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(54) **REFRIGERATOR AND CONTROLLING METHOD THEREOF**

KÜHLSCHRANK UND STEUERUNGSVERFAHREN DAFÜR

RÉFRIGÉRATEUR ET SON PROCÉDÉ DE COMMANDE

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Description

[0001] The present disclosure relates to a refrigerator and a control method thereof.

[Background Art]

[0002] JP S59 180 265 A relates to a device for detecting frost buildup in an evaporator in a refrigeration device such as a freezer or refrigerator which has an evaporator and an air circulation device such as a blower in a cooling compartment and cools the contents by circulating cold air.

[0003] JP H01 312 378 A relates to a frost sensor provided between cooling fins in proximity to the fin, which comprises a thermistor as a temperature sensing element and a heater, and which is connected to plus and minus terminals of a comparator through resistances. When the heater is energized in an unfrosted condition, the resistance of the thermistor is lowered, whereas when the heater is energized in a frosted condition, the resistance is raised.

[0004] CA 950 555 A relates to a frost detector for an air-cooling refrigeration system having an evaporator coil mounted in a main airflow duct being comprised of a first bypass duct connected to the main duct on each side of the coil and a second reference bypass duct connected to each side of a constriction in the outlet side of the main duct downstream from the coil.

[0005] Refrigerators are household appliances that are capable of store objects such as foods at a low temperature in a storage chamber provided in a cabinet. Since the storage space is surrounded by heat insulation wall, the inside of the storage space may be maintained at a temperature less than an external temperature.

[0006] The storage space may be classified into a refrigerating storage space or a freezing storage space according to a temperature range of the storage space.

[0007] The refrigerator may further include an evaporator for supplying cool air to the storage space. Air in the storage space is cooled while flowing to a space, in which the evaporator is disposed, so as to be heat-exchanged with the evaporator, and the cooled air is supplied again to the storage space.

[0008] Here, if the air heat-exchanged with the evaporator is contained in moisture, when the air is heat-exchanged with the evaporator, the moisture is frozen on a surface of the evaporator to generate frost on the surface of the evaporator.

[0009] Since flow resistance of the air acts on the frost, the more an amount of frost frozen on the surface of the evaporator increases, the more the flow resistance increases. As a result, heat-exchange efficiency of the evaporator may be deteriorated, and thus, power consumption may increase.

[0010] Thus, the refrigerator further includes a defroster for removing the frost on the evaporator.

[0011] A defrosting cycle variable method is disclosed

in Korean Patent Publication No. 2000-0004806 that is a prior art document.

[0012] In the prior art document, the defrosting cycle is adjusted using a cumulative operation time of the compressor and an external temperature.

[0013] However, like the prior art document, when defrosting cycle is determined only using the cumulative operation time of the compressor and the external temperature, an amount of frost (hereinafter, referred to as a frost generation amount) on the evaporator is not reflected. Thus, it is difficult accurately determine the time point at which the defrosting is required.

[0014] That is, the frost generation amount may increase or decrease according to various environments such as the user's refrigerator usage pattern and the degree to which air retains moisture. In the case of the prior art document, there is a disadvantage in that the defrosting cycle is determined without reflecting the various environments.

[0015] Moreover, in the case of the prior literature, there is a disadvantage that it is difficult to identify an exact defrost time point since the amount of local frost of the evaporator can be detected but the amount of frost on the entire evaporator cannot be detected.

[0016] Accordingly, there is a disadvantage in that the defrosting does not start despite a large amount of generated frost to deteriorate cooling performance, or the defrosting starts despite a low frost generation amount to increase in power consumption due to the unnecessary defrosting.

The invention is set out in the appended set of claims. Any references in the following description to embodiments, objects, aspects and/or examples which are not covered by the appended claims are considered as not being part of the present invention.

[0017] An object of the present disclosure is to provide a refrigerator and a control method thereof, which determines a time point for a defrosting operation using parameters that vary depending on the amount of frost on an evaporator.

[0018] In addition, an object of the present disclosure is to provide a refrigerator and a control method thereof, which accurately determine a time point at which defrosting is necessary according to the amount of frost on an evaporator using a sensor having an output value that varies depending on the flow rate of air.

[0019] In addition, another object of the present disclosure is to provide a refrigerator and a control method thereof, which accurately determine a defrosting time point even when the precision of a sensor used to determine the defrosting time point is low.

[0020] In addition, still another object of the present disclosure is to provide a refrigerator and a control method thereof, in which a detection logic for detecting an amount of frost on an evaporator may be executed at an appropriate time point.

[0021] In addition, still another object of the present disclosure is to provide a refrigerator and a control method

od thereof, which improve reliability in consideration of changes in an external environment in a process of detecting an amount of frost on an evaporation.

[Technical Solution]

[0022] In order to solve the above problems, a control method of a refrigerator includes all the features of claim 1.

[0023] Preferred embodiments are defined in the dependent claims.

[0024] In order to solve the above problems, a refrigerator includes all the features of independent claim 8.

[Advantageous Effects]

[0025] According to the proposed invention, since the time point at which the defrosting is required is determined using the sensor having the output value varying according to the amount of frost generated on the evaporator in the bypass passage, the time point at which the defrosting is required may be accurately determined.

[0026] In addition, even when the precision of a sensor used to determine a defrost time point is low, it is possible to accurately determine the defrost time point, thus significantly reducing the cost of the sensor.

[0027] In addition, since a detection logic for detecting the amount of frost on the evaporator may be performed at an appropriate time point, reducing power consumption and improving convenience.

[0028] In addition, since changes in external environments (e.g., internal refrigerator load) are considered in a process of detecting the amount of frost of the evaporator, product reliability is improved.

[Description of Drawings]

[0029]

FIG. 1 is a schematic longitudinal cross-sectional view of a refrigerator according to an embodiment of the present invention.

FIG. 2 is a perspective view of a cool air duct according to an embodiment of the present invention.

FIG. 3 is an exploded perspective view illustrating a state in which a passage cover and a sensor are separated from each other in the cool air duct.

FIG. 4 is a view illustrating a flow of air in a heat exchange space and a bypass passage before and after frost is generated.

FIG. 5 is a schematic view illustrating a state in which a sensor is disposed in the bypass passage.

FIG. 6 is a view of the sensor according to an embodiment of the present invention.

FIG. 7 is a view illustrating a thermal flow around the sensor depending on a flow of air flowing through the bypass passage.

FIG. 8 is a control block diagram of a refrigerator

according to an embodiment of the present disclosure.

FIG. 9 is a flow chart showing a control method for detecting an amount of frost on an evaporator according to an embodiment of the present disclosure.

FIG. 10 is a flowchart showing a method of performing a defrost operation by determining a time point when a refrigerator needs to be defrosted according to an embodiment of the present disclosure.

FIG. 11 is a view showing changes in a temperature of a heat generating element according to the turning on/off of the heat generating element before and after frost on the evaporator according to an embodiment of the present disclosure.

FIG. 12 is a flow chart showing a control method for determining an operating time point of a heat generating element according to an embodiment of the present disclosure.

[Mode for Invention]

[0030] Hereinafter, some embodiments of the present invention will be described in detail with reference to the accompanying drawings. Exemplary embodiments of the present invention will be described below in more detail with reference to the accompanying drawings. It is noted that the same or similar components in the drawings are designated by the same reference numerals as far as possible even if they are shown in different drawings. Further, in description of embodiments of the present disclosure, when it is determined that detailed descriptions of well-known configurations or functions disturb understanding of the embodiments of the present disclosure, the detailed descriptions will be omitted.

[0031] Also, in the description of the embodiments of the present disclosure, the terms such as first, second, A, B, (a) and (b) may be used. Each of the terms is merely used to distinguish the corresponding component from other components, and does not delimit an essence, an order or a sequence of the corresponding component. It should be understood that when one component is "connected", "coupled" or "joined" to another component, the former may be directly connected or jointed to the latter or may be "connected", coupled" or "joined" to the latter with a third component interposed therebetween.

[0032] Fig. 1 is a schematic longitudinal cross-sectional view of a refrigerator according to an embodiment of the present invention, Fig. 2 is a perspective view of a cool air duct according to an embodiment of the present invention, and Fig. 3 is an exploded perspective view illustrating a state in which a passage cover and a sensor are separated from each other in the cool air duct.

[0033] Referring to Figs. 1 to 3, a refrigerator 1 according to an embodiment of the present invention may include an inner case 12 defining a storage space 11.

[0034] The storage space may include one or more of a refrigerating storage space and a freezing storage space.

[0035] A cool air duct 20 providing a passage, through

which cool air supplied to the storage space 11 flows, in a rear space of the storage space 11. Also, an evaporator 30 is disposed between the cool air duct 20 and a rear wall 13 of the inner case 12. That is, a heat exchange space 222 in which the evaporator 30 is disposed is defined between the cool air duct 20 and the rear wall 13.

[0036] Thus, air of the storage space 11 may flow to the heat exchange space 222 between the cool air duct 20 and the rear wall 13 of the inner case 12 and then be heat-exchanged with the evaporator 30. Thereafter, the air may flow through the inside of the cool air duct 20 and then be supplied to the storage space 11.

[0037] The cool air duct 20 may include, but is not limited thereto, a first duct 210 and a second duct 220 coupled to a rear surface of the first duct 210.

[0038] A front surface of the first duct 210 is a surface facing the storage space 11, and a rear surface of the first duct 220 is a surface facing the rear wall 13 of the inner case 12.

[0039] A cool air passage 212 may be provided between the first duct 210 and the second duct 220 in a state in which the first duct 210 and the second duct 220 are coupled to each other.

[0040] Also, a cool air inflow hole 221 may be defined in the second duct 220, and a cool air discharge hole 211 may be defined in the first duct 210.

[0041] A blower fan (not shown) may be provided in the cool air passage 212. Thus, when the blower fan rotates, air passing through the evaporator 13 is introduced into the cool air passage 212 through the cool air inflow hole 221 and is discharged to the storage space 11 through the cool air discharge hole 211.

