June 13, 1933. W. A. DOBLE, JR 1,913,433

DEFROSTER

Filed Nov. 16, 1931 3 Sheets-Sheet 1

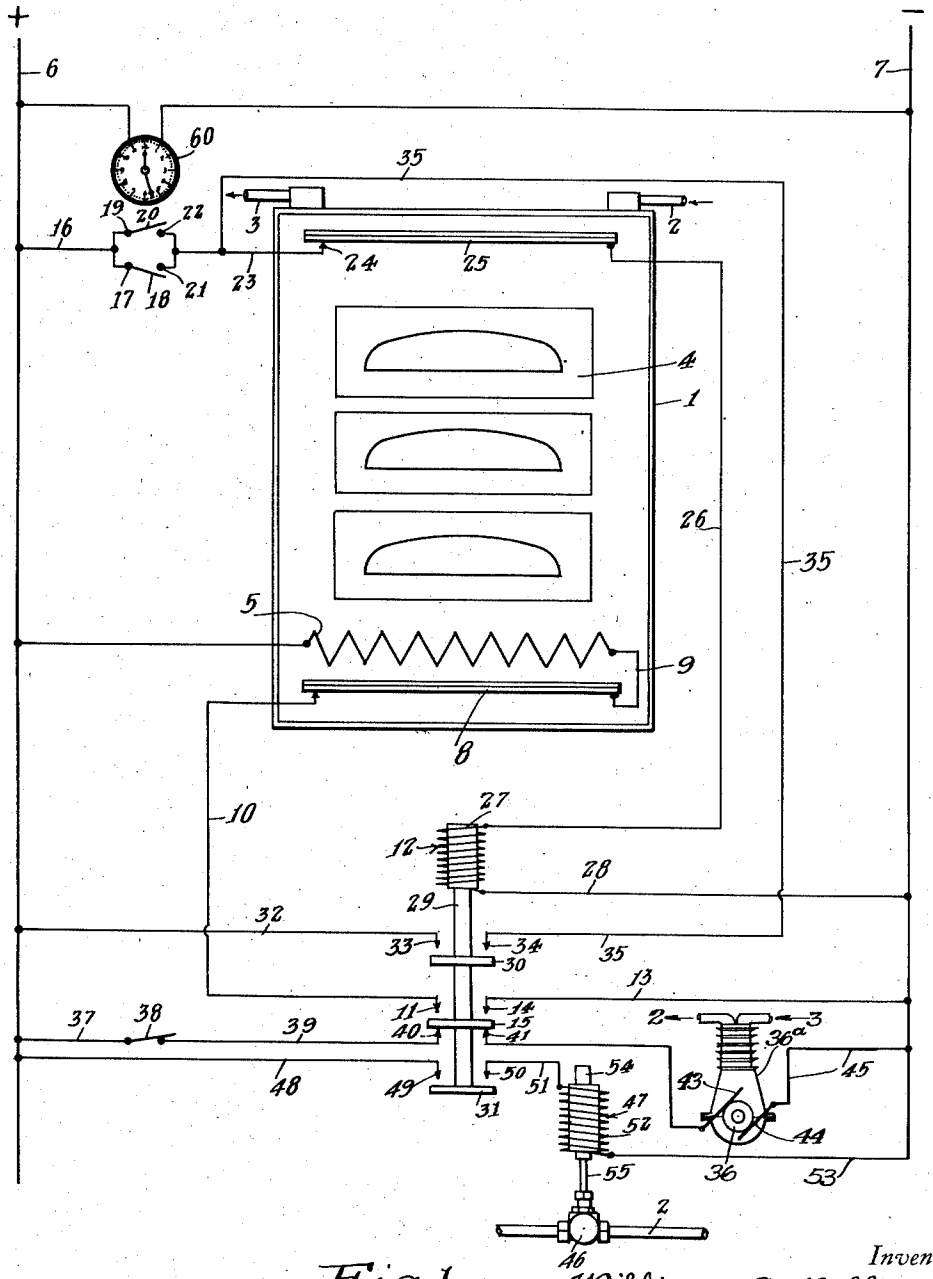

Fig. 1

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June 13, 1933. W. A. DOBLE, JR 1,913,433

