Feb. 11, 1941. H. P. KNORR 2,231,628

DEFROSTER

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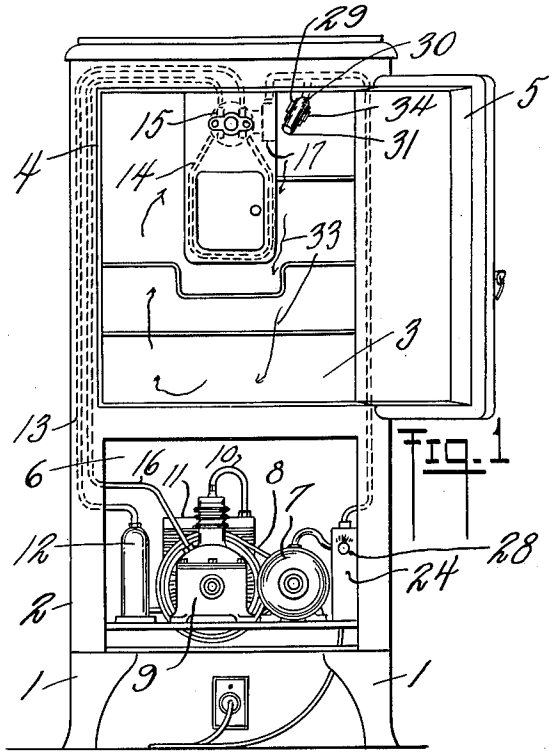

FIG. 1

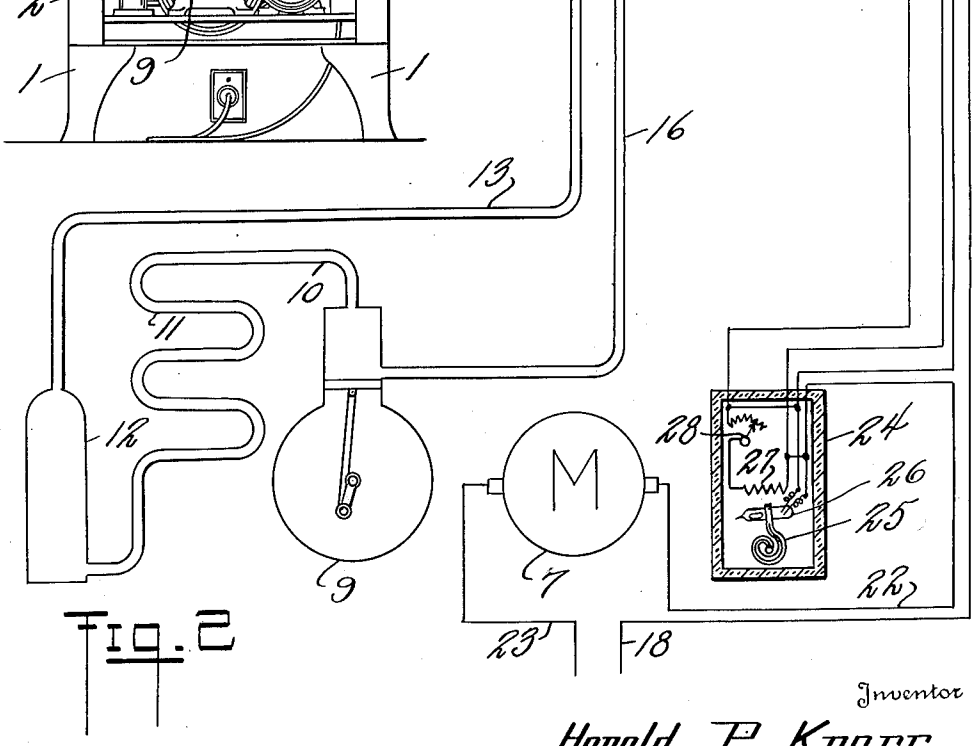

FIG. 2

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13 Claims. (Cl. 62—4)

This invention relates to efficiency in temperature control.

This invention has utility when incorporated with mechanical refrigeration, more especially providing periodically operating means for mantaining a defrosted condition of the cooling parts.

Referring to the drawing:

Fig. 1 is a view of an embodiment of the invention in a mechanical refrigeration set-up as of the household type; and

Fig. 2 is a diagram of the refrigeration circuit and control as embodied in Fig. 1 showing the fan in a different position.

Legs 1 support housing 2 having temperature controlled or refrigerated chamber 3 provided with front opening 4 to be closed by door 5, the whole forming an insulation jacketed structure. The housing 2 provides below the chamber 3, a compartment 6, in which is located electric motor 7 connected by belt 8 to pump or compressor 9. The compressor forces the refrigerating fluid through conduit 10 into condenser 11, where the refrigerant is liquefied. The liquid refrigerant passes into receiver 12 and then is forced through duct 13 to mechanically controlled temperature-affecting unit or evaporator 14, where the medium absorbs heat from the chamber 3 and then passes through fitting 15 and duct 16 back to the pump 9. This refrigerant may be sulphur dioxid, methyl chlorid, or other heat transfer effecting agent or refrigerant.

