

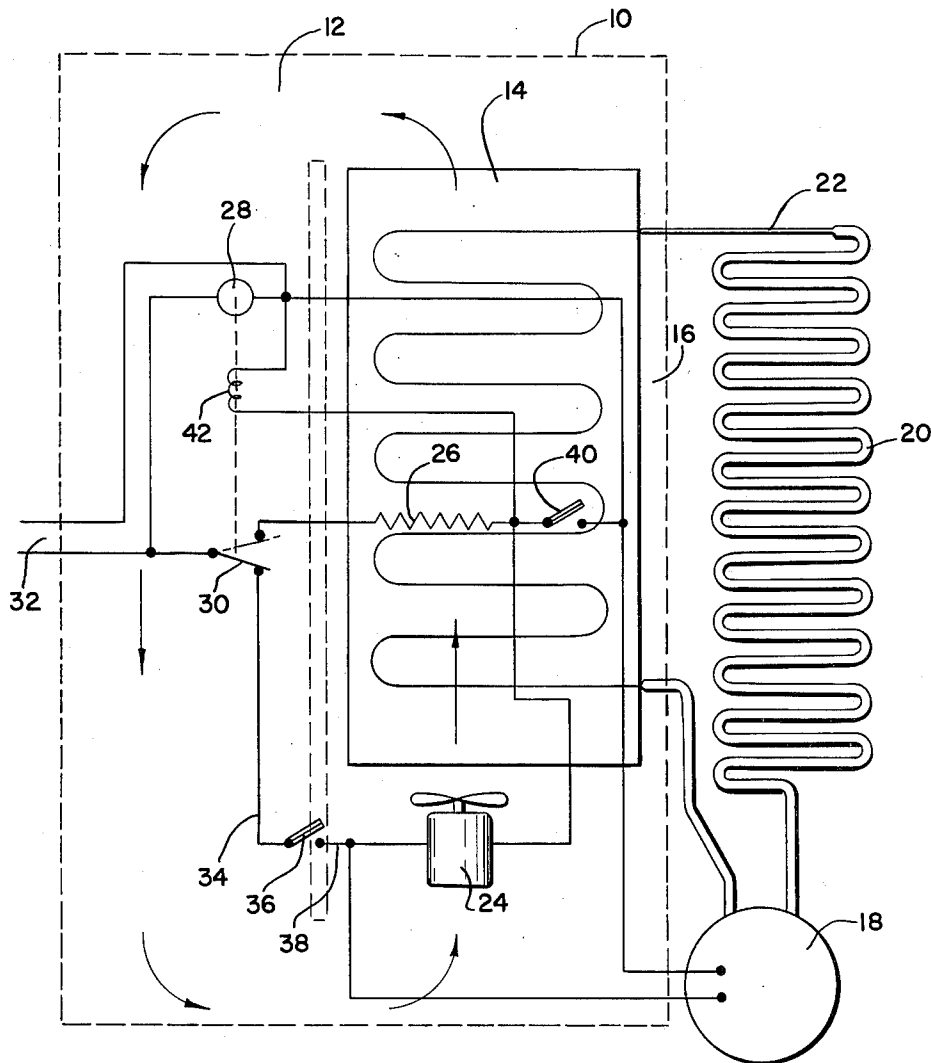
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REFRIGERATION APPARATUS WITH DEFROST CONTROL MEANS

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1

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REFRIGERATION APPARATUS WITH DEFROST CONTROL MEANS

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This invention relates to refrigerating apparatus and more particularly to a control for use in defrosting the cooling coil of a refrigerator.

In modern refrigerators where a fan is utilized to circulate a large volume of air from the food storage compartment over the evaporator and wherein the evaporator is periodically defrosted by means of the application of electric heat to the evaporator, it becomes essential to avoid adding heat to the food compartment during or immediately following the defrost period.

It is an object of this invention to provide a simple and inexpensive, yet reliable, control which will prevent the operation of the air circulating fan at the end of the defrost cycle before the evaporator has had a chance to be cooled down.