[0042] The evaporator 30 is disposed between the cool air duct 20 and the rear wall 13. Here, the evaporator 30 may be disposed below the cool air inflow hole 221.

[0043] Thus, the air in the storage space 11 ascends to be heat-exchanged with the evaporator 30 and then is introduced into the cool air inflow hole 221.

[0044] According to this arrangement, when an amount of frost generated on the evaporator 30 increases, an amount of air passing through the evaporator 30 may be reduced to deteriorate heat exchange efficiency.

[0045] In this embodiment, a time point at which defrosting for the evaporator 30 is required may be determined using a parameter that is changed according to the amount of frost generated on the evaporator 30.

[0046] The cool air duct 20 further includes a frost generation sensing portion configured so that at least a portion of the air flowing through the heat exchange space 222 is bypassed and configured to determine a time point, at which the defrosting is required, by using the sensor having a different output according to a flow rate of the air.

[0047] The frost generation sensing portion includes a bypass passage 230 bypassing at least a portion of the air flowing through the heat exchange space 222 and a sensor 270 disposed in the bypass passage 230.

[0048] The bypass passage 230 is provided in a recessed shape in the first duct 210. Alternatively, the bypass passage 230 may be provided in the second duct 220.

[0049] The bypass passage 230 is provided by recessing a portion of the first duct 210 or the second duct 220 in a direction away from the evaporator 30.

[0050] The bypass passage 230 may extend from the cool air duct 20 in a vertical direction.

[0051] The bypass passage 230 may be disposed to face the evaporator 30 within a left and right width range of the evaporator 30 so that the air in the heat exchange space 222 is bypassed to the bypass passage 230.

[0052] The frost generation sensing portion may further include a passage cover 260 that allows the bypass passage 230 to be partitioned from the heat exchange space 222.

[0053] The passage cover 260 may be coupled to the cool air duct 20 to cover at least a portion of the bypass passage 230 extending vertically.

[0054] The passage cover 260 may include a cover plate 261, an upper extension portion 262 extending upward from the cover plate 261, and a barrier 263 provided below the cover plate 261.

[0055] Fig. 4 is a view illustrating a flow of air in the heat exchange space and the bypass passage before and after frost is generated.

[0056] (a) of Fig. 4 illustrates a flow of air before frost is generated, and (b) of Fig. 4 illustrates a flow of air after frost is generated. In this embodiment, as an example, it is assumed that a state after a defrosting operation is complicated is a state before frost is generated.

[0057] First, referring to (a) of Fig. 4, in the case in which frost does not exist on the evaporator 30, or an amount of generated frost is remarkably small, most of the air passes through the evaporator 30 in the heat exchange space 222 (see arrow A). On the other hand, some of the air may flow through the bypass passage 230 (see arrow B).

[0058] Referring to (b) of Fig. 4, when the amount of frost generated on the evaporator 30 is large (when the defrosting is required), since the frost of the evaporator 30 acts as flow resistance, an amount of air flowing through the heat exchange space 222 may decrease (see arrow C), and an amount of air flowing through the bypass passage 230 may increase (see arrow D).

[0059] As described above, the amount (or flow rate) of air flowing through the bypass passage 230 varies according to an amount of frost generated on the evaporator 30.

[0060] The sensor 270 has an output value that varies according to a change in flow rate of the air flowing through the bypass passage 230. Thus, whether the defrosting is required may be determined based on the change in output value.

[0061] Hereinafter, a structure and principle of the sensor 270 will be described.

[0062] Fig. 5 is a schematic view illustrating a state in

which the sensor is disposed in the bypass passage, Fig. 6 is a view of the sensor according to an embodiment of the present invention, and Fig. 7 is a view illustrating a thermal flow around the sensor depending on a flow of air flowing through the bypass passage.

[0063] Referring to Figs. 5 to 7, the sensor 270 is disposed at one point in the bypass passage 230. Thus, the sensor 270 may contact the air flowing along the bypass passage 230, and an output value of the sensor 270 may be changed in response to a change in a flow rate of air.

[0064] The sensor 270 may be disposed at a position spaced from each of an inlet 231 and an outlet 232 of the bypass passage 230. For example, the sensor 270 may be positioned a central portion of the bypass passage 230.

[0065] Since the sensor 270 is disposed on the bypass passage 230, the sensor 270 may face the evaporator 30 within the left and right width range of the evaporator 30.

[0066] The sensor 270 is a generated heat temperature sensor. Particularly, the sensor 270 includes a sensor PCB 271, a heat generating element 273 installed on the sensor PCB 271, and a sensing element 274 installed on the sensor PCB 271 to sense a temperature of the heat generating element 273.

[0067] The heat generating element 273 may be a resistor that generates heat when current is applied.

[0068] The sensing element 274 senses a temperature of the heat generating element 273.

[0069] When a flow rate of air flowing through the bypass passage 230 is low, since a cooled amount of the heat generating element 273 by the air is small, a temperature sensed by the sensing element 274 is high.

[0070] On the other hand, if a flow rate of the air flowing through the bypass passage 230 is large, since the cooled amount of the heat generating element 273 by the air flowing through the bypass passage 230 increases, a temperature sensed by the sensing element 274 decreases.

[0071] The sensor PCB 271 may determine a difference between a temperature sensed by the sensing element 274 in a state in which the heat generating element 273 is turned off and a temperature by the sensing element 274 in a state in which the heat generating element 273 is turned on.

[0072] The sensor PCB 271 may determine whether the difference value between the states in which the heat generating element 273 is turned on/off is less than a reference difference value.

[0073] Referring to Figs. 4 and 7, when an amount of frost generated on the evaporator 30 is small, a flow rate of air flowing to the bypass passage 230 is small. In this case, a heat flow of the heat generating element 273 is little, and a cooled amount of the heat generating element 273 by the air is small.

[0074] On the other hand, when the amount of frost generated on the evaporator 30 is large, a flow rate of air flowing to the bypass passage 230 is large. Then, the

heat flow and cooled amount of the heat generating element 273 are large by the air flowing along the bypass passage 230.

[0075] Thus, the temperature sensed by the sensing element 274 when the amount of frost generated on the evaporator 30 is large is less than that sensed by the sensing element 274 when the amount of frost generated on the evaporator 30 is small.

[0076] Thus, when the difference between the temperature sensed by the sensing element 274 in the state in which the heat generating element 273 is turned on and the temperature by the sensing element 274 in the state in which the heat generating element 273 is turned off is less than the reference temperature difference, it may be determined that the defrosting is required.

[0077] According to this embodiment, the sensor 270 may sense a variation in temperature of the heat generating element 273, which varies by the air of which a flow rate varies according to the amount of generated frost to accurately determine a time point, at which the defrosting is required, according to the amount of frost generated on the evaporator 30.

[0078] The sensor 270 may be further provided with a sensor housing 272 such that air flowing through the bypass passage 230 is prevented from directly contacting the sensor PCB 271, the heat generating element 273, and the temperature sensor 274. In a state in which the sensor housing 272 is opened at one side, an electric wire connected to the sensor PCB 271 may be drawn out and then the opened portion may be covered by a cover portion.

[0079] The sensor housing 271 may surround the sensor PCB 271, the heat generating element 273, and the temperature sensor 274.

[0080] FIG. 8 is a control block diagram of a refrigerator according to an embodiment of the present disclosure.

[0081] Referring to FIG. 8, the refrigerator 1 according to an embodiment of the present disclosure may include the sensor 270 described above, a defrosting device 50 operating for defrosting the evaporator 30, a compressor 60 for compressing refrigerant, a blowing fan 70 for generating air flow, and a controller 40 for controlling the sensor 270, the defrosting device 50, the compressor 60 and the blowing fan 70.

[0082] The defrosting device 50 may include, for example, a heater. When the heater is turned on, heat generated by the heater is transferred to the evaporator 30 to melt frost generated on the surface of the evaporator 30. The heater may be connected to one side of the evaporator 30, or may be disposed spaced apart from a position adjacent to the evaporator 30.

[0083] The compressor 60 is a device for compressing low-temperature low-pressure refrigerant into a high-temperature high-pressure supersaturated gaseous refrigerant. Specifically, the high-temperature high-pressure supersaturated gaseous refrigerant compressed in the compressor 60 flows into a condenser (not shown). The refrigerant is condensed into a high-temperature

high-pressure saturated liquid refrigerant, and the condensed high-temperature high-pressure saturated liquid refrigerant is introduced to an expander (not shown) and is expanded to a low-temperature low-pressure two-phase refrigerant.

[0084] Further, the low-temperature low-pressure two-phase refrigerant is evaporated as the low-temperature low-pressure gaseous refrigerant while passing through the evaporator 30. In this process, the refrigerant flowing through the evaporator 30 may exchange heat with outside air, that is, air flowing through the heat exchange space 222, thereby achieving air cooling.

[0085] The blowing fan 70 is provided in the cold air passage 212 to generate air flow. Specifically, when the blowing fan 70 is rotated, air passing through the evaporator 30 flows into the cold air passage 212 through the cool air inflow hole 221 and is then discharged to the storage compartment 11 through the cool air discharge hole 211.

[0086] The controller 40 may control the heat generating element 273 of the sensor 270 to be turned on at regular cycles.

[0087] In order to determine when defrosting is necessary, the heat generating element 273 may maintain a turned-on state for a predetermined period of time, and the temperature of the heat generating element 273 may be detected by the sensing element 274.

[0088] After the heat generating element 273 is turned on for the predetermined period of time, the heat generating element 274 is turned off, and the sensing element 274 may detect the temperature of the heat generating element 273 which is turned off. In addition, the sensor PCB 263 may determine whether the maximum value of the temperature difference between the turned-on/off state of the heat generating element 273 is equal to or less than a reference difference value.

