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CONTROL CIRCUIT FOR REFRIGERATOR INCLUDING CASE HEATER MEANS

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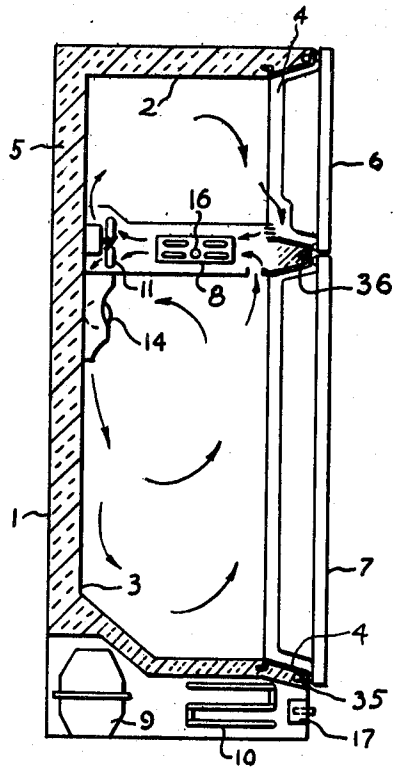

FIG. 1

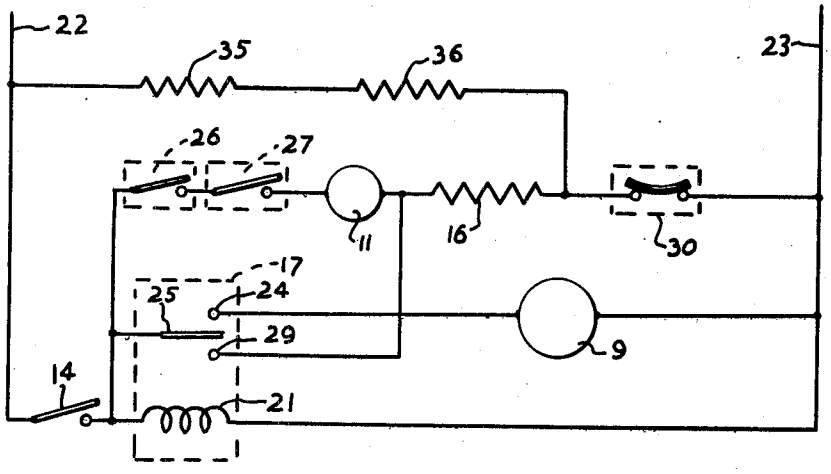

FIG. 2

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CONTROL CIRCUIT FOR REFRIGERATOR INCLUDING CASE HEATER MEANS

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ABSTRACT OF THE DISCLOSURE

An auto defrost refrigerator including thermal switch means for terminating a defrost cycle includes control circuitry whereby the case heater means for normally preventing condensation on outer cabinet wall portions is controlled by the same thermal switch means.

BACKGROUND OF THE INVENTION

Household refrigerators generally comprise an outer metal case and at least one inner liner insulated from the case and defining a refrigerated food storage compartment. Due to heat leakage through the insulating means separating the outer metal case from the liner or due to refrigerated air leakage past the door sealing means, portions of the outer metal case adjacent the access opening to the storage compartment tend to fall below the dew point of the surrounding atmosphere causing the accumulation of moisture in these areas. To prevent such condensation, suitable heating means such as electric resistance heater, generally known as case heater, have been provided to maintain the temperature of the case area adjacent the access openings sufficiently warm so that such condensation cannot occur. The heating means generally employed has been a low wattage electrical resistance heater connected directly across the power supply lines so as to be continuously energized regardless of whether the refrigerating means for cooling the storage compartment is operating or not. This produces the undesirable result that the casing may become extremely hot when the refrigerator is electrically connected on a showroom floor in order to provide power for the compartment lights and the controls are set to provide no refrigeration. To solve this problem, special switches or controls for the case heater have been included resulting in an increased cost of the refrigerator.

SUMMARY OF THE INVENTION

The present invention is directed to an improved means for controlling the energization of a case heater whereby switch means already present in the refrigerator control circuitry is used to prevent energization of the case heater whenever the refrigerator is not in normal refrigerating use, as for example when it is being exhibited on a showroom floor. More specifically, the invention relates to the autodefrost type of refrigerator including as a part of the control circuitry thereof a defrost terminating switch means and in accordance with the present invention, the case heating means is connected in the control circuitry in such a manner that whenever the defrosting terminating switch means is open the case heating means is also deenergized.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing FIGURE 1 is a side elevational view, partly in section, of a refrigerator cabinet showing somewhat schematically one form of the present invention as embodied therein; and

FIGURE 2 is a schematic diagram of that part of the refrigerator control circuitry designed to attain the objects of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGURE 1 of the drawing, there is illustrated a refrigerator cabinet including an outer case **1**, an upper inner liner **2** defining a freezer storage compartment and a lower inner liner **3** defining a fresh food storage compartment. The forward edges of both liners are spaced from the forward edges of the case and these spaces are bridged by heat insulating breaker strips **4** while the spaces between the liners and the outer case are filled with suitable insulating material **5**. The access openings to the fresh freezer and fresh food compartments are respectively closed by doors **6** and **7**.

Refrigeration for the two compartments is provided by an evaporator **8** positioned in the partion between the two liners which forms part of the refrigeration system including compressor **9** and a condenser **10**. A fan **11** rearwardly from the evaporator **8** provides means for circulating air from the two compartments over the evaporator **8** and back into the compartments.

A temperature control thermostat generally indicated by the numeral **14** including a sensing means (not shown) is provided for automatically controlling the operation of the compressor **9** to maintain the temperature within the fresh food compartment within a controlled range. Also in accordance with the usual practice, this thermostat can be moved manually to an "off" position whereby the compressor **9** is deenergized regardless of the temperatures within the cabinet.