In the above mentioned temperature control adjacent the fitting 15 in the chamber 3 is primary thermostatic switch 17. Line 18 is connected by way of service switch 19 to contact 20. In closing, the switch 17 would complete a circuit from line 18 to motor 7 by way of lines 21, 22, were not the cycle determining means interposed therebetween. The power circuit for the motor 7 is completed by line 23.

The thermostatic switch 17 is effective to cut in and cut out the motor 7 at various intervals according to the temperature changes in the chamber 3. This intermittent operation is thus automatic and of varying duration according to the temperature conditions in the chamber 3. Water vapor from materials placed in chamber 3, and especially foodstuffs, usually finds its way to coil 14 and congeals thereon. The frosting or ice, as it accumulates, forms an insulating coating detracting from the efficiency of the coil 14 and accordingly of the refrigerant unit.

In carrying out the invention, there is provided automatic, periodically operating, defrosting means promoting air flow in a closed circuit in the chamber 3. To this end, desirably placed at some suitable location exterior of the chamber 3, there may be provided insulation housing or control chamber 24 having therein bimetallic operator or thermostatic control member 25 responsive to a rise in temperature to tilt mercury switch 26 as a supplemental control and thereby close circuit between the line 21 and the line 22. The operation of switch 26 does not in itself produce any heat. However, when the switch 17 is closed, resistance 27 is connected across the lines 21, 22, as a heating unit for the supplemental thermostat 25 to close the switch 26. This unit or element 27 may have a resistance of fifty ohms when used in the device herein disclosed, with manually adjustable rheostat 28 therefor to vary the timing and the control.

In parallel with this resistance unit 27 is low amperage motor 29 operating blower 30 having nozzle 31 directed to promote a current of air against the coil 14 and thence downwardly in the chamber 3, as indicated by arrows 33 in order that such air flow may be completed as a closed circuit by entering axial port 34 at the blower 31. It is thus seen there is a closed air circuit in chamber 3 with a gentle blast effected by operation of the motor 29 directed downwardly and across the unit 14, such air melting and effectively removing any accumulation of ice, frost, or moisture therefrom. The motor 29 is of such low rating as to amperes that while placed in series with the motor 7, its operating current will pass through the motor 7 without operating the motor 7 due to the greater current carrying switch 26 being opened in the interval when this motor 29 is effective. This switch 26 is closed at all times during the operation of the motor 7 of the refrigerating unit.

When the thermostatic switch 17 is closed, the cutting out of the motor 7 by switch 26 cuts in motor 29 and in parallel therewith, the heating unit 27. The heat produced by element 27, after an interval of fifteen or eighteen minutes, or after the expiration of any other predetermined interval, causes the element 25 to expand and swing the mercury switch 36 in a clockwise direction and complete the circuit through wires 21 and 22 to the compressor motor 7. The heater 27 will then be substantially by-passed and rendered practically inoperative.

If it should happen that switch 17 remains closed and the refrigerating apparatus must operate continuously for a period of two or two and a half hours, for instance, to maintain the chamber at a temperature falling within the

range of 42° F. to 48° F., sufficient heat will leak through the insulation to allow the element 25 to cool and swing the switch 26 counterclockwise, thereby breaking the circuit through wires 21 and 22. The current will then flow through coil 27 and reheat the thermostatic element 25 and cause the switch 26 to close once more. The position of the rheostat 28 determines the length of time consumed by element 27 in producing sufficient heat to move thermostatic element 25 and close switch 26. It is, therefore, obvious that the fact that switch 17 remains closed cannot prevent operation of the defrosting means beyond a predetermined period of continuous operation of the refrigerating apparatus.

Experience with domestic refrigerators, maintained with the temperature range above mentioned, shows that operation of blower 30 for a period of about fifteen to eighteen minutes to promote a relatively slow circulation along the path indicated by arrows 33, will melt the frost from the evaporator and cause the air to take up the resulting water vapor. This will substantially prevent dehumidification of foodstuffs, even leafy vegetables, which may be placed within the chamber 3.

What is claimed and it is desired to secure by United States Letters Patent is:

1. In a refrigerator, a mechanical temperature-affecting unit, a primary control therefor responsive to temperatures created by said unit, and a remote supplemental control therefor operable by temperatures independent of the temperatures created by said unit for periodically rendering the primary control effective, said supplemental control being arranged to respond to changes in temperature about the same falling within a predetermined range, means to heat the control to temperatures within said range and means to vary the time interval within which such heating is effected by the last mentioned means.