[0089] In addition, it is determined that defrosting is necessary when the maximum value of the temperature difference between the turned-on/off states of the heat generating element 273 is equal to or less than the reference difference value, and the defrosting device 50 may be turned on by the controller 40.

[0090] Although it has been described above that the sensor PCB 263 determines whether the temperature difference between the turned-on/off states of the heat generating element 273 is equal to or less than the reference difference value, alternatively, the controller 40 may determine whether the temperature difference between the turned-on/off states of the heat generating element 273 is equal to or less than the reference difference value, and control the defrosting device 50 according to a result of the determination. That is, the sensor PCB 263 and the controller 40 may be electrically connected to each other.

[0091] Hereinafter, a method for detecting the amount of frost on the evaporator 30 using the heat generating element 273 will be described in detail with reference to the drawings.

[0092] FIG. 9 is a flow chart showing a control method for detecting an amount of frost on an evaporator according to an embodiment of the present disclosure. In the present embodiment, a method for detecting the amount of frost on the evaporator 30 in a state in which the storage compartment 11, for example, a freezing compartment is subjected to a cooling operation.

[0093] Referring to FIG. 9, in step S11, the heat generating element 27 is turned on.

[0094] Specifically, the heat generating element 273 is turned on in a state in which the cooling operation of the storage compartment 11 (e.g., freezing compartment) is performed.

[0095] Here, the state in which the cooling operation of the freezing compartment is performed may mean a state in which the compressor 60 and the blowing fan 70 are being driven.

[0096] As described above, when a change in the flow rate of the air increases as the amount of frost on the evaporator 30 is large or small, the detection accuracy of the sensor 260 is improved. That is, when the change in the flow rate of the air is large as the amount of frost on the evaporator 30 is large or small, the amount of change in the temperature detected by the sensor 270 becomes large, so that the time point at the defrosting is necessary may be accurately determined.

[0097] Therefore, it is possible to increase the accuracy of the sensor only when frost on the evaporator 30 is detected in a state in which air flow occurs, that is, the blowing fan 70 is being driven.

[0098] Next, in step S13, the temperature of the heat generating element 273 is detected when the heat generating element 273 is turned on.

[0099] The heat generating element 273 is turned on for a predetermined period of time, and the temperature (Ht1) of the heat generating element 273 may be detected by the sensing element at a certain time point in the state in which the heat generating element 273 is turned on.

[0100] As the period of time during which the heat generating element 273 is turned on increases, the temperature of the heat generating element 273 may gradually increase. Further, the temperature of the heat generating element 273 may increase gradually and converge to the highest temperature point.

[0101] On the other hand, when the amount of frost on the evaporator 30 is large, the flow rate of the air flowing into the bypass passage 230 increases, and thus the amount of cooling for the heat generating element 273 by air flowing through the bypass passage 230 may increase. Then, the highest temperature point of the heat generating element 273 may be set to be low by the air flowing through the bypass passage 230.

[0102] On the other hand, when the amount of frost on the evaporator 30 is small, the flow rate of the air flowing into the bypass passage 230 decreases, and thus the amount of cooling for the heat generating element 273 by air flowing through the bypass passage 230 decreases.

Then, the highest temperature point of the heat generating element 273 may be set to be high by the air flowing through the bypass passage 230.

[0103] The temperature of the heat generating element 273 is detected at a time point at which the heat generating element 273 is turned on. That is, in the present disclosure, it can be understood that the lowest temperature value of the heat generating element 273 is detected after the heat generating element 273 is turned on.

[0104] Next, in step S15, after the predetermined period of time has elapsed, the heat generating element 273 is turned off.

[0105] As an example, the heat generating element 273 may maintain in a turned-on state for three minutes and then turned off.

[0106] When the heat generating element 273 is turned off, the temperature of the heat generating element 273 may decrease rapidly due to the air flowing through the bypass passage 230.

[0107] As the period of time during which the heat generating element 273 is turned off increases, the temperature of the heat generating element 273 may rapidly decrease. In addition, the temperature of the heat generating element 273 may rapidly decrease, and then gradually decrease from a specific time point.

[0108] Next, in step S17, the temperature of the heat generating element 273 is detected in a state in which the heat generating element 273 is turned off.

[0109] Specifically, the temperature of the heat generating element 273 may be detected at a certain time point in a state the heat generating element 273 is turned off.

[0110] In the present embodiment, the temperature of the heat generating element 273 may be detected at a time point at which the heat generating element 273 is turned off. That is, in the present disclosure, it can be understood that the highest temperature value of the heat generating element 273 is detected after the heat generating element 273 is turned off.

[0111] Next, in step S19, the amount of frost on the evaporator 30 may be determined based on the temperature difference between the temperature detected in the state in which the heat generating element 273 is turned on and the temperature in the state in which the heat generating element 273 is turned off.

[0112] As described above, when the amount of frost on the evaporator 30 is large, the flow rate of the air flowing into the bypass passage 230 increases, and thus the amount of cooling for the heat generating element 273 by air flowing through the bypass passage 230 increases. Then, the detected highest temperature value of the heat generating element 273 become small, and as a result, the temperature difference between the lowest temperature value and the highest temperature value of the heat generating element 273 may become large.

[0113] Conversely, when the amount of frost on the evaporator 30 is small, the flow rate of the air flowing into the bypass passage 230 decreases, and thus the amount

of cooling for the heat generating element 273 by air flowing through the bypass passage 230 decreases. Then, the detected highest temperature value of the heat generating element 273 become large, and as a result, the temperature difference between the lowest temperature value and the highest temperature value of the heat generating element 273 may become small.

[0114] As described above, by detecting the lowest temperature value and the highest temperature value when the heat generating element 273 is turned on/off, the amount of cooling for the heat generating element 273 may be accurately determined by air flowing through the bypass passage 230.

[0115] In summary, when the temperature difference between the lowest temperature value and the highest temperature value of the heat generating element 273 is equal to or less than a reference value, it is determined that the amount of frost on the evaporator 30 is large. In addition, when it is determined that the amount of frost on the evaporator 30 is large, a defrosting operation is performed.

[0116] Hereinafter, a detailed method for detecting the amount of frost on the evaporator 30 described above will be described in detail with reference to the drawings.

[0117] FIG. 10 is a flowchart showing a method of performing a defrost operation by determining a time point when a refrigerator needs to be defrosted according to an embodiment of the present disclosure, and FIG. 11 is a view showing changes in a temperature of a heat generating element according to the turning on/off of the heat generating element before and after frost on the evaporator according to an embodiment of the present disclosure.

[0118] FIG. 11(a) shows a change in temperature of the freezing compartment and a change in temperature of the heat generating element before occurrence of frost on the evaporator 30, and FIG. 11(b) shows a change in temperature of the freezing compartment and a change in temperature of the heat generating element after occurrence of frost on the evaporator 30. In the present embodiment, it is assumed that a state before occurrence of frost is a state after a defrosting operation is completed.

[0119] Referring to FIGS. 10 and 11, in step S21, the heat generating element 27 is turned on.

[0120] Specifically, the heat generating element 27 may be turned on in a state in which the cooling operation is being performed on the storage compartment 11 (e.g., freezing compartment).

[0121] As an example, as shown in FIG. 11, the heat generating element 273 may be turned on at a certain time point S1 while the blowing fan 70 is being driven.

[0122] The blower fan 70 may be driven for a predetermined period of time to cool the freezing compartment. In this case, the compressor 60 may be driven at the same time. Therefore, when the blowing fan 70 is driven, the temperature Ft of the freezing compartment may decrease.

[0123] On the other hand, when the heat generating

element 273 is turned on, the temperature detected by the sensing element 274, that is, the temperature H_t of the heat generating element 273 may increase rapidly.

[0124] Next, in step S22, it may be determined whether the blowing fan 70 is turned on.

[0125] As described above, the sensor 270 may detect a change in temperature of the heat generating element 273, which is changed due to air of which the flow rate is changed according to the amount of frost on the evaporator 30. Therefore, when no air flow occurs, it is difficult for the sensor 270 to accurately detect the amount of frost on the evaporator 30.

[0126] When the blowing fan 70 is being driven, in step S23, the temperature H_{t1} of the heat generating element may be detected.

[0127] Specifically, the heat generating element 273 may be turned on for a predetermined period of time, and the temperature (H_{t1}) of the heat generating element 273 may be detected by the sensing element at a certain time point in the state in which the heat generating element 273 is turned on.

[0128] In the present embodiment, the temperature H_{t1} of the heat generating element 273 may be detected at a time point at which the heat generating element 273 is turned on. That is, in the present disclosure, the temperature immediately after the heat generating element 273 is turned on may be detected. Therefore, the detection temperature H_{t1} of the heat generating element may be defined as the lowest temperature in the state in which the heat generating element 273 is turned on.

[0129] Here, the temperature of the heat generating element 273 detected for the first time may be referred to as a "first detection temperature (H_{t1})".

[0130] Next, in step S24, it is determined whether a first reference time $T1$ has elapsed while the heat generating element 273 is turned on.

[0131] When the heat generating element 273 is maintained in the turned-on state, the temperature detected by the sensing element 274, that is, the temperature H_{t1} of the heat generating element 273 may continuously increase. However, when the heat generating element 273 is maintained in the turned-on state, the temperature of the heat generating element 273 may increase gradually and converge to the highest temperature point.

[0132] Here, the first reference time $T1$ for which the heat generating element 273 is maintained in the turned-on state may be 3 minutes, but is not limited thereto.

[0133] When a predetermined period of time has elapsed while the heat generating element 273 is turned on, in step S25, the heat generating element 273 is turned off.

[0134] As in FIG. 11, the heat generating element 273 may be turned on for the first reference time $T1$ and then turned off. When the heat generating element 273 is turned off, the heat generating element 273 may be rapidly cooled by air flowing through the bypass passage 230. Therefore, the temperature H_t of the heat generating element 273 may rapidly decrease.

