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(54) CONTROL METHOD FOR REFRIGERATOR

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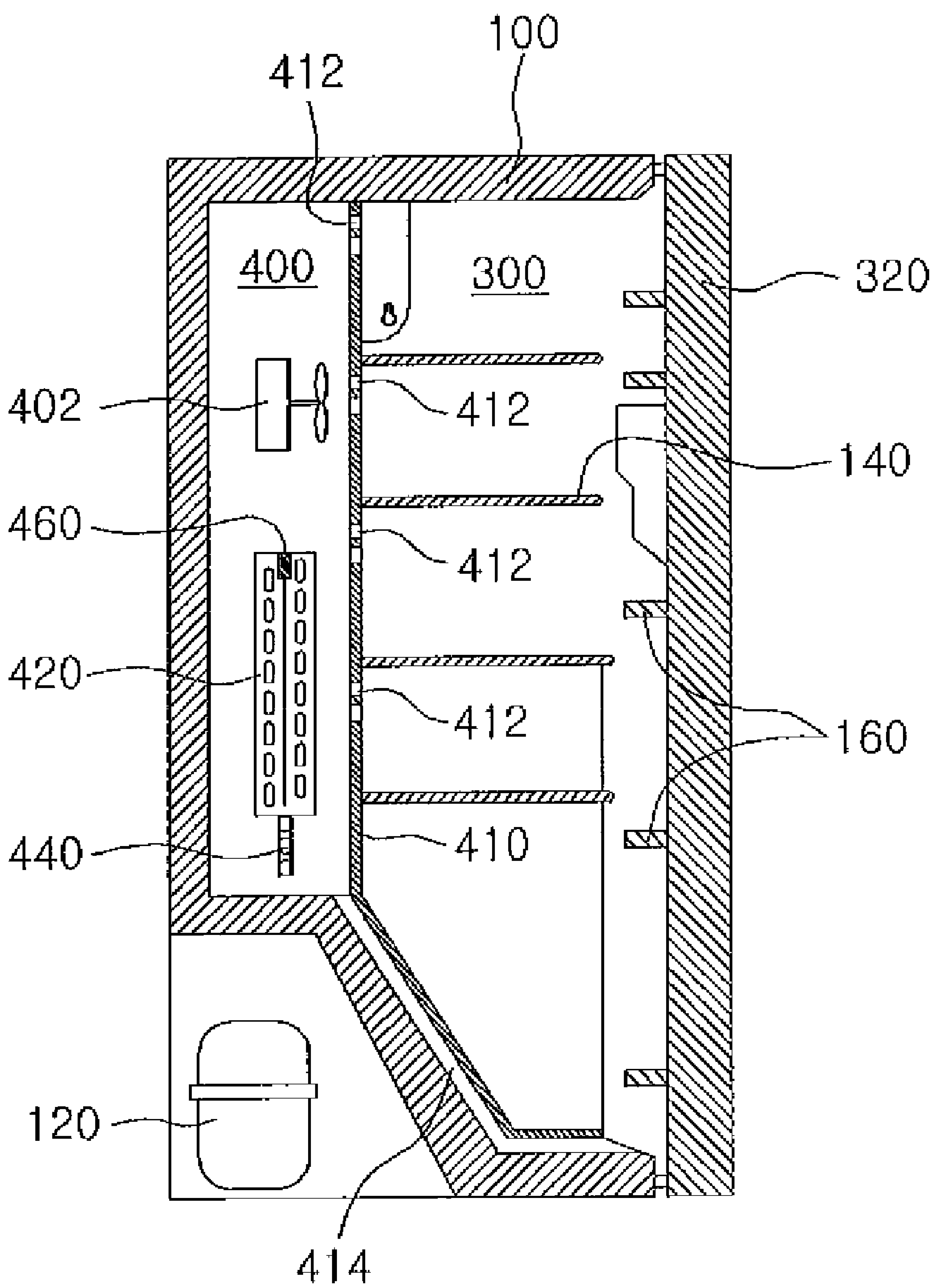
(57) **ABSTRACT**

A control method for a refrigerator is provided. In the method, operating conditions of a compressor are determined through a defrost sensor mounted to an evaporator to reduce power consumption. Because the operating conditions of the compressor are determined according to the temperature of the evaporator, cooling efficiency of the refrigerator can be improved, and power consumption can be reduced.