The evaporator **8** operates at temperatures below freezing and for the purpose of periodically removing accumulated frost from the evaporator surfaces there is provided a defrost heater **16** which is periodically energized by operation of a timer **17**.

The refrigerator thus far described is similar to that shown and described in Patent 3,320,761 issued May 23, 1967 in the name of Robert Gelbard and reference is made to that patent for a more complete description of the operating components thereof. The control circuitry and components for controlling the normal and defrost operation of the refrigerator is illustrated in FIGURE 2 of the drawing. The defrost timer **17** includes a motor **21** connected across the supply lines **22** and **23** through the temperature control or thermostat **14**. The timer **17** also includes a double throw switch operated by the timer motor **21** and including a first contact **24** which is normally engaged by the switch arm **25** to complete a circuit through the thermostat **14** for energizing the compressor **9**. The fan **11** is controlled by the thermostat **14** and is energized whenever the thermostat calls for cooling. Door operated fan switches **26** and **27** are provided for deenergizing the fan if either door is opened.

In the illustrated circuit the evaporator fan motor **11** is also connected in series with the defrost heater **16** and a defrost termination switch **30**. The defrost determination switch **30** senses the temperature of the evaporator and is closed when the evaporator is operating at normal or below freezing temperatures.

The timer **17** is designed so that at predetermined intervals, the timer switch arm **25** moves from engagement with the contact **24** into engagement with a second contact **29** thereby opening the circuit to compressor **9**. Engagement with the switch contact **29** completes a circuit from the temperature control **14** bypassing or shorting the evaporator fan **11**. Full line voltage is thereby applied to the defrost heater **16** so that it warms the evaporator to defrost temperatures. When the evaporator has reached a temperature which indicates that all of the frost has been removed from the evaporator or more specifically

when the defrost terminating switch **30** senses this fact, the defrost terminating switch **30** opens. After a suitable period, the timer **17** again moves the switch arm **25** into engagement with the contact **24** thereby inactivating the heater and energizing the fan and compressor circuits to return the refrigerator to normal or cooling cycle of operation.

The case heaters, such as a heater **35** surrounding the periphery of the access openings at the front of the case and a mullion heater **36** for heating the forward edge of the partition dividing the fresh food and freezer compartments, are usually connected to the lines **22** and **23**. In accordance with the present invention, such heaters are connected through the defrost terminating switch **30**. In other words, these heaters are wired in parallel with the fan **11** and defrost heater **16** and in series with the defrost terminating switch **30**. Thus the case heaters **35** and **36** cannot be energized when the defrost terminating switch is open and this switch **30** is open whenever the temperature sensed thereby is above freezing as when the refrigerator is being displayed on a showroom floor with the cabinet connected to a source of power and temperature control **14** in the "off" position. On the other hand, since the defrost termination switch is closed during normal refrigeration operation or in other words whenever the temperature sensed thereby is below defrosting temperatures, the case heaters **35** and **36** are energized during all cabinet conditions in which their heating effect is required.

It will be obvious of course that modifications may be made in the circuitry without departing from the inventive concept of controlling the energization of the case heaters **35** and **36** by means of a defrost terminating switch **30** which is adapted to be open at normal room temperatures or more specifically at any evaporator temperature above freezing. For example, the evaporator fan **11** and the switches **26** and **27**, as described in the aforementioned Gelbard patent, may be connected in parallel with the compressor **9** and controlled by the same switch contact.

What I claim as new and desire to secure by the Letters Patent of the United States is:

1. In an autodefrost refrigerator comprising a cabinet including a storage compartment, an electrical case heating means for warming an outer wall portion of said cabinet, an evaporator for cooling said compartment, an electrical defrost heater for periodically warming the evaporator to defrost temperatures;

thermal switch means responsive to an above freezing temperature of said evaporator for both terminating energization of said defrost heater and said wall heating means whenever said thermal means senses an above freezing temperature.

2. In a refrigerator including a cabinet containing a storage compartment, case heating means for warming an outer wall portion of said cabinet, an evaporator for cooling said compartment, and a defrost heater for periodically warming the evaporator to defrost temperatures;

control circuitry comprising:

defrost terminating switch means responsive to an above freezing temperature of said evaporator for deenergizing said defrost heater and said case heating means.

3. The refrigerator of claim **2** including timing means for periodically initiating defrost operation of said defrost heater.

4. The refrigerator of claim **2** including fan means for circulating air from said compartment over said evaporator, said fan being connected to a power source in parallel with said case heating means and in series with said defrost heater and defrost terminating switch means.

5. In a refrigerator including a cabinet containing a storage compartment, refrigeration means including an evaporator for normally cooling said compartment, a defrost heater for periodically warming said evaportor to a defrosting temperature, and case heating means for normally warming an outer wall portion of said cabinet; control means comprising:

a temperature control switch means movable to a closed position when the temperature in said compartment rises above a predetermined point and to an open position when the temperature of said compartment falls below a second predetermined point, and manually movable to said open position independent of the temperature of said compartment,

a defrost control switch means having a defrost heater energizing position and a refrigeration means energizing position,

a defrost terminating switch means responsive to the temperature of said evaporator and movable to an open position when said evaporator is at an above-freezing temperature,

a first circuit including, in series connection, said temperature control switch means, said defrost control switch means, said defrost heater and said defrost terminating switch means,

a second circuit connecting said case heating means in series with said defrost terminating means and in parallel with the remaining components of said first circuit whereby when said temperature control switch means is moved manually to the open position to maintain said evaporator at above-freezing temperatures, the resultant opening of said defrost terminating switch means deenergizes said case heating means.

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MEYER PERLIN, Primary Examiner

U.S. Cl. X.R.

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