[0135] However, when the turned-off state of the heat generating element 273 is maintained, the temperature H_t of the heat generating element may gradually decrease, and the decrease rate thereof is significantly reduced.

[0136] Next, in step S26, the temperature H_{t2} of the heat generating element may be detected.

[0137] That is, the temperature H_{t2} of the heat generating element is detected by the sensing element 273 at a certain time point $S2$ in a state in which the heat generating element 273 is turned off.

[0138] In the present embodiment, the temperature H_{t2} of the heat generating element may be detected at a time point at which the heat generating element 273 is turned off. That is, in the present disclosure, the temperature immediately after the heat generating element 273 is turned off may be detected. Therefore, the detection temperature H_{t2} of the heat generating element may be defined as the lowest temperature in the state in which the heat generating element 273 is turned off.

[0139] Here, the temperature of the heat generating element 273 detected for the second time may be referred to as a "second detection temperature (H_{t2})".

[0140] In summary, the temperature H_t of the heat generating element may be first detected at a time point $S1$ when the heat generating element 273 is turned on, and may be additionally detected at a time point $S2$ at which the heat generating element 273 is turned off. In this case, the first detection temperature H_{t1} that is detected for the first time may be the lowest temperature in the state in which the heat generating element 273 is turned on, and the second detection temperature H_{t2} that is additionally detected may be the highest temperature in the state in which the heat generating element 273 is turned off.

[0141] Next, in step S27, it is determined whether a temperature stabilization state has been achieved.

[0142] Here, the temperature stabilization state may mean a state in which internal refrigerator load does not occur, that is, a state in which the cooling of the storage compartment is normally performed. In other words, the fact that the temperature stabilization state is made may mean that the opening/closing of a refrigerator door is not performed or there are no defects in components (e.g., a compressor and an evaporator) for cooling the storage compartment or the sensor 270.

[0143] That is, the sensor 270 may accurately detect the amount of frost on the evaporator 30 by determining whether or not temperature stabilization has been achieved.

[0144] In the present embodiment, in order to determine the temperature stabilization state is achieved, it is possible to determine the amount of change in the temperature of the freezing compartment for a predetermined period of time. Alternatively, in order to determine the temperature stabilization state is achieved, it is possible to determine the amount of change in the temperature of the evaporator 30 for a predetermined period of

time.

[0145] For example, a state in which the amount of change in temperature of the freezing compartment or in temperature of the evaporator 30 during the predetermined period of time does not exceed 1.5 degrees may be defined as the temperature stabilization state.

[0146] As described above, the temperature H_t of the heat generating element may rapidly decrease immediately after the heat generating element 273 is turned off, and then the temperature H_t of the heat generating element may gradually decrease. Here, it is possible to determine whether temperature stabilization has been achieved by determining whether the temperature H_t of the heat generating element decreases normally after decreasing rapidly.

[0147] When the temperature stabilization state is achieved, in step S28, the temperature difference ΔH_t between the temperature H_{t1} detected when the heat generating element 273 is turned on and the temperature H_{t2} detected when the heat generating element 273 is turned off may be calculated.

[0148] In step S29, it is determined whether the temperature difference ΔH_t is less than a first reference temperature value.

[0149] Specifically, when the amount of frost on the evaporator 30 is large, the flow rate of the air flowing into the bypass passage 230 increases, and thus the amount of cooling for the heat generating element 273 by air flowing through the bypass passage 230 may increase. When the amount of cooling increases, the temperature H_{t2} of the heat generating element detected immediately after the heat generating element 273 is turned off may be relatively low compared to a case where the amount of frost on the evaporator 30 is small.

[0150] As a result, when the amount of frost on the evaporator 30 is large, the temperature difference ΔH_t is small. Accordingly, it is possible to determine the amount of frost on the evaporator 30 through the temperature difference ΔH_t . Here, the first reference temperature value may be 32 degrees, for example.

[0151] Next, when the temperature difference ΔH_t is less than the first reference temperature value, in step S30, a defrosting operation is performed.

[0152] When the defrosting operation is performed, the defrosting device 50 is driven and heat generated by the heater is transferred to the evaporator 30 so that the frost generated on the surface of the evaporator 30 is melted.

[0153] On the other hand, in step S27, when the temperature stabilization state is not achieved or, in step S29, when the temperature difference ΔH_t is greater than or equal to the first reference temperature value, the algorithm ends without performing the defrosting operation.

[0154] In the present embodiment, the temperature difference ΔH_t may be defined as a "logic temperature" for detection of frosting. The logic temperature may be used as a temperature for determining a time point for a defrosting operation of the refrigerator, and may be used as a temperature for determining a time point at which the

heat generating element 273 is turned on, which is to be described later.

[0155] FIG. 12 is a flow chart showing a control method for determining an operating time point of a heat generating element according to an embodiment of the present disclosure. The present embodiment may be understood as a control method for determining a time point (step S21) at which the heat generating element 373 is turned on in FIG. 10.

[0156] Referring to FIGS. 11 and 12 together, in step S31, the heat generating element 27 may be turned off. Here, step S31 may mean step S25 of FIG. 10 described above. That is, the present embodiment may be understood as a control method after step S25.

[0157] When the heat generating element 27 is turned off, in step S32, it is determined whether the logic temperature ΔH_t is less than a second reference temperature value.

[0158] The reason why it is determined whether the logic temperature ΔH_t is less than the second reference temperature value may be to detect the amount of frost on the evaporator 30.

[0159] For example, the second reference temperature value may be 35 degrees.

[0160] Specifically, in FIG. 10, it has been described that the first reference temperature value for performing the defrosting operation is 32 degrees. In this case, the second reference temperature value may be set to be greater than the first reference temperature value. That is, even when the defrosting operation is completed, the amount of frost on the evaporator 30 may be large, and therefore, the amount of frost on the evaporator 30 may be detected again.

[0161] When the logic temperature ΔH_t is less than the second reference temperature value, in step S33, it is determined whether the accumulated operation time of the freezing compartment has reached the second reference time. Here, the second reference time may be 1 hour, for example.

[0162] Next, when the logic temperature ΔH_t is less than the second reference temperature value, it may be determined whether the blowing fan 70 is being driven in step S34.

[0163] When the blowing fan 70 is driven, it is determined whether the temperature stabilization state is achieved in step S35, and when temperature stabilization state is achieved, the heat generating element 273 is turned on in step S36.

[0164] Here, the temperature stabilization state may mean a state in which internal refrigerator load does not occur or a state in which the cooling of the storage compartment is normally performed. In other words, the fact that the temperature stabilization state is made may mean that the opening/closing of a refrigerator door is not performed or there are no defects in components (e.g., a compressor and an evaporator) for cooling the storage compartment or the sensor 270.

[0165] In the present embodiment, in order to deter-

mine the temperature stabilization state, the heat generating element 273 may be turned on/off at a predetermined time interval. For example, in the process of determining the temperature stabilization state, the heat generating element 273 may be turned on/off at the predetermined time interval. In this case, a time point when the heat generating element 273 is turned on/off to determine the temperature stabilization state may be a time point when the blowing fan 70 is turned on (S0).

[0166] That is, the heat generating element 273 may be turned on/off at the predetermined time interval immediately after the blowing fan 70 is turned on. When the blowing fan 70 is driven, the heat generating element 273 is repeatedly turned on/off every 10 seconds.

[0167] In addition, it is determined whether the detected amount of temperature change in the temperature change amount of the temperature (Ft) of the freezing compartment and the temperature (Ht) of the heat generating element is less than a third reference temperature value by detecting the amount of temperature change in the temperature (Ft) of the freezing compartment or in the temperature (Ht) of the heat generating element during a predetermined period. For example, the third reference temperature value is not limited thereto, but may be 0.5 degrees.

[0168] As shown in FIG. 11, since the blowing fan 70 is being driven, the temperature Ft of the freezing compartment may gradually decrease. In addition, the temperature Ht of the heat generating element may increase by a certain amount by turning on/off the heat generating element 273.

[0169] In the present embodiment, a case in which the detected amount of change in the temperature (Ft) of the freezing compartment and the detected amount of change in the temperature (Ht) of the heat generating element are less than the third reference temperature value may be determined to be the temperature stabilization state.

[0170] On the other hand, in step S32, when the logic temperature is equal to or higher than the second reference temperature value, or in step S33, when the accumulated operation time does not reach the second reference time, the process returns to step S31.

[0171] Further, in step S34, when the blowing fan is not driven, or in step 35, when the temperature stabilization state is not achieved, the process returns to step S31.

[0172] Meanwhile, in the present embodiment, it is described that the amount of frost on the evaporator 30 is detected based on a temperature difference between the first detection temperature Ht1 detected in the state in which the heat generating element 273 is turned on and the second detection temperature Ht2 detected in the state in which the heat generating element 273 is turned off.

[0173] However, alternatively, the temperature of the heat generating element may be detected in the state in which the heat generating element 273 is turned on. The amount of frost on the evaporator 30 may be detected

based on the temperature difference between the first detection temperature (Ht1) which is the lowest value of the detection temperatures of the heat generating element and the second detection temperature (Ht2) which is the highest value of the detection temperatures of the heat generating element.

[0174] That is, it is possible to detect the amount of frost on the evaporator 30 through the detection temperatures Ht1 and Ht2 in the state in which the heat generating element 273 is turned on, without detecting the temperature of the heat generating element in the state in which the heat generating element 273 is turned off.

[0175] According to the method of controlling a refrigerator, the time point at which defrosting is necessary may be accurately determined using a sensor having an output value which varies depending on the amount of frost on the evaporator in the bypass passage. Accordingly, when the amount of frost is large, a rapid defrosting operation is possible, and when the amount of frost is small, a phenomenon in which defrosting starts is prevented.