2. An electric refrigerator unit embodying an evaporator, a main motor, a thermostatic switch for the main motor responsive to temperatures of the evaporator, a circuit for the main motor, means for circulating air, a motor for said means, a circuit for the latter motor, a control arranged to respond to changes in temperature about the same falling within a predetermined range, means to heat the control to temperatures within said range and means to vary the time interval within which such heating is effected by the last mentioned means and thereby affect the functioning of the air circulating means.

3. An electrical refrigerator unit embodying an evaporator, a main motor, a primary thermostatic switch for the main motor responsive to temperatures of the evaporator, a circuit for the main motor including a thermostat, a chamber, means creating a range of temperatures in said chamber of another range than that of the evaporator, an evaporator defrosting fan having a motor, a circuit for said fan motor, and a switch controlled by the thermostat for rendering the fan motor operative while precluding operation of the main motor.

4. An electrical refrigerator unit embodying an evaporator, a main motor, a primary thermostatic switch for the main motor responsive to certain temperatures of the evaporator, a circuit for the main motor including a thermostat responsive to other temperatures, an evaporator defrosting fan having a motor, a circuit for said fan motor interconnected with the circuit for the main motor, and a switch controlled by the thermostat for cutting in the main motor and precluding operation of the fan motor.

5. An electrical refrigerator unit embodying an evaporator, a main motor, a primary thermostatic switch for the main motor responsive to certain temperatures of the evaporator, a circuit for the main motor including a thermostat responsive to other temperatures, an evaporator defrosting fan having a motor, a circuit for said fan motor interconnected with the circuit for the main motor, a switch controlled by the thermostat for cutting in the fan motor while precluding operation of the main motor, and a resistance in the fan motor circuit in parallel with the fan motor adapted to generate heat to act upon the thermostat.

6. An electrical refrigerator unit embodying an evaporator, a main motor, a primary thermostatic switch for the main motor responsive to one range of temperatures of the evaporator, an insulation chamber, a circuit for the main motor including a thermostat in said chamber responsive to another range of temperatures, an evaporator defrosting fan having a motor, a circuit for said fan motor interconnected with the circuit for the main motor, a switch controlled by the thermostat for rendering the fan motor operative while precluding operation of the main motor, and a resistance in the fan motor circuit in parallel with the fan motor in the chamber with the thermostat adapted to generate heat to act upon the thermostat.

7. In a refrigerator, a chamber, an evaporator therein, mechanical means for supplying a refrigerant to said evaporator, a primary control for said mechanical means, air flow promotion means for directing current of air toward said evaporator, and a supplemental control precluding operation of the air flow promotion means during operation of the mechanical means and embodying manually adjustable means for selectively limiting the length of time of operation of said mechanical means.

8. In a refrigerator, a chamber, an evaporator therein, mechanical means for supplying a refrigerant to said evaporator, a primary control for said mechanical means, a fan for promoting a closed circuit of air in the chamber about the evaporator, and a supplemental control rendering the fan periodically operative or inoperative and the mechanical means alternatively periodically operative and embodying manually adjustable means for selectively limiting the length of time of operation of said mechanical means.

9. A mechanical refrigeration unit including an evaporator, a chamber housing said evaporator, evaporator temperature reducing mechanism, fan means for intermittently forcing a current of air in said chamber toward the evaporator, an additional chamber, a temperature-affected control for said fan in said chamber embodying shiftable means for affecting the operation of the fan independently of any temperature conditions created by the evaporator.

10. A mechanical refrigeration unit including an evaporator, a chamber housing said evaporator, evaporator temperature reducing mechanism, fan means for intermittently forcing a current of air in said chamber about the evaporator, a circuit for said fan, a control chamber heat-insulated from the evaporator chamber, temperature-affecting means for said control chamber, and temperature-affected means in the fan

circuit in said control chamber for controlling fan operation.

11. In a refrigerator, an insulated cooling chamber, an evaporator therein, mechanical means for delivering refrigerant to said evaporator, an electric circuit adapted to control operation of said mechanical means, a thermostatic switch in said circuit adjacent the evaporator adapted to effect operation of the evaporator, a heat insulated control chamber having a thermostat therein, and a switch in said circuit operated by said thermostat and adapted to effect predetermined timed intervals for said operations.

12. In a mechanical refrigerator unit, a main motor, a circuit therefor including a thermostatic switch, in said circuit an additional switch, a resistance by-passing the additional switch, and a thermostat responsive to heat generated by said resistance to operate the additional switch.

13. In a mechanical refrigerator unit, a main motor, a circuit therefor including a thermostatic switch, in said circuit an additional switch, a resistance by-passing the additional switch, a thermostat responsive to heat generated by said resistance to operate the additional switch, and a fan motor in parallel with said resistance.

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