Thus, it is an object of this invention to provide a control wherein the refrigeration system begins operating at the completion of the defrost cycle before the fan circulates air from the evaporator compartment into the food storage compartment.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

The drawing shows somewhat schematically a refrigerator embodying the invention.

Referring now to the drawing wherein a preferred arrangement has been shown, reference numeral 10 generally designates a refrigerator cabinet having a food storage compartment 12 which is adapted to be refrigerated by means of an evaporator 14 which for purposes of illustration has been shown located in an air duct 16 adjacent the food storage compartment 12. While the compartment 12 is intended to represent the freezer compartment in a refrigerator, the invention could also be used in a standard home refrigerator wherein forced air circulation is used for cooling the food compartment. The evaporator 14 forms a part of a conventional refrigerating system including a compressor 18 which withdraws vaporized refrigerant from the evaporator 12 and discharges compressed refrigerant into the condenser 20 from whence the liquid refrigerant flows to the evaporator 12 through a capillary tube type of restrictor 22. A fan 24 is used to circulate air from the food compartment over the evaporator which serves to cool the air before being returned to the food compartment.

The evaporator 12 must be defrosted from time to time such as once every 24 hours and for that purpose, there is provided an electric heater 26 which is arranged in thermal exchange relationship with the evaporator 14 and which serves to supply heat for defrosting the evaporator in a manner to be described more fully hereinafter. Power for operating the refrigerator and its controls is supplied through the power supply lines 32.

A timer 28 is arranged as shown to control a double-throw switch 30 which serves to selectively energize either the heater circuit 26 or the circuit for the compressor 18. This timer serves to move the switch 30 from its full line position to its dotted line position once every 24 hours. The switch 30 has been shown in its down

2

position in the drawing wherein it supplies current to the line 34 which leads to the temperature control thermostat 36. The thermostat 36 responds to refrigeration requirements and serves to close the circuit to the line 38 whenever refrigeration is required. The thermostat 36 is preferably located in the freezer compartment or in the return air duct and opens the circuit to the fan and the compressor at -5° F. and recloses at $+5^{\circ}$ F. When the thermostat 36 is in the closed position, both the fan 24 and the compressor 18 will operate.

The timer 28 moves the switch 30 from its down position to the dotted line position so as to deenergize the fan 24 and the compressor 18 and energize the heater 26 once every 24 hours. The timer will not return the switch to its full line position unless the heater 26 has been energized for a period of 30 minutes. The heater 26 is arranged in circuit with a defrost limiter switch 40 which is normally closed at the beginning of the defrost cycle and which opens the circuit when the temperature of the evaporator 14 reaches a value such as 50° F. indicative of all of the frost having been melted from the evaporator.

When all of the frost has been melted from the evaporator 14, the thermostat 40 will open the circuit to the heater 26 and if this occurs in less than 30 minutes after the timer closed the circuit to the defrost heater, the solenoid coil 42 will be energized and will move the switch 30 to its full line position. The defrost limiter switch 40 shunts the coil 42 when it is in its closed position. When the circuit leading to the compressor and the fan 24 is reestablished, the compressor will begin operating so as to render the evaporator 14 effective for cooling purposes. However, the fan 24 will not start operating until the defrost limiter switch 40 has moved to the closed position as the result of the evaporator 14 having been cooled to a temperature such as 22° F. By virtue of the above described circuit arrangement, it is obvious that the blower or fan 24 will not be capable of circulating air over the evaporator until after the temperature of the evaporator has been reduced to a value such as 22° F.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In combination, a refrigerator cabinet having an insulated food storage compartment therein, a source of electric power, an evaporator, means including a fan for circulating air for said compartment in thermal exchange relationship with said evaporator, refrigerant liquefying means for supplying liquid refrigerant to said evaporator, temperature responsive switch means connecting said liquefying means to said power source, means for periodically defrosting said evaporator including an electric heater arranged in thermal exchange relationship with said evaporator, clock operated means for initiating a defrost cycle wherein said electric heater is energized and said switch means is disconnected from said power source, a temperature responsive defrost limiter switch in series circuit with said heater for deenergizing said heater at evaporator temperatures above a predetermined value, and means for connecting said defrost limiter switch in series with said fan whereby said fan is deenergized when said defrost limiter switch is open.