Claims

1. A method for controlling a refrigerator comprising:

allowing a heat generating element (273) of a sensor (270) reacting to a change in a flow rate of air to be turned on for a predetermined period of time and then turned off;

detecting (S13) a first detection temperature (Ht1) of the heat generating element (273) by the sensor (270) in a state in which the heat generating element (273) is turned on and detecting (S17) a second detection temperature (Ht2) of the heat generating element (273) by the sensor (270) in a state in which the heat generating element (273) is turned off;

detecting (S19) an amount of frost on an evaporator (30) based on a temperature difference between the first detection temperature (Ht1) and the second detection temperature (Ht2), determining (S29) whether a temperature difference value between the first detection temperature (Ht1) and the second detection temperature (Ht2) is less than a first reference difference value; and

performing (S30) a defrost operation of removing frost generated on a surface of the evaporator (30) when it is determined that a temperature difference value between the first detection temperature (Ht1) and the second detection temperature (Ht2) is less than a first reference difference value,

wherein the heat generating element (273) is turned on while a storage compartment (11) of the refrigerator is being cooled and a blowing fan

- (70) for cooling a storage compartment (11) is being driven,
wherein when an amount of frost on the evaporator (30) increases, the temperature difference value decreases. 5
2. The method of claim 1, wherein the first detection temperature (Ht1) is a temperature detected by a sensing element (274) of the sensor (270) immediately after the heat generating element (273) is turned on. 10
 3. The method of claim 1, wherein the second detection temperature (Ht2) is a temperature detected by a sensing element (274) of the sensor (270) immediately after the heat generating element (273) is turned off. 15
 4. The method of claim 1, wherein the first detection temperature (Ht1) is a lowest temperature value during a period of time when the heat generating element (273) is turned on. 20
 5. The method of claim 1, wherein the second detection temperature (Ht2) is a highest temperature value after the heat generating element (273) is turned off. 25
 6. The method of claim 1, further comprising:

determining (S32) whether a temperature difference value between the first detection temperature (Ht1) and the second detection temperature (Ht2) is less than a second reference difference value when the heat generating element (273) is turned on for the predetermined period of time and then turned off, 30

wherein the heat generating element (273) is turned on according to whether a temperature difference value between the first detection temperature (Ht1) and the second detection temperature (Ht2) is less than a second reference difference value, wherein, preferably, the heat generating element (273) is turned on based on an accumulated cooling operation time of the storage compartment (11) when the temperature difference value between the first detection temperature (Ht1) and the second detection temperature (Ht2) is less than the second reference difference value. 35 40 45
 7. The method of claim 1, further comprising:

allowing the heat generating element (273) to be turned on based on an accumulated cooling operation time of a storage compartment (11) when the heat generating element (273) is turned on for the predetermined period of time and then turned off. 50
 8. A refrigerator comprising: 55

an inner case (12) configured to define a storage space (11);
a cooling duct (20) configured to guide flow of air in the storage space (11) and define a heat exchange space (222) with the inner case (12);
an evaporator (30) disposed in the heat exchange space (222);
a bypass passage (230) disposed to be recessed in the cool air duct and configured to allow air flow to bypass the evaporator (30);
a sensor (270) including a heat generating element (273) disposed in the bypass passage (230) and a sensing element (274) configured to detect a temperature of the heat generating element (273); and
a controller (40) configured to detect an amount of frost on an evaporator (30) based on a temperature difference value between a first detection temperature (Ht1) of the heat generating element (273) detected by the sensing element (274) in a state in which the heat generating element (273) is turned on and a second detection temperature (Ht2) of the heat generating element (273) detected by the sensing element (274) in a state in which the heat generating element (273) is turned off,
wherein when the amount of frost on the evaporator (30) increases, the temperature difference value decreases.

9. The refrigerator of claim 8, wherein the first detection temperature (Ht1) is a temperature detected by a sensing element (274) immediately after the heat generating element (273) is turned on.
10. The refrigerator of claim 8, wherein the second detection temperature (Ht2) is a temperature detected by a sensing element (274) immediately after the heat generating element (273) is turned off.
11. The refrigerator of claim 8, wherein the first detection temperature (Ht1) is a lowest temperature value during a period of time when the heat generating element (273) is turned on.
12. The refrigerator of claim 8, wherein the second detection temperature (Ht2) is a highest temperature value after the heat generating element (273) is turned off.

Patentansprüche

1. Verfahren zum Steuern eines Kühlschranks, umfassend:

Zulassen, dass ein wärmeerzeugendes Element (273) eines Sensors (270), der auf eine

- Änderung einer Strömungsrate von Luft reagiert, für einen vorbestimmten Zeitraum eingeschaltet und dann ausgeschaltet wird;
Erfassen (S13) einer ersten Erfassungstemperatur (Ht1) des wärmeerzeugenden Elements (273) durch den Sensor (270) in einem Zustand, in dem das wärmeerzeugende Element (273) eingeschaltet ist, und Erfassen (S17) einer zweiten Erfassungstemperatur (Ht2) des wärmeerzeugenden Elements (273) durch den Sensor (270) in einem Zustand, in dem das wärmeerzeugende Element (273) ausgeschaltet ist;
Erfassen (S19) einer Frostmenge auf einem Verdampfer (30) auf der Grundlage einer Temperaturdifferenz zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2),
Bestimmen (S29), ob ein Temperaturdifferenzwert zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2) kleiner als ein erster Referenzdifferenzwert ist; und
Durchführen (S30) eines Abtauvorgangs zum Entfernen von Frost, der auf einer Oberfläche des Verdampfers (30) erzeugt wurde, wenn bestimmt wird, dass ein Temperaturdifferenzwert zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2) kleiner als ein erster Referenzdifferenzwert ist, wobei das wärmeerzeugende Element (273) eingeschaltet wird, während ein Lagerfach (11) des Kühlschranks gekühlt wird und ein Gebläseventilator (70) zum Kühlen eines Lagerfachs (11) angetrieben wird, wobei, wenn die Frostmenge auf dem Verdampfer (30) zunimmt, der Temperaturdifferenzwert abnimmt.
2. Verfahren nach Anspruch 1, wobei die erste Erfassungstemperatur (Ht1) eine Temperatur ist, die von einem Sensorelement (274) des Sensors (270) unmittelbar nach dem Einschalten des wärmeerzeugenden Elements (273) erfasst wird.
3. Verfahren nach Anspruch 1, wobei die zweite Erfassungstemperatur (Ht2) eine Temperatur ist, die von einem Sensorelement (274) des Sensors (270) unmittelbar nach dem Ausschalten des wärmeerzeugenden Elements (273) erfasst wird.
4. Verfahren nach Anspruch 1, wobei die erste Erfassungstemperatur (Ht1) ein niedrigster Temperaturwert während eines Zeitraums ist, in dem das wärmeerzeugende Element (273) eingeschaltet ist.
5. Verfahren nach Anspruch 1, wobei die zweite Erfassungstemperatur (Ht2) ein höchster Temperaturwert nach dem Ausschalten des wärmeerzeugenden Elements (273) ist.
6. Verfahren nach Anspruch 1, ferner umfassend:
Bestimmen (S32), ob ein Temperaturdifferenzwert zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2) kleiner als ein zweiter Referenzdifferenzwert ist, wenn das wärmeerzeugende Element (273) für den vorbestimmten Zeitraum eingeschaltet und dann ausgeschaltet wird, wobei das wärmeerzeugende Element (273) in Abhängigkeit davon eingeschaltet wird, ob ein Temperaturdifferenzwert zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2) kleiner als ein zweiter Referenzdifferenzwert ist, wobei das wärmeerzeugende Element (273) vorzugsweise auf der Grundlage einer akkumulierten Kühlbetriebszeit des Lagerfachs (11) eingeschaltet wird, wenn der Temperaturdifferenzwert zwischen der ersten Erfassungstemperatur (Ht1) und der zweiten Erfassungstemperatur (Ht2) kleiner als der zweite Referenzdifferenzwert ist.
7. Verfahren nach Anspruch 1, ferner umfassend:
Zulassen, dass das wärmeerzeugende Element (273) auf der Grundlage einer akkumulierten Kühlbetriebszeit eines Lagerfachs (11) eingeschaltet wird, wenn das wärmeerzeugende Element (273) für den vorbestimmten Zeitraum eingeschaltet und dann ausgeschaltet wird.
8. Kühlschrank, umfassend:
ein Innengehäuse (12), das dazu ausgebildet ist, einen Lagerraum (11) zu definieren;
einen Kühlluftkanal (20), der dazu ausgebildet ist, eine Luftströmung in dem Lagerraum (11) zu führen und zusammen mit dem Innengehäuse (12) einen Wärmeaustauschraum (222) zu definieren;
einen Verdampfer (30), der in dem Wärmeaustauschraum (222) angeordnet ist;
einen Bypass-Durchgang (230), der derart angeordnet ist, dass er im Kühlluftkanal vertieft ist, und dazu ausgebildet ist, zuzulassen, dass die Luftströmung den Verdampfer (30) umgeht;
einen Sensor (270), der ein in dem Bypass-Durchgang (230) angeordnetes wärmeerzeugendes Element (273) und ein Sensorelement (274) umfasst, das dazu ausgebildet ist, eine Temperatur des wärmeerzeugenden Elements (273) zu erfassen; und
eine Steuerung (40), die dazu ausgebildet ist, eine Frostmenge auf einem Verdampfer (30) auf

