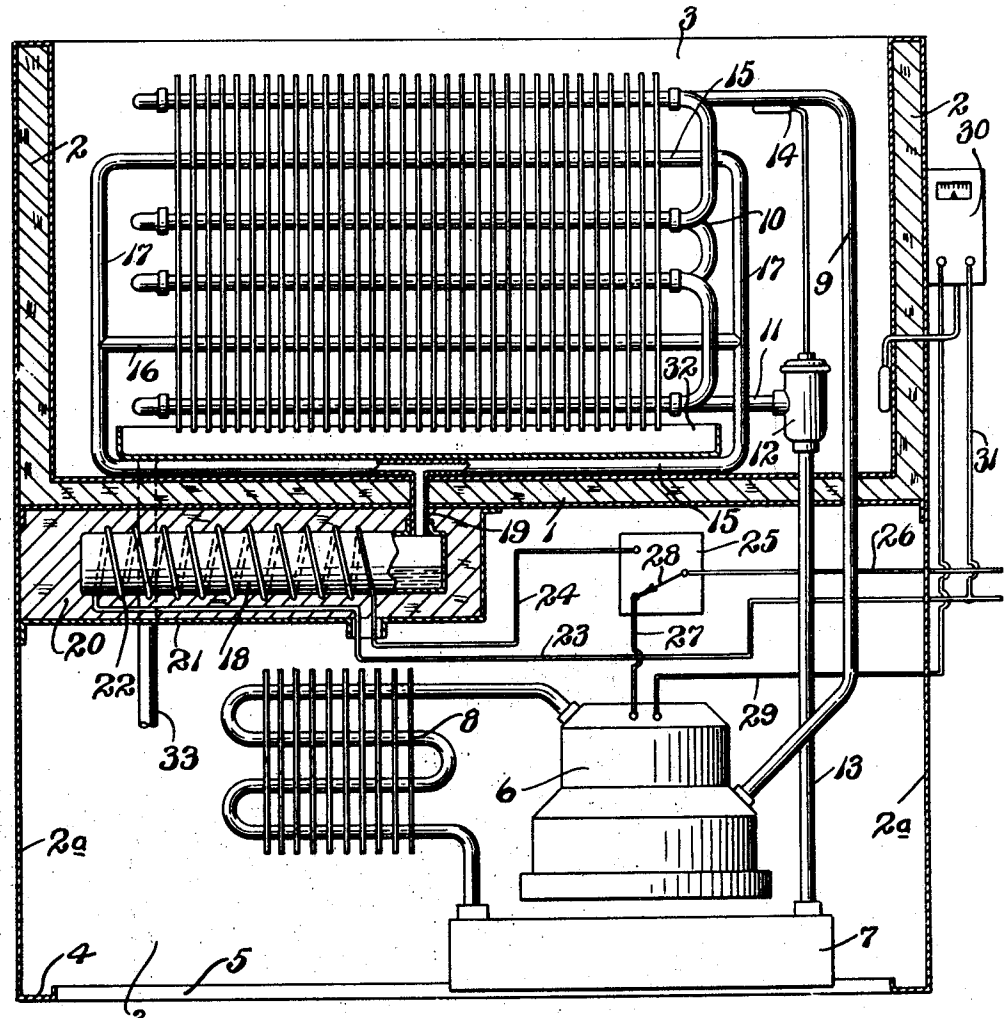

FIG. 1.

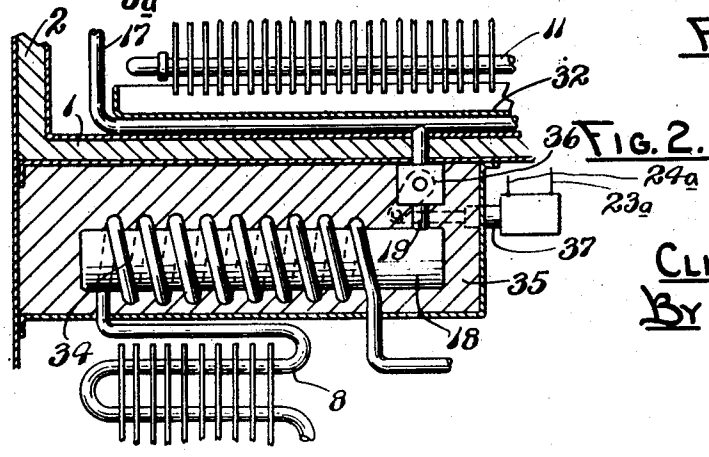

FIG. 2.

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REFRIGERATOR DEFROSTING DEVICE

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5 Claims. (Cl. 62—115)

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This invention is directed to a practical and novel mechanism for defrosting refrigerating coils at predetermined intervals. More broadly, it is directed to a novel structure of the type stated for effectively defrosting refrigerating coils either automatically or under the control of an operator. Such defrosting is desirable in open display self-service cabinets or cases where both the refrigerating coil and the merchandise are exposed to atmospheric conditions of temperature and humidity. Because of such conditions, a more rapid and heavier frost accumulation occurs than normally in many refrigerators, and it is very desirable that the accumulated frost be removed rapidly in order that the cabinet temperature shall not rise to a danger point before refrigeration again takes place.

