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(54) Device for reducing energy consumption during refrigerator defrosting.

(57) A device (10) for reducing energy consumption during the defrosting of a refrigerator (1), such as a domestic refrigerator, comprising at least one compartment, such as a refrigeration compartment (4), either in combination or not in combination with a preservation and/or freezing compartment (3), and provided with at least one electrical resistance heater (8) for automatically defrosting the usual evaporator (7) contained in said compartment (4), said refrigerator (1) being located in an environment such as a kitchen, cellar or the like, comprises at least one temperature sensor (15) connected to a switch member (16) connected in series with said electrical resistance heater (8), said sensor (15) being arranged to measure the temperature of the environment housing the refrigerator (1) and to interrupt electrical feed to the resistance heater (8) when ambient temperature exceeds a predetermined value such as to allow at least partial defrosting of the evaporator (7) without the operation of said resistance heater (8).

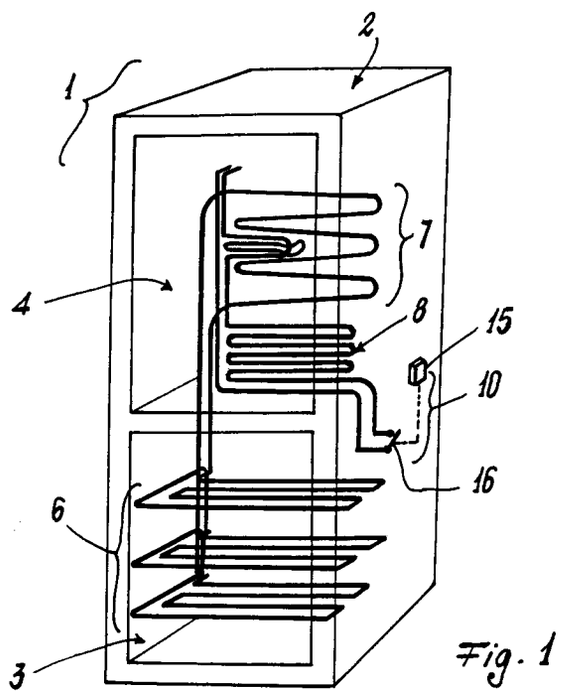

Fig. 1

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This invention relates to a device in accordance with the introduction to the independent claim.

With particular but non-limiting reference to a domestic refrigerator comprising a freezer compartment and a refrigeration compartment, it is well known that the evaporators contained in said compartments require periodic defrosting.

This periodic defrosting is particularly required in the refrigeration compartment. This is achieved for example by timed activation of a defrosting resistance heater positioned at the evaporator.

This need can however be satisfied without activating said resistance heater if the temperature in the environment containing the refrigerator exceeds 20-22 °C and the refrigerator compressor is halted. In this case the heat transmitted through the refrigerator walls is sufficient to raise the temperature within the refrigeration compartment to an extent sufficient to defrost its walls (in particular that at the evaporator).

In such a case, activation of the said defrosting resistance heater is unnecessary, such activation resulting only in additional energy consumption to the detriment of the operating costs of the refrigerator.

An object of the invention is to provide a device which enables the defrosting resistance heater to be switched out of its usual power circuit when the temperature within the environment in which the refrigerator is located exceeds the predetermined temperature, ie exceeds a predetermined value which enables the refrigeration compartment to be defrosted without the operation of said resistance heater. This results in a corresponding energy saving during refrigerator operation.

A further object is to provide a device of the aforesaid type which is of reliable use and of simple low-cost construction. These and further objects which will be apparent to the expert of the art are attained by a device in accordance with the characterising part of the independent claim.

The present invention will be more apparent from the accompanying drawing, which is provided by way of non-limiting example and in which:
Figure 1 is a schematic view of a refrigerator provided with the device of the invention; and
Figure 2 is a partial schematic view of the electrical circuit of a refrigerator such as that shown in Figure 1.

With reference to said figures, a refrigerator 1 (for example an upright refrigerator) comprises a cabinet 2 housing a freezer compartment 3 and a refrigeration compartment 4. Hairpin evaporator coils indicated respectively by 6 and 7 are contained in these compartments (which are provided with usual walls and closure doors, not shown). These coils form part of a single evaporator of the refrigeration circuit, which is of known type and therefore not further described.

In the refrigeration compartment 4 in a position corresponding with the coil 7 there is provided (inside the compartment on a wall thereof, not shown) a usual defrosting electrical resistance heater 8 which is activated in known manner (for example during predetermined cycles) in such a manner as to (partially or totally) defrost the coil 7 and the walls of the compartment 4. According to the invention the electrical resistance heater 8 is connected to a device 10 which measures the temperature of the environment containing the refrigerator 1, to allow the resistance heater 8 to be powered only when this temperature exceeds 20-22 °C.