- der Grundlage eines Temperaturdifferenzwerts zwischen einer ersten Erfassungstemperatur (Ht1) des wärmeerzeugenden Elements (273), die von dem Sensorelement (274) in einem Zustand erfasst wird, in dem das wärmeerzeugende Element (273) eingeschaltet ist, und einer zweiten Erfassungstemperatur (Ht2) des wärmeerzeugenden Elements (273), die von dem Sensorelement (274) in einem Zustand erfasst wird, in dem das wärmeerzeugende Element (273) ausgeschaltet ist, zu erfassen, wobei, wenn die Frostmenge auf dem Verdampfer (30) zunimmt, der Temperaturdifferenzwert abnimmt.
9. Kühlschrank nach Anspruch 8, wobei die erste Erfassungstemperatur (Ht1) eine Temperatur ist, die von einem Sensorelement (274) unmittelbar nach dem Einschalten des wärmeerzeugenden Elements (273) erfasst wird.
10. Kühlschrank nach Anspruch 8, wobei die zweite Erfassungstemperatur (Ht2) eine Temperatur ist, die von einem Sensorelement (274) unmittelbar nach dem Ausschalten des wärmeerzeugenden Elements (273) erfasst wird.
11. Kühlschrank nach Anspruch 8, wobei die erste Erfassungstemperatur (Ht1) ein niedrigster Temperaturwert während eines Zeitraums ist, in dem das wärmeerzeugende Element (273) eingeschaltet ist.
12. Kühlschrank nach Anspruch 8, wobei die zweite Erfassungstemperatur (Ht2) ein höchster Temperaturwert nach dem Ausschalten des wärmeerzeugenden Elements (273) ist.
- Revendications**
1. Procédé de commande d'un réfrigérateur comprenant :
- permettre qu'un élément générateur de chaleur (273) d'un capteur (270) réagissant à une variation d'un débit d'air soit allumé pendant une période de temps prédéterminée puis éteint ; détecter (S13) une première température de détection (Ht1) de l'élément générateur de chaleur (273) par le capteur (270) dans un état dans lequel l'élément générateur de chaleur (273) est allumé et détecter (S17) une seconde température de détection (Ht2) de l'élément générateur de chaleur (273) par le capteur (270) dans un état dans lequel l'élément générateur de chaleur (273) est éteint ; détecter (S19) une quantité de givre sur un évaporateur (30) sur la base d'une différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2), déterminer (S29) si une valeur de différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2) est inférieure à une première valeur de différence de référence ; et effectuer (S30) une opération de dégivrage consistant à éliminer le givre généré sur une surface de l'évaporateur (30) lorsqu'il est déterminé qu'une valeur de différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2) est inférieure à une première valeur de différence de référence, dans lequel l'élément générateur de chaleur (273) est allumé tandis qu'un compartiment de stockage (11) du réfrigérateur est en cours de refroidissement et qu'un ventilateur de soufflage (70) destiné au refroidissement d'un compartiment de stockage (11) est entraîné, dans lequel, lorsque la quantité de givre sur l'évaporateur (30) augmente, la valeur de différence de température diminue.
2. Procédé selon la revendication 1, dans lequel la première température de détection (Ht1) est une température détectée par un élément sensible (274) du capteur (270) immédiatement après que l'élément générateur de chaleur (273) est allumé.
3. Procédé selon la revendication 1, dans lequel la seconde température de détection (Ht2) est une température détectée par un élément sensible (274) du capteur (270) immédiatement après que l'élément générateur de chaleur (273) est éteint.
4. Procédé selon la revendication 1, dans lequel la première température de détection (Ht1) est une valeur de température la plus basse pendant une période de temps au cours de laquelle l'élément générateur de chaleur (273) est allumé.
5. Procédé selon la revendication 1, dans lequel la seconde température de détection (Ht2) est une valeur de température la plus élevée après que l'élément générateur de chaleur (273) est éteint.
6. Procédé selon la revendication 1, comprenant en outre :
- déterminer (S32) si une valeur de différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2) est inférieure à une seconde valeur de différence de référence lorsque l'élément générateur de chaleur (273) est allumé

- pendant la période de temps prédéterminée puis éteint,
dans lequel l'élément générateur de chaleur (273) est allumé selon qu'une valeur de différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2) est inférieure à une seconde valeur de différence de référence, dans lequel, de préférence, l'élément générateur de chaleur (273) est allumé sur la base d'un temps de fonctionnement de refroidissement cumulé du compartiment de stockage (11) lorsque la valeur de différence de température entre la première température de détection (Ht1) et la seconde température de détection (Ht2) est inférieure à la seconde valeur de différence de référence.
7. Procédé selon la revendication 1, comprenant en outre :
- permettre que l'élément générateur de chaleur (273) soit allumé sur la base d'un temps de fonctionnement de refroidissement cumulé d'un compartiment de stockage (11) lorsque l'élément générateur de chaleur (273) est allumé pendant la période de temps prédéterminée puis éteint.
8. Réfrigérateur comprenant :
- une cuve intérieure (12) configurée pour définir un espace de stockage (11) ;
un conduit de refroidissement (20) configuré pour guider l'écoulement de l'air dans l'espace de stockage (11) et définir, avec la cuve intérieure (12), un espace d'échange thermique (222) ;
un évaporateur (30) disposé dans l'espace d'échange thermique (222) ;
un passage de dérivation (230) disposé de manière à être en retrait dans le conduit d'air froid et configuré pour permettre à l'écoulement de l'air de contourner l'évaporateur (30) ;
un capteur (270) comprenant un élément générateur de chaleur (273) disposé dans le passage de dérivation (230) et un élément sensible (274) configuré pour détecter une température de l'élément générateur de chaleur (273) ; et
un contrôleur (40) configuré pour détecter une quantité de givre sur un évaporateur (30) sur la base d'une valeur de différence de température entre une première température de détection (Ht1) de l'élément générateur de chaleur (273) détectée par l'élément sensible (274) dans un état dans lequel l'élément générateur de chaleur (273) est allumé et une seconde température de détection (Ht2) de l'élément générateur de chaleur (273) détectée par l'élément sensible (274) dans un état dans lequel l'élément générateur de chaleur (273) est éteint, dans lequel, lorsque la quantité de givre sur l'évaporateur (30) augmente, la valeur de différence de température diminue.
9. Réfrigérateur selon la revendication 8, dans lequel la première température de détection (Ht1) est une température détectée par un élément sensible (274) immédiatement après que l'élément générateur de chaleur (273) est allumé.
10. Réfrigérateur selon la revendication 8, dans lequel la seconde température de détection (Ht2) est une température détectée par un élément sensible (274) immédiatement après que l'élément générateur de chaleur (273) est éteint.
11. Réfrigérateur selon la revendication 8, dans lequel la première température de détection (Ht1) est une valeur de température la plus basse pendant une période de temps au cours de laquelle l'élément générateur de chaleur (273) est allumé.
12. Réfrigérateur selon la revendication 8, dans lequel la seconde température de détection (Ht2) est une valeur de température la plus élevée après que l'élément générateur de chaleur (273) est éteint.