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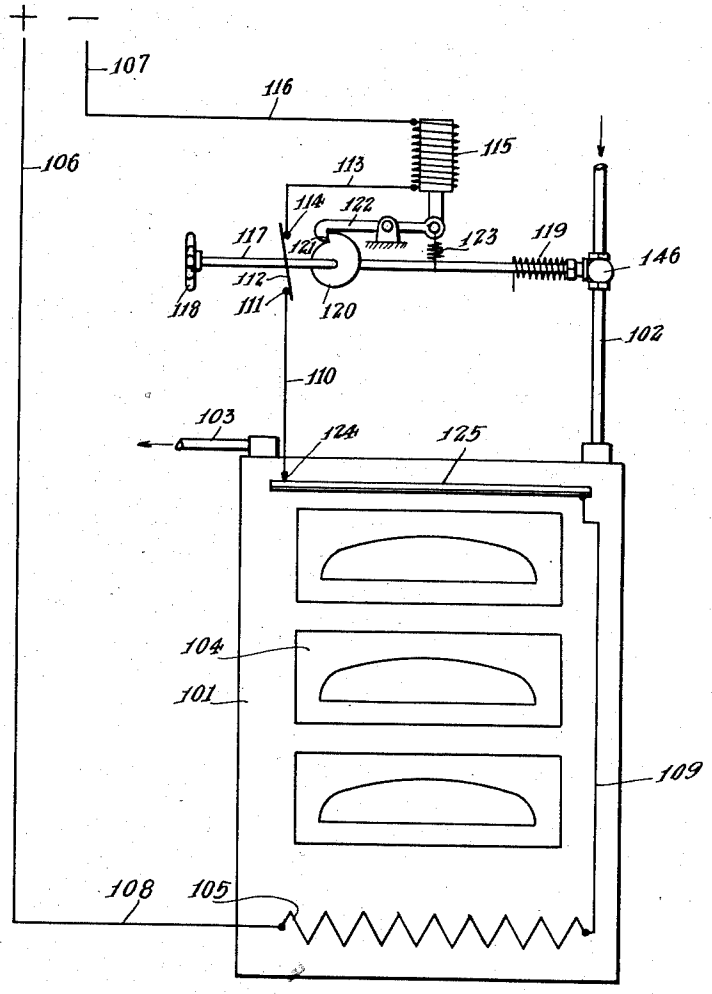