In this respect, it has been found that with such an ambient temperature, heat is transmitted into the compartment 4 through the refrigerator cabinet 2 to such an extent as to cause the temperature in said compartment to rise sufficiently to achieve the said defrosting without the need to activate the resistance heater 8.

Specifically, the device 10 comprises a temperature sensor member 15 associated with the cabinet 2 and located in such a position as to measure the ambient temperature without being influenced by the internal temperature of the compartment 4. This sensor is positioned for example on the outside of said cabinet. The sensor is connected to a switch member 16 connected in series with the resistance heater 8.

In its most simple form the sensor is a bimetallic element 17 in the form of a strip connected in series with the resistance heater 8 and located in such a position as to sense ambient temperature.

The element 17 also acts as a switch because when ambient temperature exceeds 20 °C it changes its spatial position to open the electrical power circuit to the resistance heater 8.

One embodiment of this circuit is shown in Figure 2. It comprises an electrical feed line 20 of known type and a return line 21, to which there is connected an electrical branch 22 comprising a switch 23 controlled by the usual thermostat positioned in the refrigeration compartment 4. To this branch there is connected a usual motor-compressor unit 25 provided with the necessary starter device 25A and protection device 25B, and forming part of the said refrigeration circuit.

In parallel with the switch 23 there is a second electrical branch 28 into which the resistance heater for defrosting the coil 7 associated with the compartment 4 is connected.

The bimetallic element 17 is connected in series with the resistance heater 29 to act on fixed contacts 37 and 38 of the branch 28.

During normal operation of the refrigerator 1 the resistance heater 29 is short-circuited by the switching thermostat 23 with the result that no electrical signal passes through the branch 28, the motor-compressor unit 25 then being powered via the branch 22.

When the required temperature is reached the switching thermostat 23 opens and interrupts the power passing through it to the motor-compressor unit 25. During this rest stage (switching thermostat 23 open), and if ambient temperature is less than 20 °C, the resistance heater 29 is powered at one end (line 20) via the bimetallic element 17 and at its other end (line 21) via the motor-compressor unit 25 (the resistance of the resistance heater 29 is much higher than the internal resistance of the electric motor, so that during said rest stage the motor windings merely act as the conducting wire to feed the electrical signal from the line 21 to the resistance heater 29).

Hence during the rest stage the resistance heater 29 heats the compartment 4 and the coil 7, to defrost them.

When the temperature of the environment containing the refrigerator exceeds 20 °C, the bimetallic element 17 changes its spatial arrangement and separates from the contacts 37, 38. In this manner power is cut off to the resistance heater 29 with the result that defrosting takes place naturally without the operation of said resistance heater. The element 17 maintains its position of separation from the contacts 37, 38 until ambient temperature falls a few degrees below the said 20 °C (for example to below 16 °C). The element 17 then again closes said contacts to again power the resistance heater 29. During the time in which ambient temperature is such as to allow "natural" defrosting of the compartment 4, the resistance heater 29 is not powered, with consequent energy saving.

After defrosting, the switching thermostat 23 closes to restore normal operating conditions.

The described device can obviously be constructed in a more complicated manner, for example by connecting the sensor 15 to an electrical or electronic circuit (for example of microprocessor type) which acts on the switch 16 so that it closes and opens on the basis of the temperature of the environment containing the refrigerator 1.

A preferred embodiment of the invention has been described. Other embodiments are however possible (comprising usual electrical members or circuits), which are to be considered as falling within the scope of the present document.

Claims

1. A device for reducing energy consumption during the defrosting of a refrigerator, such as a domestic refrigerator, comprising at least one compartment, such as a refrigeration compartment, either in combination or not in combination with a preservation and/or freezing compartment, and provided with at least one electrical resistance heater for automatically defrosting the usual evaporator contained in said compartment, said refrigerator being located in an environment such as a kitchen, cellar or the like, characterised by comprising at least one temperature sensor (15) connected to a switch member (16) connected in series with said electrical resistance heater (8), said sensor (15) being arranged to measure the temperature of the environment housing the refrigerator (1) and to interrupt electrical feed to the resistance heater (8) when ambient temperature exceeds a predetermined value such as to allow at least partial defrosting of the evaporator (7) without the operation of said resistance heater (8).

2. A device as claimed in claim 1, characterised in that the temperature sensor (15) is positioned on the outside of the refrigerator cabinet (2).

3. A device as claimed in claim 1, characterised in that the temperature sensor and the switch member are a bimetallic element (17) connected in series with the defrosting resistance heater.