Fig. 1

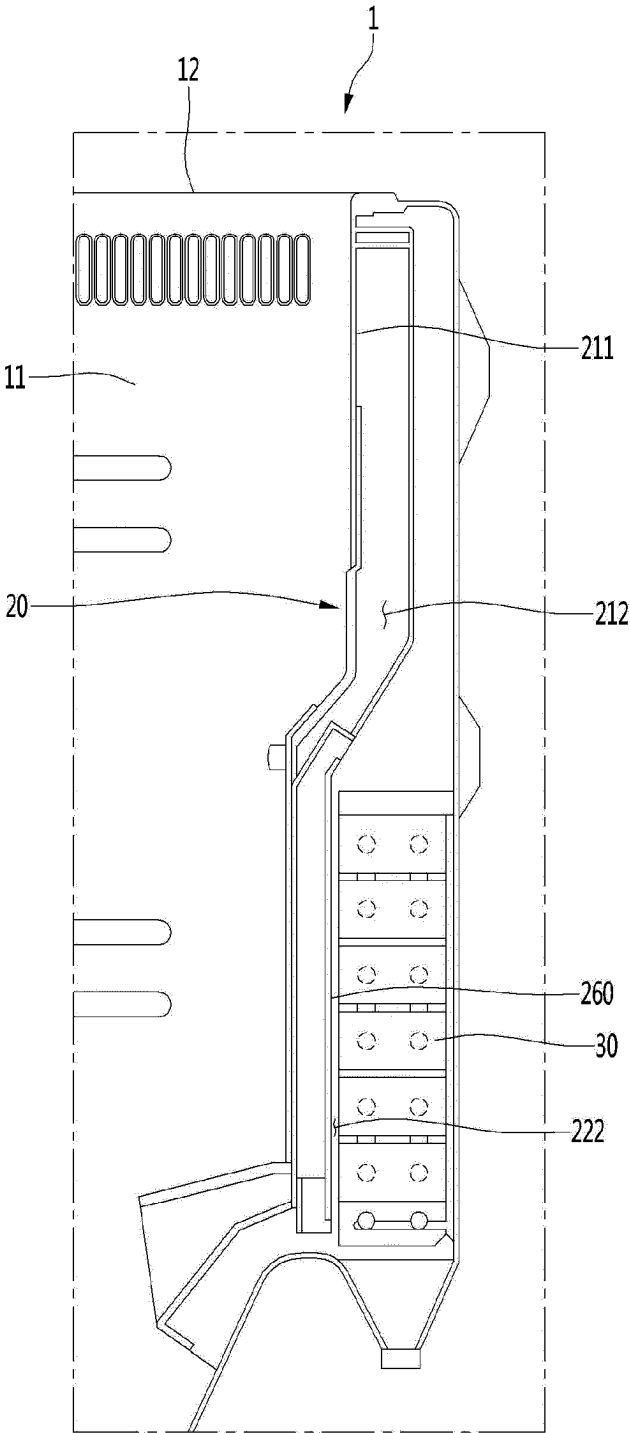


Fig. 2

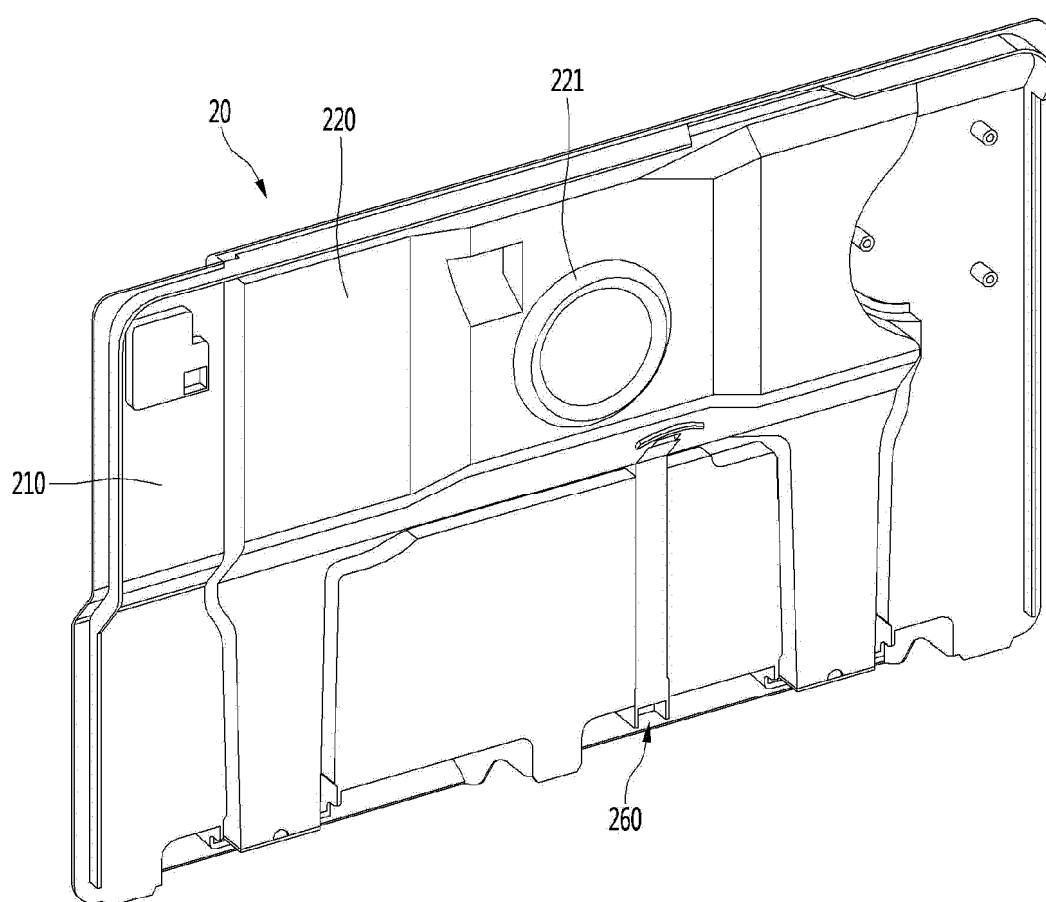


Fig. 3

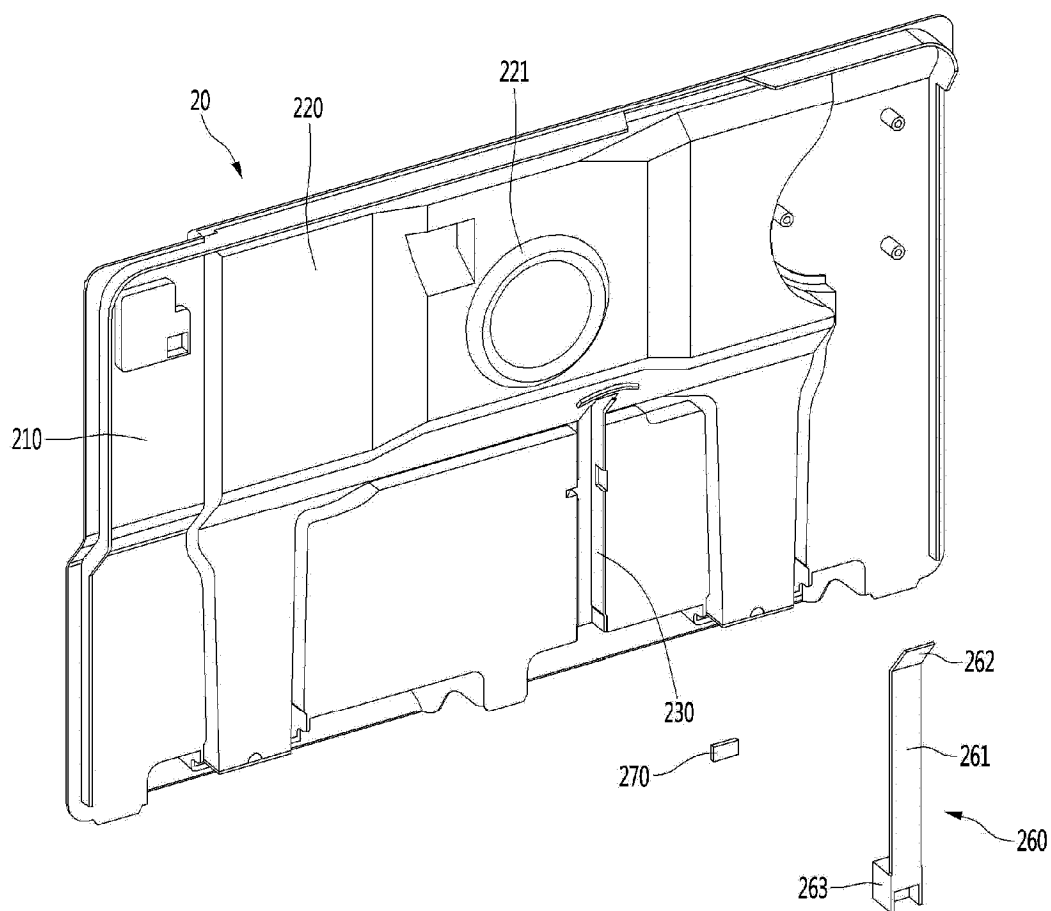


Fig. 4

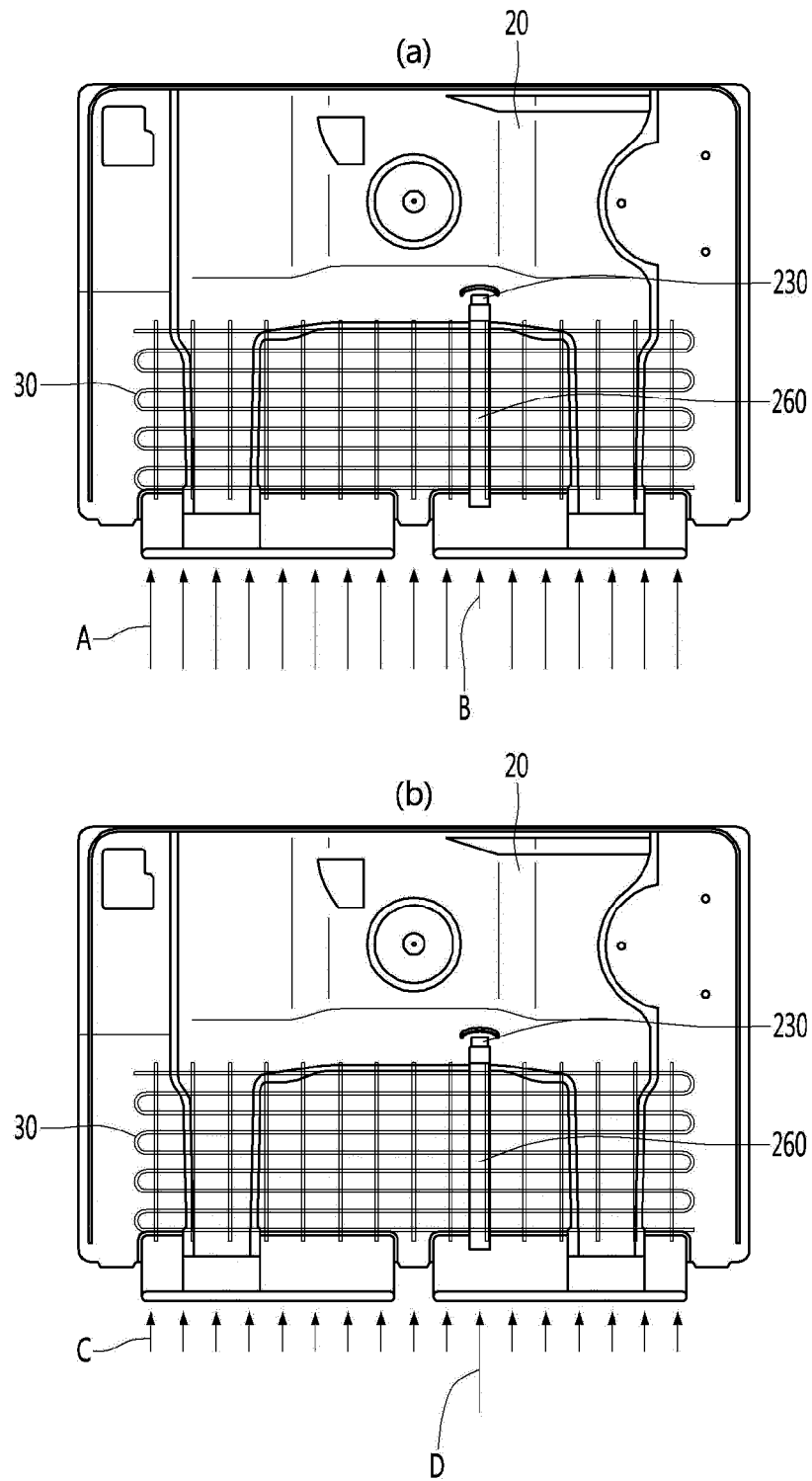


Fig. 5

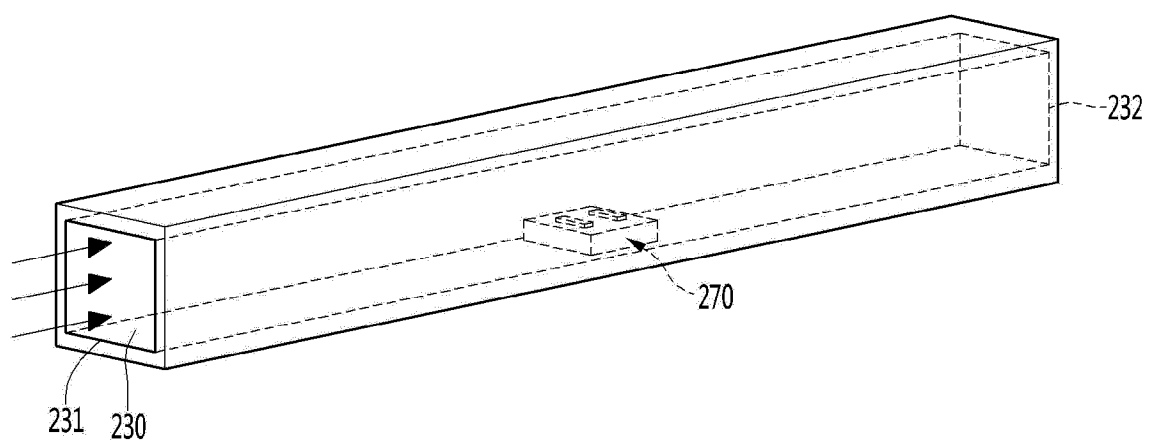