2. In combination, a refrigerator cabinet having an insulated food storage compartment therein, a source of electric power, an evaporator, means including a fan for circulating air for said compartment in thermal exchange relationship with said evaporator, refrigerant liquefying means for supplying liquid refrigerant to said evaporator, means including a temperature responsive switch for connecting said liquefying means to said power source, means

3

for periodically defrosting said evaporator including an electric heater arranged in thermal exchange relationship with said evaporator, means for initiating a defrost cycle wherein said electric heater is energized and said temperature responsive switch is disconnected from said power source, a temperature responsive defrost limiter switch in series circuit with said heater for deenergizing said heater at evaporator temperatures above a predetermined value, and means for connecting said defrost limiter switch in series with said fan whereby said fan is deenergized when said defrost limiter switch is open.

3. In combination, a refrigerator cabinet having an insulated food storage compartment therein, a source of electric power, an evaporator, means including a fan for circulating air for said compartment in thermal exchange relationship with said evaporator, refrigerant liquefying means for supplying liquid refrigerant to said evaporator, temperature responsive switch means connecting said liquefying means to said power source, means for periodically defrosting said evaporator including an electric heater arranged in thermal exchange relationship with said evaporator, said last named means including a single pole double-throw switch for selectively energizing either said means for supplying liquid refrigerant or said electric heater, timer means for operating said single pole double-throw switch, solenoid means for actuating said single pole double-throw switch to deenergize said electric heater, a temperature responsive defrost limiter switch in series circuit with said heater for deenergizing said heater at evaporator temperatures above a predetermined value, said defrost limiter switch serving to shunt said solenoid means when closed, and means for connecting said defrost limiter switch in series with said fan whereby said fan is deenergized when said defrost limiter switch is opened.

4. In combination, a refrigerator cabinet having an insulated food storage compartment therein, a source of electric power, an evaporator, means including a fan for circulating air for said compartment in thermal exchange relationship with said evaporator, refrigerant liquefying means for supplying liquid refrigerant to said evaporator, temperature responsive switch means connecting said liquefying means to said power source, means for periodically defrosting said evaporator including an electric heater arranged in thermal exchange relationship

4

with said evaporator, said last named means including a single pole double-throw switch for selectively energizing either said means for supplying liquid refrigerant or said electric heater, timer means for operating said single pole double-throw switch, solenoid means for controlling the operation of said single pole double-throw switch, a temperature responsive defrost limiter switch in series circuit with said heater for deenergizing said heater at evaporator temperatures above a predetermined value, said defrost limiter switch serving to shunt said solenoid means when closed, and means for connecting said defrost limiter switch in series with said fan whereby said fan is deenergized when said defrost limiter switch is opened.

5. In combination, a refrigerator cabinet having an insulated food storage compartment therein, a source of electric power, an evaporator, means including a fan for circulating air for said compartment in thermal exchange relationship with said evaporator, refrigerant liquefying means for supplying liquid refrigerant to said evaporator, temperature responsive switch means connecting said liquefying means to said power source, means for periodically defrosting said evaporator including an electric heater arranged in thermal exchange relationship with said evaporator, said last named means including a single pole double-throw switch for selectively energizing either said means for supplying liquid refrigerant or said electric heater, timer means for operating said single pole double-throw switch, solenoid means for controlling the operation of said single pole double-throw switch, a temperature responsive defrost limiter switch in series circuit with said heater for deenergizing said heater at evaporator temperatures above a predetermined value, said solenoid being connected in shunt circuit relationship with said defrost limiter switch, and means for connecting said defrost limiter switch in series with said fan whereby said fan is deenergized when said defrost limiter switch is opened.

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