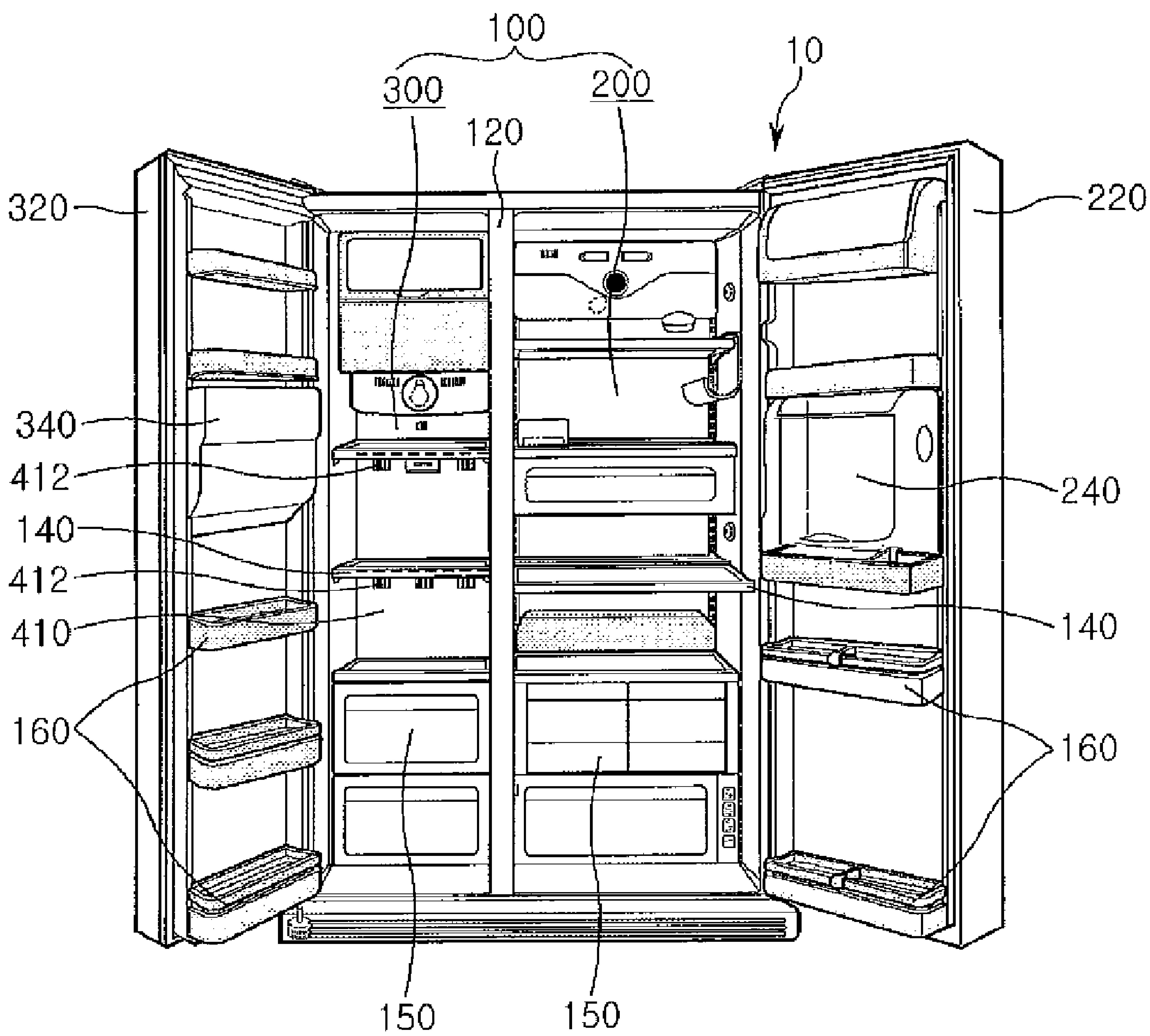

100
300
200
10
120
320
220
340
412
240
140
412
140
410
160
160
150
150

FIG.1

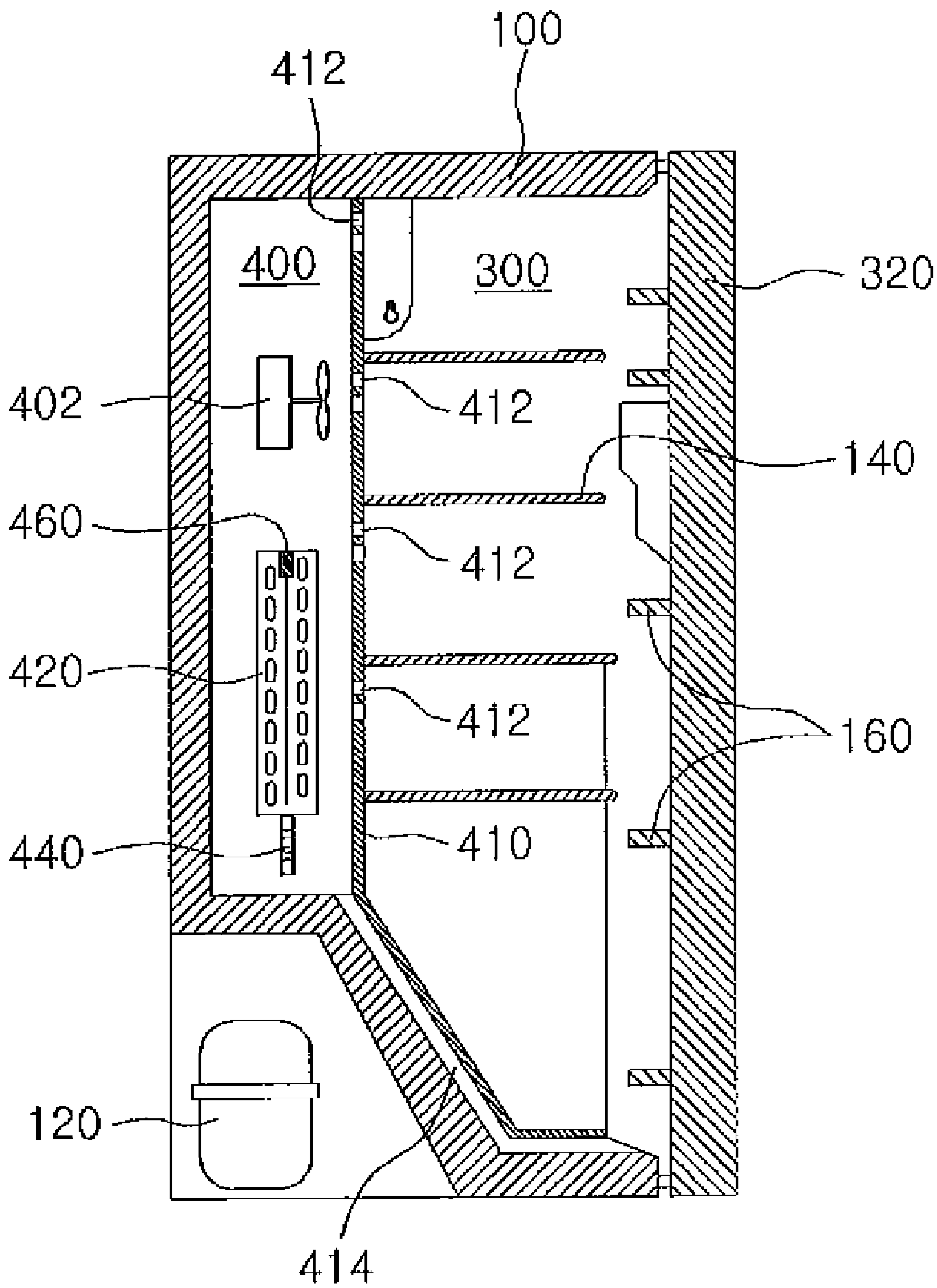

100
412
400
300
320
402
412
140
460
412
420
412
160
440
410
120
414

FIG.2

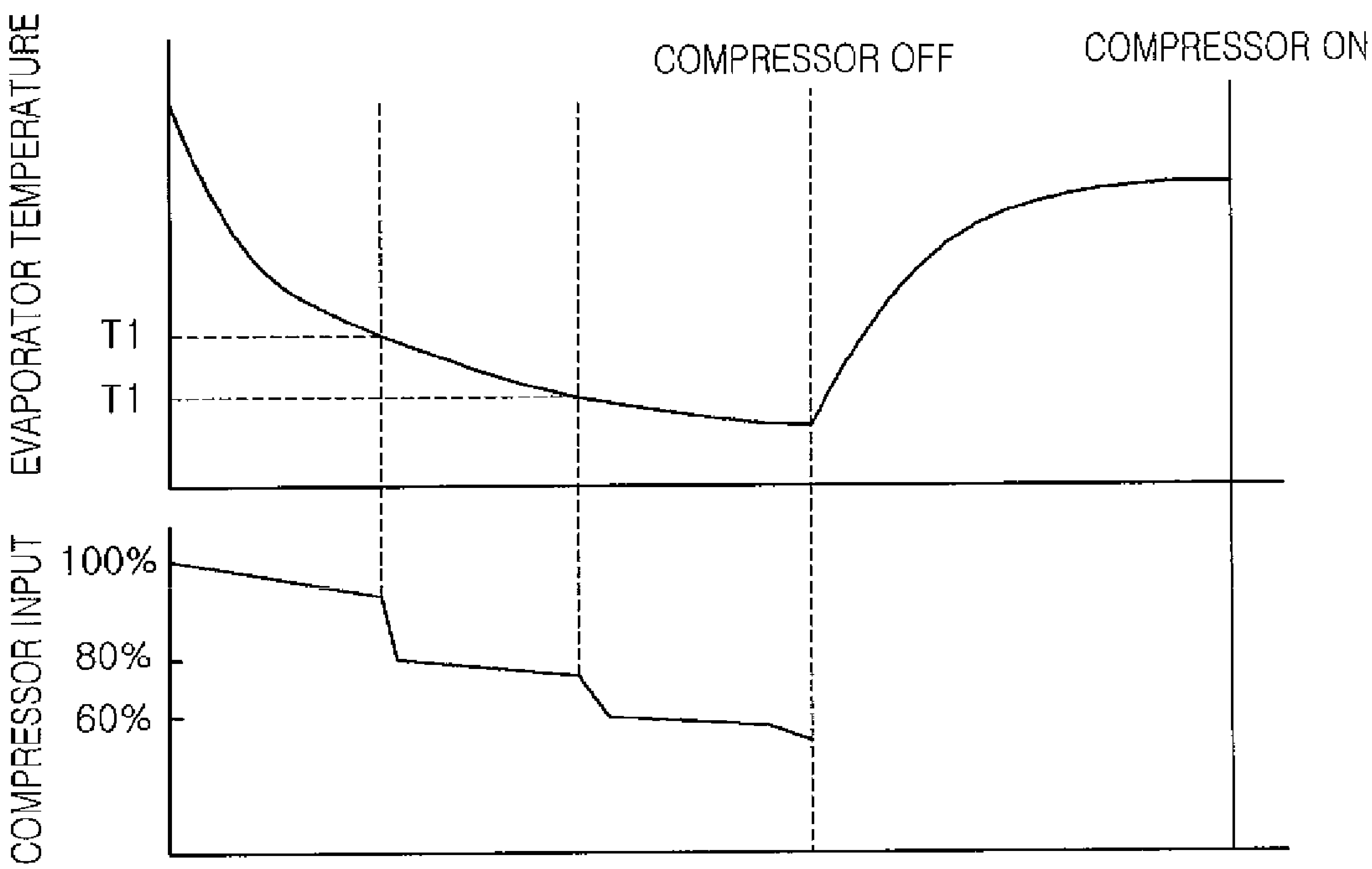

EVAPORATOR TEMPERATURE
COMPRESSOR OFF
COMPRESSOR ON
T1
T1