Fig. 2

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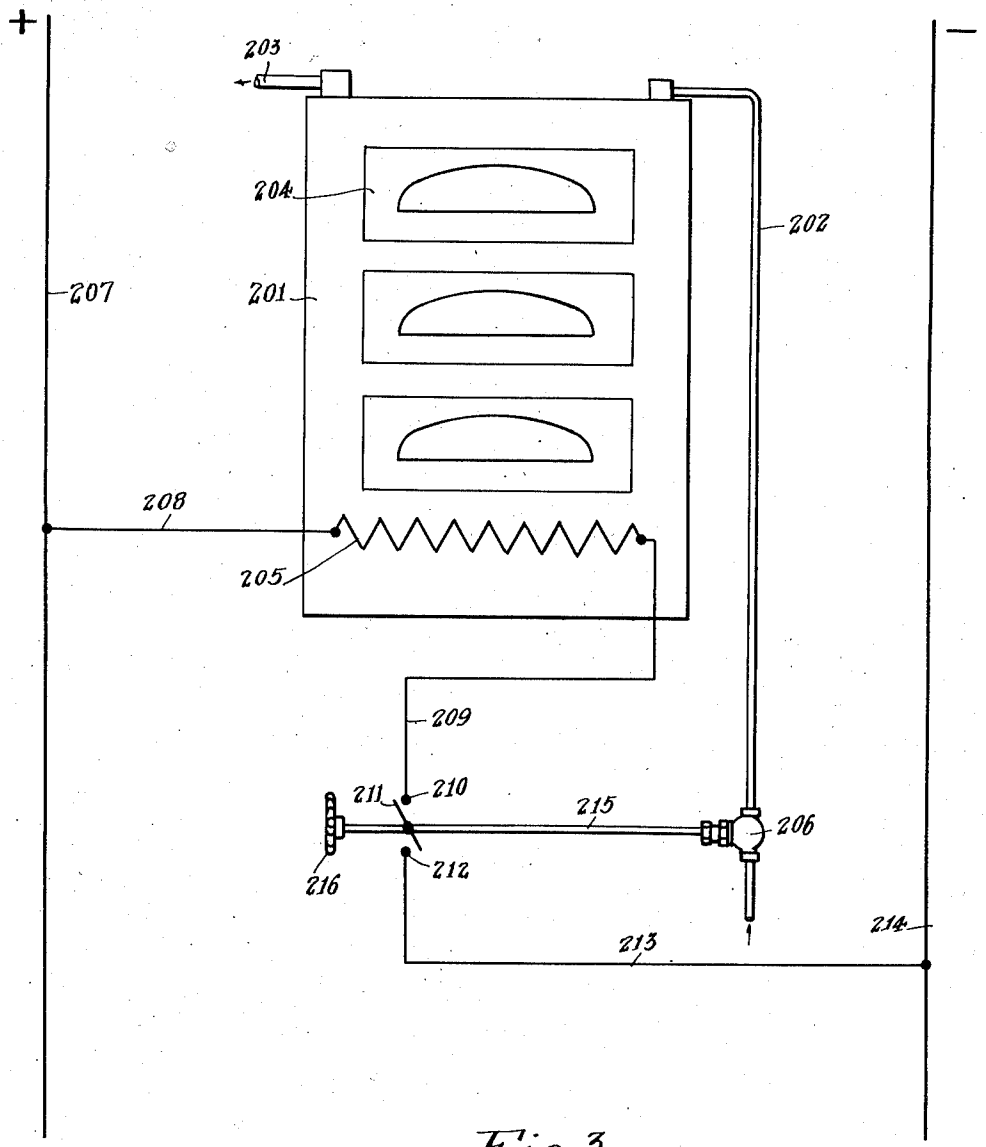

Fig. 3

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Patented June 13, 1933 1,913,433

UNITED STATES PATENT OFFICE

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DEFROSTER

Application filed November 16, 1931. Serial No. 575,227.

This invention relates to a defroster for the cooling element of a refrigerating plant.

The principal object of this invention is to provide a heating element in the cooling element of a refrigerating plant which may be brought into action during the defrosting operation of the cooling element in order that the cooling element may be rapidly heated to a temperature above the defrosting point before the temperature of the refrigerator and its contents will have had time to rise materially.

A further object is to provide means for rapidly defrosting the cooling element of a refrigerating plant.

A further object is to provide means for disconnecting the heater element when the cooling element has become defrosted.

A further object is to provide means operative when the cooling element has been defrosted to shut off the heating element and to turn on the refrigerant.

A further object is to provide means operative for simultaneously turning off the refrigerant supply and turning on the heating element.

A further object is to provide means operative for automatically, at predetermined intervals, turning off the refrigerant and turning on the heating element, and when the cooling element has been defrosted for automatically turning off the heating element and turning on the refrigerant.

A further object is to provide means for preventing the heating element from rising in temperature above a predetermined degree.

A further object is to provide means for preventing the cooling element from being heated above a predetermined temperature by said heating element.

Other objects and advantages of this invention will be apparent as the nature of the same is more fully understood from the following description and accompanying drawings, wherein is set forth what is now believed to be a preferred embodiment. It should be understood, however, that the particular embodiment of the invention is chosen principally for the purpose of exemplification, and that many varaitions therefrom in detail of construction or arrangement of the parts may accordingly be effected and yet remain within the spirit and scope of the invention, as the same is set forth in the appended claims.

In the drawings—

Figure 1 illustrates a diagrammatic representation of the invention installed in the cooling element of a refrigerating plant and the control system therefor.

Figure 2 illustrates a diagrammatic representation of the invention installed in the cooling element of a refrigerating plant and a modified control system therefor.

Figure 3 illustrates diagrammatically a further modified control system for the invention.