With the usual conventional refrigeration the period of time of defrosting is dependent upon the length of time necessary for the coil temperature to rise above freezing, and also the time element involved in the duration of the frost or ice melting. This may allow temperatures to rise in a cabinet to a danger point such that discoloration or spoilage of stored merchandise results.

With my invention, two independent circuits are both charged with refrigerant, one of which serves for refrigerating the cabinet and the other for defrosting the refrigerating coil. Upon defrosting the refrigerating coil, the other or defrosting coil is supplied with a heat-carrying medium for transferring heat from the defrosting coil which melts and removes the accumulated frost and ice very rapidly. The process of defrosting may be started instantly at any time wanted through the manual control of a control switch for such purpose, and of course the switch may also be controlled to be operated either at predetermined intervals of time or on the attainment of other conditions relative to the cabinet and the refrigerating and defrosting coils therein.

An understanding of the invention may be had from the following description, taken in connection with the accompanying drawing, in which,

Fig. 1 is an elevation and partial section of the refrigerating and defrosting unit made in accordance with my invention, and

Fig. 2 is a fragmentary similar view showing another form or embodiment of the invention.

Like reference characters refer to like parts in the figures of the drawing.

The refrigerating coil and the defrosting coil in association therewith are shown as located above the horizontal bottom 1 of a compartment which has vertical spaced ends 2 and sides 3, also suitably insulated. The insulation material is within a metal covering therefor, and the outer sides of the metal covering are continued downwardly in ends 2a and sides 3a, with which is connected a bottom 4 having a relatively large opening therein surrounded by an upward extending short flange, as indicated at 5.

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The compressor 6 is located in the compartment below the described bottom 1 and below it is the receiver 7 of the refrigerating system. The compressed refrigerant is forced through a condenser coil 8 supplied with suitable heat radiating fins in the usual manner, so that the refrigerant under compression is forced into the receiver 7.

The refrigerant from the refrigerating coil or evaporator returns to the compressor through the pipe 9. It is connected with the refrigerating or evaporator coil 10 at one end. The other end pipe 11 of the evaporator coil is joined conventionally with the control valve within the housing 12 from which a pipe 13 leads to the receiver 7. The valve within the housing 12 is automatically operated in the usual manner in conjunction with the control at 14 conventionally shown.

The refrigerating unit thus far described is old, well known and conventional.

The defrosting coil is made of a plurality of horizontal pipes, upper and lower pipes 15 and an intermediate horizontal pipe 16, which are connected with vertical ends 17. Of course, more than one of the intermediate pipes 16 may be used. This forms a closed frame with a connecting pipe 16 between the ends into which fluid may be passed. Associated with the several pipes of the evaporator and the defrosting coil are the normal heat dissipating fins.

Below the bottom 1 a tank 18, shown as of elongated circular form, is located. It is connected at its upper side and at one end by a connecting pipe 19 with the lower side 15 of the defrosting coil. The tank is adapted to contain therein a refrigerant fluid which practically will be the same as that used in the refrigerating system. It is, however, to be understood that the invention is not essentially limited to the use of a refrigerant fluid in the tank 18. This tank is surrounded by heat insulating material 20, within the usual sheet metal covering shown at 21.

A heating coil 22 of wire resistant to the passage of electric current, is around the tank 18, at one end connected to one wire 23 of an electric circuit which supplies current. At the other end

it is connected to a wire 24 which is secured to a switch contact on a base 25. The second wire 26 of the electric circuit is connected to a suitable post on the base 25, and from a second contact on the base 25 a wire 27 leads to one side of the motor of the compressor 6. A movable switch 28 mounted on the post to which the wire 26 is connected may be moved between the two contacts at the ends of the wires 24 and 27. When said switch connects the wire 24 with the wire 26 an electric circuit is completed through the heating coil 22.

A wire 29 leads from the other side of the compressor motor to a temperature-controlling mechanism diagrammatically shown in 30 and is connected by the wire 31 to the first described circuit wire 23. Thus when the switch 28 is positioned as shown in Fig. 1, the motor of the compressor will operate upon its automatic starting in accordance with the control which is supplied at 30. The detail of this structure need not be entered into, as it is old and well known and is not novel in the present invention.

A water-collecting pan 32 is located over the lower pipe 15 of the defrosting coil and has a drain pipe at 33.

With this structure, when the switch at 28 is shown as in Fig. 1, the refrigerating system operates in the usual manner, being thermostatically controlled to maintain a desired temperature within a cabinet in which the refrigerating unit is located. Ice and frost from water vapor condensing upon the refrigerating coil accumulates in the usual manner.