COMPRESSOR INPUT
100%
80%
60%

FIG.3

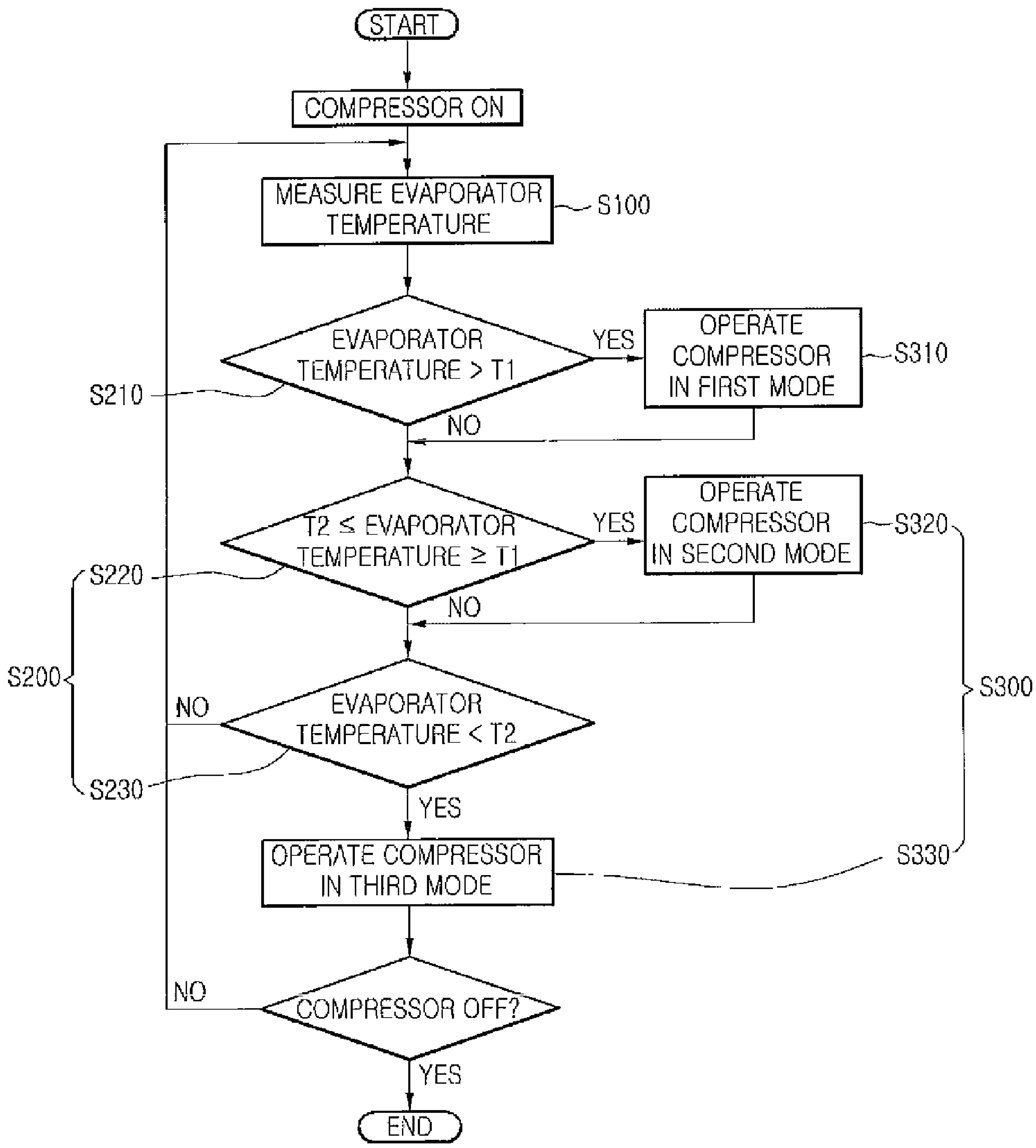

START
COMPRESSOR ON
MEASURE EVAPORATOR TEMPERATURE
S100
EVAPORATOR TEMPERATURE > T1
YES
OPERATE COMPRESSOR IN FIRST MODE
S310
S210
NO
T2 ≤ EVAPORATOR TEMPERATURE ≥ T1
YES
OPERATE COMPRESSOR IN SECOND MODE
S320
S220
NO
S200
NO
EVAPORATOR TEMPERATURE < T2
S300
S230
YES
OPERATE COMPRESSOR IN THIRD MODE
S330
NO
COMPRESSOR OFF?
YES
END

FIG.4

CONTROL METHOD FOR REFRIGERATOR

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority under 35 U.S.C. 119 and 35 U.S.C. 365 to Korean Patent Application No. 10-2007-0084391 (filed on Aug. 22, 2007), which is hereby incorporated by reference in its entirety.

BACKGROUND

[0002] The present disclosure relates to a control method for a refrigerator that measures the temperature of an evaporator through a defrost sensor mounted to the evaporator, and controls the operating capacity of a compressor according to the temperature of the evaporator, in order to improve the efficiency of the compressor.