In Figure 1, a completely automatic defrosting system is disclosed which may include a cooling element 1 of any preferred design or type mounted in a refrigerator box not shown. The cooling element is provided with a refrigerant inlet 2 and a refrigerant outlet 3, and with the usual ice trays 4. The portion of the refrigerating plant so far described may be of the usual form and construction utilized in domestic refrigerating plants in which an electric motor compressing plant forms a unit or may be a portion of a refrigerating system which includes a plurality of cooling elements, such as used in apartment houses. As is well known, in the operation of the refrigerating plant a coating of frost gradually collects upon the cooling element and as the frost builds up in the thickness, it acts as an insulating medium which materially reduces the cooling efficiency of the cooling element. To remove the frost from the cooling element the usual practice is to turn off the supply of refrigerant to the cooling element, thus permitting the cooling element to rise in temperature above the melting point of frost, which, as a result thereof, melts and drops off of the cooling element. Refrigerator boxes are heavily insulated to prevent heat from flowing therein and in consequence thereof, after the refrigerant has been shut off, a long time must elapse before the cooling element, the

refrigerator box and its contents rise in temperature sufficiently to melt the coating of frost from the cooling element, which is not only extremely bothersome but even more serious, as it affects the condition of the food and in many instances spoils the food or other products contained within the refrigerator box. To overcome this difficulty I place an electric heating element 5 in the cooling element which, when supplied with an electric current, will relatively quickly raise the temperature of the cooling element to the defrosting point before the refrigerator box of contents will have had time to materially change in temperature. As soon as the cooling element has defrosted, the electric current would be shut off and refrigerant again supplied to the cooling element and the temperature thereof quickly reduced to its normal operating temperature, the entire defrosting operation requiring such a short period of time that the refrigerator box and contents will not have had time to rise to a damaging temperature.

The control system for the heating element 5, as illustrated in Figure 1, includes the positive side of an electric circuit 6 and the negative side 7. One side of the heating element is connected to the main 6, while the opposite side of the heating element may be connected to a thermostat 8 by means of the conductor 9. The thermostat 8 and heating element 5 may form a unit whereby the thermostat prevents the heating element from rising above a predetermined temperature. The thermostat 8 is a protective element, but may not be used in all installations. The conductor 10 connects the thermostat 8 to one pole 11 of a relay switch 12, while the conductor 13 connects the opposite pole 14 of relay switch 12 with the negative line 7. As illustrated, the heating element circuit is open between the poles 11 and 14 of the relay switch 12, but is adapted to be closed by the bridging member 15 when said switch 12 is actuated.

The relay switch is included in a circuit having a conductor 16 connecting the main 6 with one pole 17 of the manually operable switch 18 and with one pole 19 of the automatic switch 20. The opposite poles 21 and 22 of the switches 18 and 20 are connected by the conductor 23 to the contact 24 of the thermostat 25, while the opposite side of thermostat 25 is connected by means of the conductor 26 to the magnetic coil 27 of the relay switch 12, and the opposite side of coil 27 is connected to the negative line 7 by the conductor 28. By closing either switch 18 or 20 the circuit is completed through the thermostat 25 and the magnetic coil 27, causing the armature 29 to be drawn into magnetic coil 27. The armature 29 carries the bridging members 30, 15 and 31 so that with the upward movement thereof these bridging members are brought into circuit closing contact with their respective pole members, as, for example, the bridging member 15 upon the upward movement of the armature closes the circuit through the heating element 5 by engaging poles 11 and 14.

The switches 18 and 20 need only be momentarily closed to initially energize the magnetic coil 27 of the relay switch to cause the armature to move to its up or closed position, thereby completing a holding circuit, which holding circuit includes a conductor 32 connecting the positive wire 6 with the pole 33 through the bridging member 30, which now engages the poles of the switch through pole 34, and then through the conductor 35 to the conductor 23 of the circuit, which includes the switches 18 and 20, which, as previously described, includes conductor 23, thermostat contact 24, thermostat 25, conductor 26, magnetic coil 27, and conductor 28 to the negative line 7. Should the temperature in the cooling element rise above the predetermined temperature for which the thermostat 25 has been set, the thermostat will act to open or break the holding circuit to the magnetic coil 27, thus rendering coil 27 inactive and consequently causing the armature 29 to return to its initial position and thereby opening the heating element circuit and the holding circuit, rendering the heating element inoperative until either of the switches 18 or 20 are again closed.