4. A device as claimed in claim 1, characterised in that the electrical feed to the resistance heater is interrupted when ambient temperature is at least 20 °C, feed restoration occurring when ambient temperature is equal to or less than 16 °C.

5. A device as claimed in claim 1, characterised in that the temperature sensor is associated with at least one switch control unit, advantageously an electrical microprocessor circuit.

6. A device as claimed in claim 1, comprising an electrical feed circuit for the usual refrigerator motor-compressor unit (25), which is powered via an electrical branch into which there is connected at least one switch (23) controlled by a corresponding known thermostat located in the relative compartment (4) of the refrigerator (1), said switch (23) being connected in parallel with an electrical branch (28) comprising at least one defrosting electrical resistance heater (29), said electrical branches (22, 28) being interposed between an electrical feed line and a return line, characterised in that in

series with the electrical resistance heater (29) there is connected an element (17) sensitive to the temperature of the environment in which the refrigerator is situated, said element being able to assume two different spatial positions on the basis of said temperature, such as to enable said resistance heater (29) to be powered when in only one if said positions.

7. A device as claimed in claim 6, characterised in that the element (17) connected in series with the electrical resistance heater (29) is a bimetallic strip.

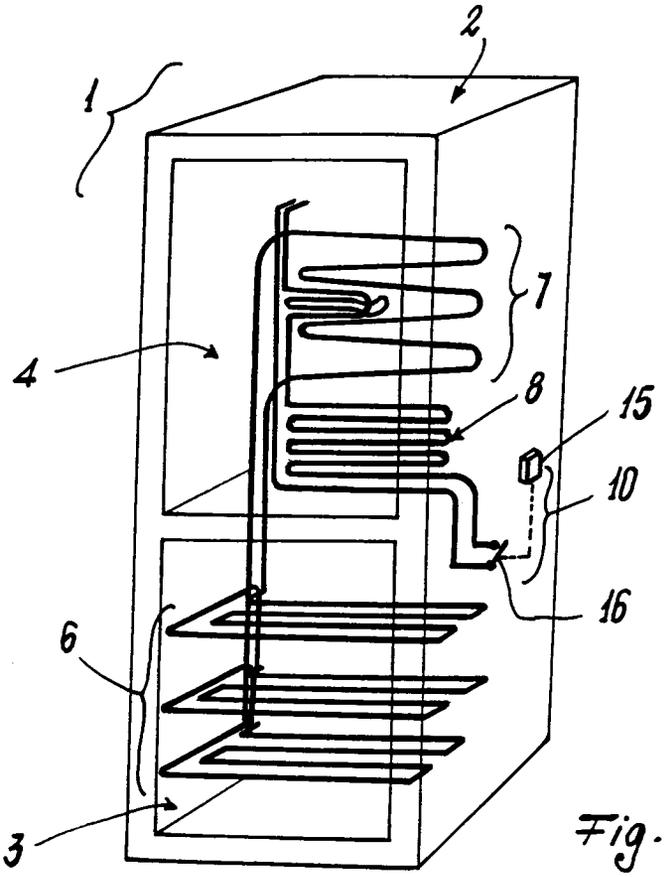

Fig. 1

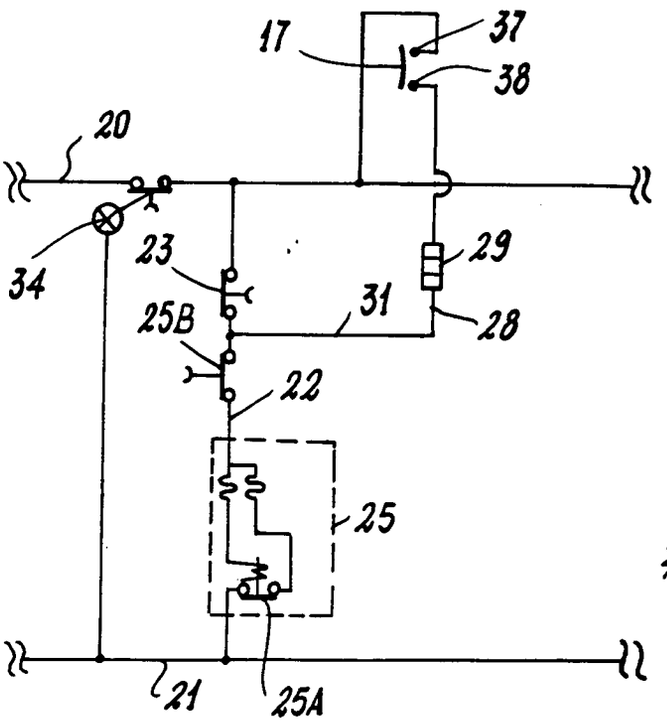

Fig. 2