[0003] In general, a refrigerator is an apparatus for storing foods at low temperature, and is configured to store foods according to type in frozen or refrigerated states.

[0004] Refrigerators can be categorized into top mounted refrigerators with a freezer compartment provided above a refrigeration compartment, bottom freezer refrigerators with a freezer compartment provided below a refrigeration compartment, and side-by-side refrigerators with a freezer compartment and a refrigeration compartment partitioned to the left and right of one another.

[0005] Due to a modern trend of enlarging and providing multifunctional refrigerators, brought about by diversifying user preferences and changing eating habits, a wide range of products with different configurations is being marketed.

[0006] The inside of a refrigerator is cooled by continually supplied cold air generated through heat exchange of refrigerant in a repeating compression-condensation-expansion-evaporation cycle.

[0007] Evaporation of refrigerant is performed by an evaporator provided within the refrigerator, and cold air formed with the evaporator is uniformly circulated throughout the inside of the refrigerant by means of convection currents, to enable food to be stored in the refrigerator at a desired temperature.

[0008] That is, temperatures within a refrigerator are maintained through performing or deactivating a cooling cycle according to temperatures sensed by temperature sensors provided in the freezer compartment and refrigeration compartment.

[0009] Also, a defrost sensor is mounted at a side of the evaporator, and it is determined from the temperature of the evaporator sensed by the defrost sensor whether or not to implement defrosting.

[0010] However, in a refrigerator according to the related art configured as described above, the following limitations are inherent.

[0011] Because operation of a related art refrigerator is controlled based primarily on data from the temperature sensors provided in the freezer compartment and refrigeration compartment, and a compressor that compresses refrigerant is always driven at full capacity while the refrigerator operates, the efficiency of the refrigerator is compromised.

[0012] Additionally, because the compressor is driven at full capacity, power consumption of the refrigerator is unfavorable.

[0013] Furthermore, because a related art defrost sensor is used only for defrosting operation, its utility is restricted.

SUMMARY

[0014] Embodiments provide a control method of a refrigerator that controls operating conditions of a compressor through a defrost sensor mounted to an evaporator, instead of through temperature sensors in a freezer compartment and a refrigeration compartment.

[0015] Embodiments also provide a control method of a refrigerator that uses a defrost sensor mounted to an evaporator to adjust the operating capacity (or operating conditions) of a compressor, to reduce power consumption of the refrigerator.

[0016] In one embodiment, a control method of a refrigerator includes: measuring a temperature of an evaporator with a temperature sensor provided at a side of the evaporator; comparing the measured temperature of the evaporator to a reference temperature; and determining operating condition of a compressor according to results of the comparison of the temperatures.

[0017] According to a control method for a refrigerator according to the present disclosure, because the operating capacity of the compressor can be controlled according to the temperature of the evaporator, cooling efficiency of the refrigerator can be increased.

[0018] Also, because the compressor is not always operated at full capacity, power consumption of the refrigerator can be reduced. In other words, even if the cooling cycle is being performed due to the temperatures in the freezer compartment and the refrigeration compartment being higher than set temperatures, the operating conditions of the compressor are determined based on the temperature of the evaporator sensed by the defrost sensor, so that the compressor does not always have to be operated at maximum capacity. Accordingly, power consumption of the refrigerator can be reduced to economically benefit the consumer of the refrigerator and increase product satisfaction.

[0019] Moreover, operating noise of the compressor can be reduced, thus providing the added advantage of reducing dissatisfaction arising from excessive noise.

[0020] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. **1** is a frontal perspective view showing the inside of a refrigerator, to which the control method for a refrigerator according to embodiments of the present disclosure is applied.

[0022] FIG. **2** is a side sectional view of the refrigerator in FIG. **1**.

[0023] FIG. **3** is a graph showing a process for controlling pressure of a compressor according to the temperature of an evaporator in a refrigerator according to embodiments of the present disclosure.

[0024] FIG. **4** is a flowchart showing a control method for a refrigerator according to embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] Reference will now be made in detail to the embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. While a side-by-side refrigerator is described as an example of a refrigerator for the sake of descriptive convenience, it should be noted that the present disclosure may be applied to all types of refrigerators.