It is desirable to shut off the supply of the refrigerant during the defrosting operation, which may be accomplished by turning off the compressor motor, or by closing a valve means in the refrigerant supply pipe line 2.

In electric refrigerators in which the motor-compressor forms a unit with the box it may be necessary to shut off only the compressor motor, but I prefer to also shut off the refrigerant supply pipe, as usually a considerable quantity of refrigerant is stored in the condensor which might be wasted if the refrigerant supply pipe were not shut off, and also the stored supply of refrigerant would act to maintain the cooling element cold, thus lengthening the defrosting period. In Figure 1 I have illustrated means for shutting off both the motor compressor unit 36*a* and the refrigerant supply pipe. However, either one may be used separately.

The motor for the motor-compressor unit 36*a* is illustrated diagrammatically at 36 and is controlled by the relay switch 12. The motor circuit includes the conductor 37 connecting the positive line 6 with a normally closed switch 38. The conductor 39 connects the other pole of switch 38 with one pole 40 of relay switch 12. The other pole 41 of relay switch 12 is connected to the motor brush 43 by the conductor 42, while the opposite brush 44 is connected to the negative line 7 by the conductor 45. When relay switch 12

is not energized, the poles 40 and 41 are bridged by the member 15 to normally maintain a closed circuit through motor 36. The motor circuit would also include the usual pressure and temperature switches.

When the relay switch is energized, the armature carries the bridging member 15 out of contact with the poles 40 and 41 to open the motor circuit, thus stopping the motor until the defrosting operation has been completed, whereupon the holding switch is deenergized, permitting the armature to return the bridging member into circuit closing contact with the poles 40 and 41, thus completing the motor circuit and again placing the motor in service.

The means for shutting off the refrigerant supply pipe may include any preferred type of valve 46 which may be opened and closed by an electric motor or a solenoid motor 47, or may utilize the relay coil 27 and armature 29 for actuating the valve. The motor 47 for actuating the refrigerant supply valve 46 may be controlled also by the relay switch 12. The valve-motor operating circuit includes the conductor 48 connecting the positive line 6 to the pole 49 of the holding switch, while the pole 50 thereof is connected to one side of the motor 47, as illustrated in Figure 1, to one side of the magnetic coil 52, and the other side of coil 52 is connected to the negative line 7 by the conductor 53. The armature 29 of the relay switch 12 carries a bridging member 31 which completes the circuit to actuate the motor 47 to shut off the refrigerant supply valve during the defrosting operation. The armature 54 of the motor 47 may be connected to the valve stem 55 of the refrigerant supply valve 46 by any suitable means.

It will be understood that the supply pipe 2 in which the supply valve 46 is located is the same and continues to the broken portion of the supply pipe 2 which enters the cooling element.

In apartment house installations where there are a plurality of cooling elements for each compressor unit, the motor-compressor shut-off circuit would not be included in the system, but the refrigerant shut-off valve 46 and operating motor 47 therefor would be included in the system.

To obtain the maximum efficiency from the cooling element it should be periodically defrosted, and for that purpose I preferably provide an electric clock 60 adapted to close switch 20 at predetermined intervals of time, say once every twenty-four hours, or once every forty-eight hours, or any other desired interval of time. The clock 60 need only momentarily close the switch 20 to cause the relay switch to actuate, which will automatically set up its own holding circuit, as previously described, and upon completion of the defrosting operation, the thermostat 25 will open the holding circuit to disconnect the heating element and turn on the refrigerant supply. Means other than an electric clock may be used for periodically bringing the system into operation to defrost the cooling element.

Should it be desired to defrost the cooling element at times other than for which the clock 60 has been set, the switch 18 need only be closed to set the system into operation. In some installations the automatic clock means 60 and switch 20 may not be included, in which case the system would be brought into operation to defrost the cooling element by closing switch 18.

In large installations a plurality of heating elements may be placed in the cooling element to insure rapid and even defrosting.

The modified system illustrated in Figure 2 includes the cooling element 101, refrigerant inlet pipe 102, refrigerant outlet pipe 103, ice trays 104, heating element 105, positive power line 106, negative power line 107, a refrigerant supply shut-off valve 146, means for locking the refrigerant supply valve closed, means for opening valve 146, a switch for closing the circuit to the heating element, and a thermostat 125.