When defrosting is to take place, the switch 28, moved either manually or through any suitable automatic arrangement, is swung to the position to connect the wires 24 and 26. This disconnects the motor of the compressor from receiving electric current. The heating coil warms the fluid within the tank 18 which vaporizes and fills all of the tubes 15, 16 and 17 of the defrosting coil, giving up heat to melt the frost and ice collected on it and on the evaporator coil, thus becoming reduced in temperature and returning as a liquid, but with a continuous supply of gaseous fluid at the higher temperature to which it has been raised by the heating coil 22. This maintains a continuous supply of heat and the frost and ice are rapidly melted and removed. As soon as the defrosting has been completed, the switch 28 is returned to its initial position for the operation of the refrigerating mechanism in the usual manner. The water from the melted ice and frost falls by gravity to the pan 32 and is carried away through the drain pipe 33. It is of course understood that the air within the defrosting coil and in the tank 18 has been exhausted.

In Fig. 2, the structure is modified by replacing the heating coil 22 with a pipe coil 34 made in the pipe leading from the compressor to the condenser 8. Such coil 34 is located around the tank 18 in substantially the same manner as the electric heating coil 22 and is surrounded by a heat storing material at 35, one example of which is paraffin.

The refrigerant passing through the condenser under compression from the compressor is at a relatively high temperature and will give up some of its heat to the paraffin or other heat storing medium 35. Therefore, the fluid within the tank 18 is at a relatively high temperature and must be kept from filling the defrosting coil except at the times wanted.

Accordingly, in the connecting pipe 19, a valve at 36 is mounted to close the passage through said pipe 19. This valve is closed at all times that the refrigerator is operating in its usual manner. The valve may be opened by the movement of the armature of a solenoid structure indicated at 37, having lead wires 23*a* and 24*a* carrying electric current in substantially the same manner as described in Fig. 1, a circuit being closed only when a main wire, as at 26, of the electric circuit is connected by movement of the switch 28 with the wire 24. When this occurs the valve at 36 is opened and the heat carrying fluid fills the defrosting coil pipes 15, 16 and 17 to melt the accumulated frost and ice in the same way.

The structure is very practical and useful, and not only is there rapid defrosting attained, but it is not necessarily interdependent upon the refrigerating conditions. Defrosting may be done rapidly at any time and all danger of discoloration or spoiling of merchandise within a display case avoided.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a refrigerating system including a compressor, condenser, receiver and evaporator, with conventional connections therebetween and with conventional control for rendering said refrigerating system periodically operative, of a defrosting unit located in heat exchange relationship to said evaporator, a container for a vaporizable liquid, a conduit connection between said container and the defrosting unit, means for applying heat to said container to vaporize liquid therewithin and to force vapor into said defrosting unit, and means for controlling the passage of said vapor to the defrosting unit contemporaneously with rendering the compressor of the refrigerating system inoperative.

2. In a structure of the class described, a refrigerating system including compressor, condenser, receiver, evaporator and connections therebetween, of a defrosting unit having a closed inner circuit for receiving vapor at an elevated temperature, said defrosting unit and evaporator being located in heat exchange relationship to each other, a container for a vaporizable liquid, a conduit connecting said container with the closed inner circuit of the defrosting unit, means for elevating the temperature of the liquid within said container located around and lengthwise of the container, and means for controlling the supplying of the elevated temperature vapor from said container to the defrosting unit contemporaneously with stopping operation of the compressor of the refrigerating system.

3. In a structure as described, a refrigerating system including compressor, condenser, receiver, an evaporator, and connections therebetween, of a defrosting coil of tubular structure having a lower tubular member and tubular connections therewith providing closed tubular connected passages, said defrosting unit being disposed in heat exchange relationship to the evaporator, an elongated container for a liquid vaporizable under heat located below the lower side of said defrosting unit, a conduit connection between the upper side of said container and the lower tubular member of the defrosting unit, and heating means coiled lengthwise of and around said container.

4. A construction as defined in claim 3, said heating means around the container comprising, wire resistant to the passage of electric current, the temperature of which is elevated by current passage therethrough, an electric circuit in which said wire is located, a switch therein for making and breaking the circuit, and said compressor being located in said circuit, operation of the switch to close the circuit for passage of current through said coil breaking the circuit for conducting current to said compressor, and closure of the circuit by said switch for the continuation of current to the compressor breaking the circuit to the electric coil around said container.

5. In a structure as described, a refrigerating evaporator upon which frost and ice are adapted to collect, a hollow defrosting unit in heat exchange proximity to said evaporator, a conduit connected with the defrosting unit at one end of said conduit, a container for a vaporizable liquid connected with the opposite end of the conduit, refrigeration means connected with said evaporator including, a compressor, condenser and receiver, said condenser including a pipe leading from the compressor to the receiver, said pipe in its length being coiled around said container, a heat storing medium surrounding said container and the coiled portion of the condenser pipe, and a movable valve in the conduit between the container and defrosting unit.

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