[0026] FIG. **1** is a frontal perspective view showing the inside of a refrigerator, to which the control method for a refrigerator according to embodiments of the present disclosure is applied, and FIG. **2** is a side sectional view of the refrigerator in FIG. **1**.

[0027] Referring to FIGS. **1** and **2**, a refrigerator **10** according to embodiments of the present disclosure includes a main body **100** partitioned into a freezer compartment **300** and a refrigeration compartment **200** by a barrier **120**, a freezer compartment door **320** pivotably provided at the front of the freezer compartment **300**, and a refrigeration compartment door **220** pivotably provided at the front of the refrigeration compartment **200**.

[0028] According to the type of product, the refrigeration compartment door **220** may be provided with a home bar **240**, and the freezer compartment door **320** may be provided with a dispenser **340**.

[0029] In addition, a plurality of door baskets **160** may be provided on the rear surfaces of the refrigeration compartment door **220** and the freezer compartment door **320** to store a wide range of foods by type.

[0030] The freezer compartment **300** and the refrigeration compartment **200** may be divided into a plurality of levels by means of a plurality of shelves **140**, and a plurality of storage containers **150** for storing food by type may be provided on the divided levels.

[0031] The storage containers **150** may be divided into a vegetable box for storing vegetables, and drawers defining multipurpose storage spaces, and the vegetable box and drawers may be mounted within the freezer compartment **300** and/or refrigeration compartment **200**, configured to be withdrawn by being slid forward.

[0032] An evaporation chamber **400** is defined at the rear of the freezer compartment **300**. The evaporation chamber **400** is defined between the main body **100** and the rear wall **410** of the freezer compartment **300**. In detail, a plurality of cold air discharge holes **412** is defined in the rear wall **410** of the freezer compartment, to discharge cold air generated in the evaporation chamber **400** into the freezer compartment **300**.

[0033] An evaporator **420** for generating cold air through heat exchanging of refrigerant is provided in the evaporation chamber **400**. In detail, the cold air generated by the evaporator **420** is forcefully circulated by a cooling fan **402** provided above the evaporator **420**, to be discharged through the cold air discharging holes **412** into the freezer compartment **300**.

[0034] The cold air circulating inside the freezer compartment **300** returns to the evaporation chamber **400** through a cold air return duct **414** defined at the lower portion of the main body **100**.

[0035] The cold air that returns through the cold air return duct **414** exchanges heat again in the evaporation chamber **400**, and is discharged again by the cooling fan **402** into the freezer compartment **300**. This circulation process is performed repeatedly to cool the freezer compartment **300** to a predetermined temperature. The cold air supplied into the freezer compartment **300** is also supplied to the refrigeration compartment **200** through a connecting passage (not shown) defined in the barrier **120**. In another method, the evaporation chamber **400** extends to behind the rear wall of the refrigeration compartment **200**, and cold air discharge holes are also defined in the rear wall of the refrigeration compartment **200**, so that cold air can be directly supplied from the evaporation chamber **400** to the refrigeration compartment **200**.

[0036] A defrost heater **440** for removing frost forming on the evaporator **420** is provided below the evaporator **420**. The defrost heater **440** radiates heat at predetermined intervals to remove frost, and is configured with a defrost sensor **460** provided at the top of the evaporator **420** to selectively shut off power to the defrost heater **440**.

[0037] The defrost sensor **460** is fixed firmly against the surface of the evaporator **420** to measure the temperature at the surface of the evaporator **420**, in order to determine whether or not to perform defrosting according to the surface temperature of the evaporator **420**. Also, in the present disclosure, the operating conditions (capacity) of the compressor **120** are determined according to the temperature of the evaporator **420** measured by the defrost sensor **460**.

[0038] The compressor **120** for compressing refrigerant to a high temperature and pressure is disposed at the lower portion to the outside of the freezer compartment **300** (as shown in FIG. **2**), that is, at the rear surface and the bottom of the main body **100**. The compressor **120** provided may be a linear compressor or an inverter compressor, whose operating conditions are controlled by input power.

[0039] The compressor **120** is connected through a pipe to the evaporator **420**, has its operating conditions controlled according to the temperature sensed by the defrost sensor **460** provided at the top, side surface of the evaporator **420**, and is switched ON/OFF by means of a temperature sensor (not shown) provided in the freezer compartment **300**.