The electric circuit includes a conductor 108 for connecting one side of the heating element 105 to the positive power line 106, a conductor 109 for connecting the opposite side of the heating coil to one end of the thermostat 125, a conductor 110 for connecting the contact 124 of the thermostat to one pole 111 of the switch 112; the conductor 113 connects the other pole 114 of the switch to one side of the solenoid 115, while the conductor 116 connects the other side of the solenoid with the negative power line.

The switch 112 may be of any desired form and may be provided with an operating shaft 117 and an operating handle 118. Switch 112 is normally held in open position by any suitable means, such as the tortional spring 119 having one end operatively connected to the operating shaft and the other end suitably connected to a stationary portion of the machine. The tortional spring 119 acts to yieldingly retain the switch blade 112 out of contact with the switch poles 111 and 114 and also acts to yieldingly retain the refrigerant supply valve 146 open, as the supply valve is operatively connected to the operating shaft 117.

A lock means is provided to retain the switch 112 and the supply valve 146 closed during the defrosting operation, which means is rendered inoperative when the cooling element has risen in temperature, to a predetermined degree, thereby allowing the spring 119 to open both switch 112 and valve 146. Many different forms of such means may be employed. However, the locking means may include a ratchet cam 120 opera-

tively mounted upon shaft 117, which cam is provided with a ratchet notch 121.

A pawl 122 is positioned to engage the ratchet notch 121 when shaft 117 is rotated to close the switch 112 and the valve 146. A solenoid 115 is operatively connected to and actuates the pawl into locking position when the electric circuit is completed through closing switch 112. When the circuit is broken by the thermostat 125, solenoid 115 becomes de-energized permitting pawl 122 to be moved out of engagement with the ratchet notch 121, whereupon the torsional spring 119 will act to rotate shaft 117 to open switch 112 and also open the refrigerant supply valve 146.

In this form of the invention, to defrost the cooling element the operating handle 118 is actuated to close the circuit switch and the refrigerant supply valve, whereupon the circuit will be energized, causing the solenoid to actuate the pawl to lock the circuit and valve closed, and also the heating coil to rapidly raise the temperature of the cooling element to a predetermined temperature to insure the complete defrosting thereof. When the cooling element has reached the predetermined temperature, the thermostat 125 will act to open the circuit, which will immediately de-energize the solenoid 115, permitting spring 123 to unlock the cam, whereupon the torsional spring 119 will open switch 112 and the refrigerant supply valve 146, thus automatically placing the refrigerating system back into service.

In Figure 3 a simplified form of the invention is illustrated and includes a cooling element 201, a refrigerant supply inlet pipe 202, a refrigerant discharge pipe 203, ice trays 204, an electric heating element 205, a control valve for the refrigerant supply pipe 206, and an electric circuit for the heating element, which circuit includes a positive main 207, a conductor 208 connecting one side of the heating element thereto, a conductor 209 for connecting the other side of the heating element to one pole 210 of the switch 211, while the conductor 213 connects the other pole 212 of the switch with the negative main 214. The switch 211 may be operatively connected to the valve actuating stem 215 which carries an operating handle 216. It is to be understood that the switch 211 and valve 206 may have separate actuating means; also a thermostat may be provided for preventing the heating element from rising above a predetermined temperature. To defrost the cooling element 201 the handle 216 is turned until first, the refrigerant supply is shut off, and then the switch 211 closes the circuit to the heating element, which immediately heats up and quickly raises the temperature of the cooling element above the defrosting point. When the cooling element has been defrosted, the handle 216 is actuated to turn off the current to the heating element and to turn on the refrigerant supply, placing the refrigerating system back in operation. Thus, the cooling element is quickly and easily defrosted before the contents of the refrigerator will have had time to materially rise in temperature.

It is also to be understood that the heating element need not be positioned within the cooling element, but may be suitably mounted upon the exterior thereof, say, for example, the heating element may be mounted to form a good thermal contact with the bottom of the cooling element.

A heating element of any well known type may be used; for the purposes of illustration a coil resistance form of element has been shown.

It is also to be understood that a switch for controlling the compressor motor may be substituted for the refrigerant supply valve means in Figures 2 and 3.

All of the elements such as the electric time clock, heating coil, thermostat, magnetic valve and relay switch are all old and well known in the art, and there are many types of these elements upon the market which may be satisfactorily used and therefore no claim is made in this invention to the specific type or form of element which is utilized.

While I have illustrated the preferred form of my invention, it is to be understood that the foregoing description is for illustrative purposes only, and I do not desire to be limited by any of the details shown or described, except as defined in the appended claims.

I claim:—

1. A defrosting means for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, an electric heating element associated with said cooling element, means for shutting off said refrigerant supply, means for connecting said heating element with an electric current, and means responsive to a predetermined temperature of said cooling element and operative for disconnecting said electric current and for turning on said refrigerant supply.

2. A defrosting means for the cooling element of a refrigerating machine, including, a cooling element, an electric heating element associated therewith, an electric circuit for supplying said heating element with an electric current, a switch in said circuit, means for yieldingly retaining said switch open, means for closing said switch, means operative to lock said switch in closed position, and means responsive to a predetermined temperature of the cooling element for actuating said locking means to release said switch, whereupon said switch will be

snapped and held open by said yielding means.

3. A defrosting means for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, means for controlling said refrigerant supply, an electric heating element associated with said cooling element, an electric circuit for supplying said heating element with an electric current, a switch in said circuit, a unitary means adapted to yieldingly retain said switch and said refrigerant control means open, means for actuating said unitary means for closing said switch and said refrigerant supply means, means operative for locking said unitary means in closed position, and means responsive to a predetermined temperature of said cooling element for actuating said locking means to release said unitary means to automatically open said switch and said refrigerant supply means.

4. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, means for controlling said refrigerant supply, an electric heating element associated with said cooling element, a thermostat associated with said cooling element, a solenoid, a switch, an electric circuit serially connecting said heating element, thermostat, solenoid and switch, a unitary means adapted to yieldingly retain said switch and said refrigerant control means open, means for actuating said unitary means for closing said switch and said refrigerant control means, a locking means carried by said unitary means, a pawl operatively connected with said solenoid and yieldingly retained out of engagement with said locking means, whereby when said switch is closed said solenoid becomes energized and actuates said pawl into locking engagement with said locking means to retain said switch and said refrigerant control means in closed position, also with the closing of said switch the heating coil becomes energized to rapidly heat the cooling element above the defrosting point, whereupon said thermostat is actuated to open said circuit, de-energize said solenoid, thereby releasing said locking means, whereupon said unitary means is automatically actuated to open said switch and said refrigerant control means to again place the refrigerating system in operation.

5. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, a motor compressor unit for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized by and when said relay circuit is completed for holding said relay in closed position, a heating element circuit arranged to be energized by and when said relay is in closed position, an electric circuit for said electrically operated valve arranged to be energized by and when said relay is in closed position, a motor circuit arranged to be de-energized by and when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for opening said holding circuit.

6. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, a motor compressor unit for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch manually operable for energizing said relay circuit, a second switch automatically operable at predetermined intervals of time for energizing said relay circuit, a holding circuit energized by and when said relay circuit is energized for holding said relay in closed position, a heating element circuit arranged to be energized by and when said relay is in closed position, an electric circuit for said electrically operated valve arranged to be energized by and when said relay is in closed position, a motor circuit arranged to be de-energized by and when said relay is in closed position, and means responsive to a predetermined temperature of said cooling element for opening said holding circuit.

7. A defrosting system for the cooling element of a refrigerating machine, including, a cooling element, means for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, means for holding said relay in closed position when said relay circuit has been energized, a heating element circuit arranged to be energized by and when said relay is in closed position, an electric circuit for said electrically operated valve arranged to be energized by and when said relay is in closed position, and means responsive to a predetermined temperature of said cooling element for releasing said relay holding means.

8. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, means operable at predeter-

mined intervals of time for energizing said relay circuit for actuating said relay into closed position, means for holding said relay in closed position after said relay circuit has been energized, a heating element circuit arranged to be energized by and when said relay is in closed position, an electric circuit for said electrically operated valve arranged to be energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for releasing said relay holding means.

9. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, means for controlling said supply, an electric heating element associated with said cooling element, means operable for energizing said electric heating element and for actuating said control means to shut off said refrigerant supply, and means operable when the cooling element has reached a predetermined temperature for de-energizing said electric heating element and for actuating said control means for turning on said refrigerant supply.

10. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, means for controlling said supply, an electric heating element associated with said cooling element, means operable for energizing said electric heating element and for actuating said control means to shut off said refrigerant supply, means for regulating the temperature of said heating element, and means operable when the cooling element has reached a predetermined temperature for de-energizing said electric heating element and for actuating said control means for turning on said refrigerant supply.

11. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, an electric heating element associated therewith, means for connecting said heating element with an electric current, means for regulating the temperature of said heating element, and means responsive to a predetermined temperature of said cooling element for disconnecting said electric current supply.

12. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, an electric heating element associated therewith, means operable for energizing said electric heating element, means responsive to the temperature of said heating element for controlling the temperature thereof, and means responsive to a predetermined temperature of said cooling element for rendering said heating element energizing means inoperative.

13. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, means for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is completed for holding said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, an electric circuit for said electrically operated valve arranged to be energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for releasing said relay holding means.

14. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, means for supplying a refrigerant thereto, a valve means for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay arranged for operating said valve, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is completed for holding said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for opening said relay holding circuit.

15. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, a motor compressor unit for supplying a refrigerant thereto, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is energized for holding said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, a motor circuit arranged to be de-energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for opening said holding circuit.

16. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, means for supplying a refrigerant thereto, an electrically operated valve for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is completed for hold-

ing said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, a thermostat associated with said heating element and operative for opening the heating element circuit when the heating element rises above a predetermined temperature and for closing said circuit when the heating element falls below a predetermined temperature, an electric circuit for said electrically operated valve arranged to be energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for opening said relay holding circuit.

17. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, means for supplying a refrigerant thereto, a valve means for controlling said refrigerant supply, an electric heating element associated with said cooling element, a relay arranged for operating said valve, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is completed for holding said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, means associated with said heating element for opening the heating element circuit when the heating element rises above a predetermined temperature and for closing said circuit when the heating element falls below a predetermined temperature, and means operative when the cooling element rises above a predetermined temperature for opening said relay holding circuit.

18. A defrosting system for a cooling element of a refrigerating machine, including a cooling element, a motor compressor unit for supplying a refrigerant thereto, an electric heating element associated with said cooling element, a relay, a circuit for said relay, a switch for energizing said relay circuit for actuating said relay into closed position, a holding circuit energized when said relay circuit is energized for holding said relay in closed position, a heating element circuit arranged to be energized when said relay is in closed position, means associated with said heating element for opening the heating element circuit when the heating element rises above a predetermined temperature and for closing said circuit when the heating element falls below a predetermined temperature, a motor circuit arranged to be de-energized when said relay is in closed position, and means operative when the cooling element has reached a predetermined temperature for opening said holding circuit.

Signed at Los Angeles, California, this 11th day of November, 1931.

WILLIAM A. DOBLE, JR.

DISCLAIMER

1,913,433.—*William A. Doble, jr.*, Berkeley, Calif. DEFROSTER. Patent dated June 13, 1933. Disclaimer filed May 4, 1934, by the patentee.

Your petitioner, therefore, hereby enters this disclaimer to those parts of claims 1 and 9 of said patent and specifications in the following words, to-wit:

"1. A defrosting means for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, an electric heating element associated with said cooling element, means for shutting off said refrigerant supply, means for connecting said heating element with an electric current, and means responsive to a predetermined temperature of said cooling element and operative for disconnecting said electric current and for turning on said refrigerant supply."

"9. A defrosting system for the cooling element of a refrigerating machine including, a cooling element, means for supplying a refrigerant thereto, means for controlling said supply, an electric heating element associated with said cooling element, means operable for energizing said electric heating element and for actuating said control means to shut off said refrigerant supply, and means operable when the cooling element has reached a predetermined temperature for de-energizing said electric heating element and for actuating said control means for turning on said refrigerant supply."

[*Official Gazette May 29, 1934.*]