[0040] Below, a detailed description will be given of a control method for a refrigerator configured as above according to the present disclosure, with reference to FIGS. **3** and **4**.

[0041] FIG. **3** is a graph showing a process for controlling pressure of a compressor according to the temperature of an evaporator in a refrigerator according to embodiments of the present disclosure, and FIG. **4** is a flowchart showing a control method for a refrigerator according to embodiments of the present disclosure.

[0042] Referring to FIG. **3**, when the refrigerator operates, the defrost sensor temperature (or, the temperature of the evaporator) gradually falls, and the inside of the refrigerator is cooled correspondingly to the temperature of the defrost sensor. Here, the operating conditions of the compressor are controlled through controlling the input power to the compressor in a plurality of levels according to the temperature of the evaporator.

[0043] Specifically, when the temperature at the defrost sensor exceeds a temperature T**1**, the input power to the compressor may be 100% to drive the compressor at full capacity. When the temperature at the defrost sensor is less than a temperature T**2**, the input power to the compressor may be 60% to drive the compressor at minimum capacity. When the temperature at the defrost sensor is between temperatures T**1** and T**2**, the input power to the compressor may be 80% to drive the compressor at medium capacity.

[0044] Referring to FIG. **4**, after the refrigerator is operated, the defrost sensor is used to perform a measurement of the evaporator temperature in operation S**100**. Then, in operation S**200**, a comparison is performed of the evaporator temperature measured in operation S**100** with reference temperatures T**1** and T**2**.

[0045] Operation S200 is performed a plurality of times, and a compressor controlling operation S300 is performed many times to control the operating conditions of the compressor according to the results of the temperature comparison in operation S200.

[0046] In detail, when it is determined in operation S210 that the evaporator temperature exceeds T1, an input power of 100% is applied to the compressor to drive it at full capacity in a first mode in operation S310 to quickly cool the inside of the refrigerator.

[0047] When it is determined in operation S220 that the evaporator temperature is greater than T2 and less than T1, an input power of 80% that is less than that applied in operation S310 is applied to the compressor to drive it in a second mode in operation S320. Then, when it is determined in operation S230 that the evaporator temperature is less than T2, an input power of 60% that is less than that applied in operation S320 is applied to the compressor to drive it at minimum capacity in a third mode in operation S330. When it is determined through the temperature sensors mounted in the freezer compartment and the refrigeration compartment that the temperatures inside the refrigerator have reached adequate levels, the compressor is turned off. When it is determined that the temperatures within the refrigerator are not within a set temperature range, the compressor is reactivated, and operations S100 to S300 are performed again.

[0048] Any reference in this specification to "one embodiment," "an embodiment," "exemplary embodiment," etc., means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the disclosure. The appearances of such phrases in various places in the specification are not necessarily all referring to the same embodiment. Further, when a particular feature, structure, or characteristic is described in connection with any embodiment, it is submitted that it is within the purview of one skilled in the art to affect such feature, structure, or characteristic in connection with others of the embodiments.

[0049] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

What is claimed is:

1. A control method for a refrigerator, comprising:
measuring a temperature of an evaporator with a temperature sensor provided at a side of the evaporator;
comparing the measured temperature of the evaporator to a reference temperature; and
determining operating conditions of a compressor according to result of the comparison of the temperatures.

2. The control method according to claim 1, wherein the operating condition of the compressor is varied according to the result of the comparison of the temperatures.

3. The control method according to claim 1, wherein the operating condition of the compressor, according to the result of the comparing of the temperatures, comprises at least two modes.

4. The control method according to claim 1, wherein the temperature sensor is a defrost sensor.

5. The control method according to claim 1, wherein the operating condition of the compressor comprises:
a first operating mode performed when the temperature of the evaporator exceeds a set temperature range;
a second operating mode performed when the temperature of the evaporator lies within the set temperature range; and
a third operating mode performed when the temperature of the evaporator is below the set temperature range.

6. The control method according to claim 5, wherein
the compressor is operated with 100% input power in the first operating mode,
the compressor is operated with 80% input power in the second operating mode, and
the compressor is operated with 60% input power in the third operating mode.

7. The control method according to claim 1, wherein the operating condition of the compressor comprises modes determined through controlling input power to the compressor.

8. The control method according to claim 1, wherein operation of the compressor is stopped when a temperature within the refrigerator reaches a set temperature.

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