Fig. 6

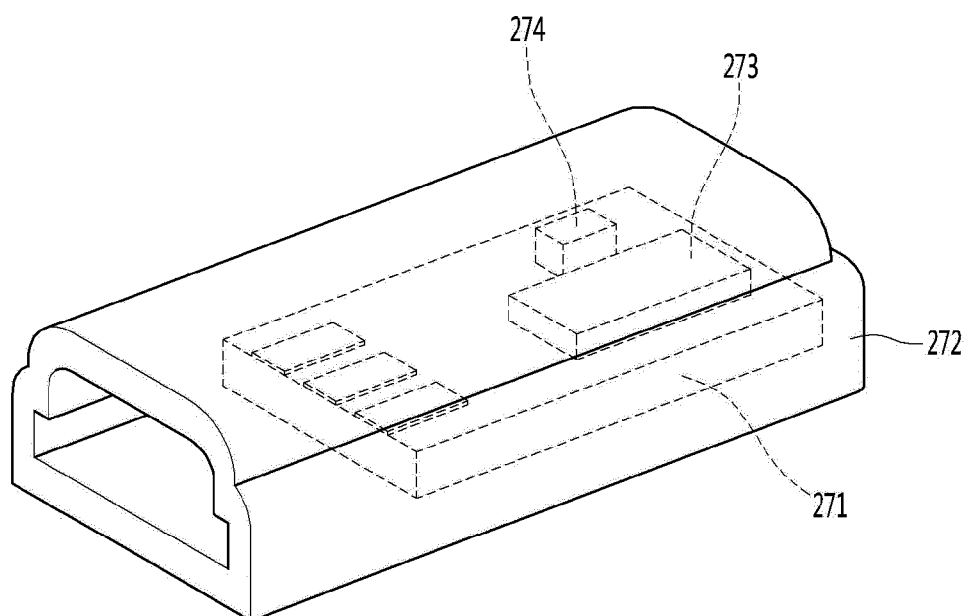


Fig. 7

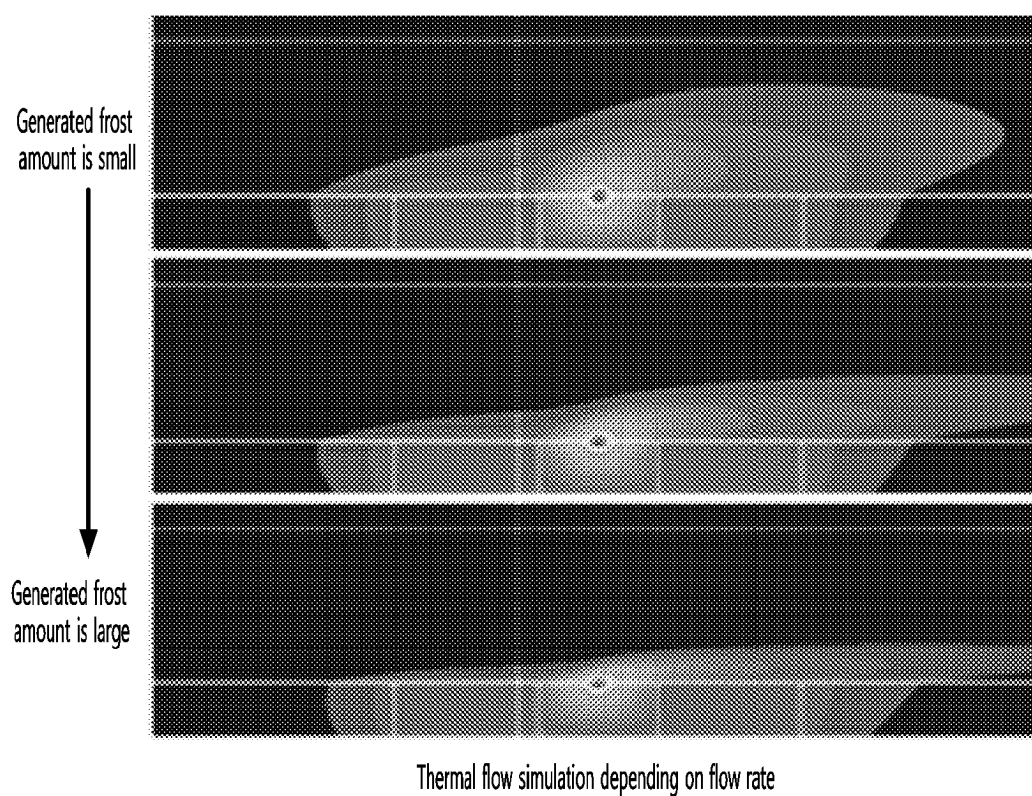


Fig. 8

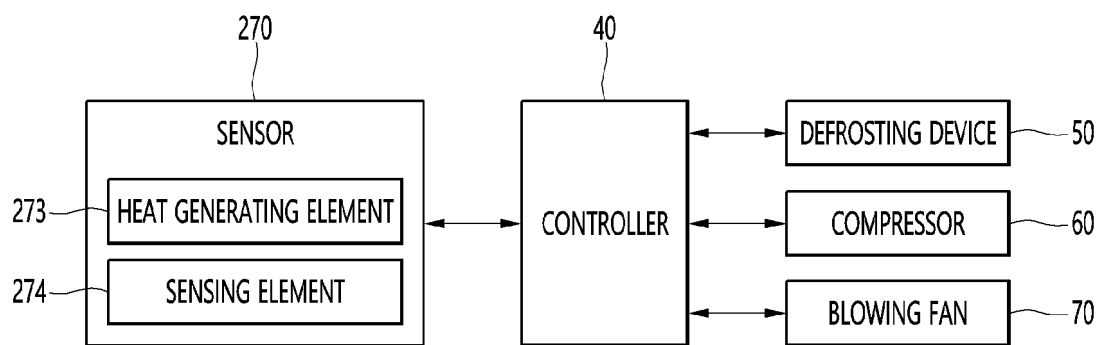


Fig. 9

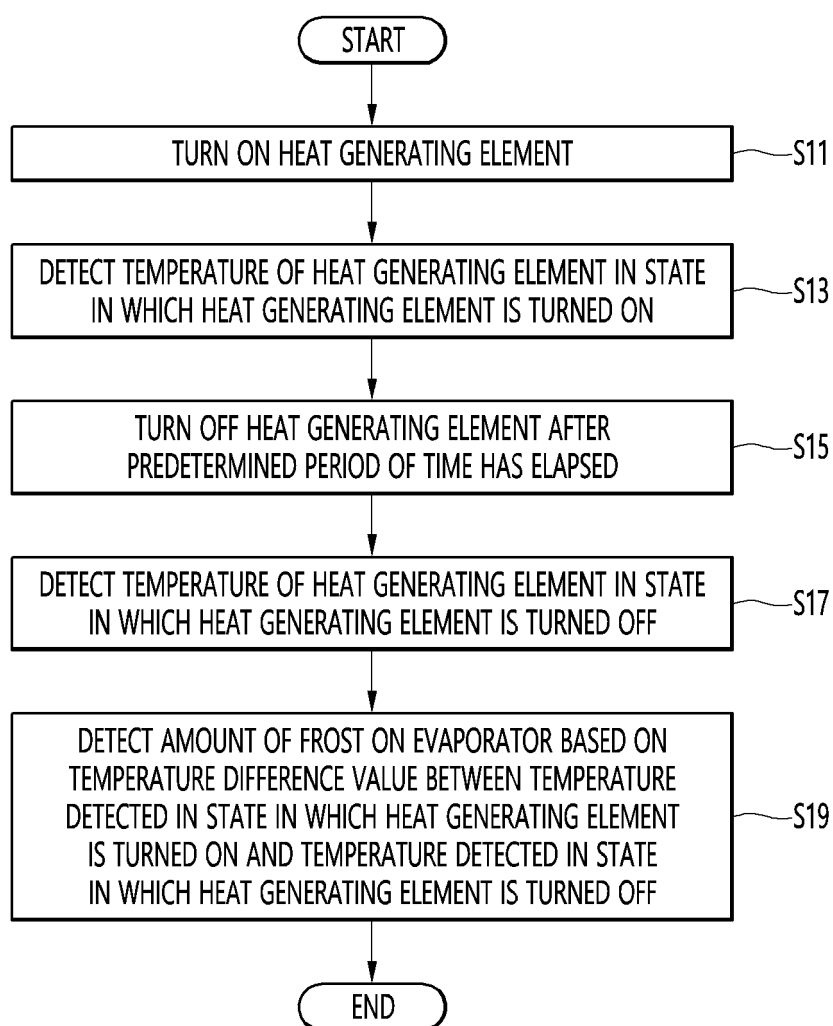


Fig. 10

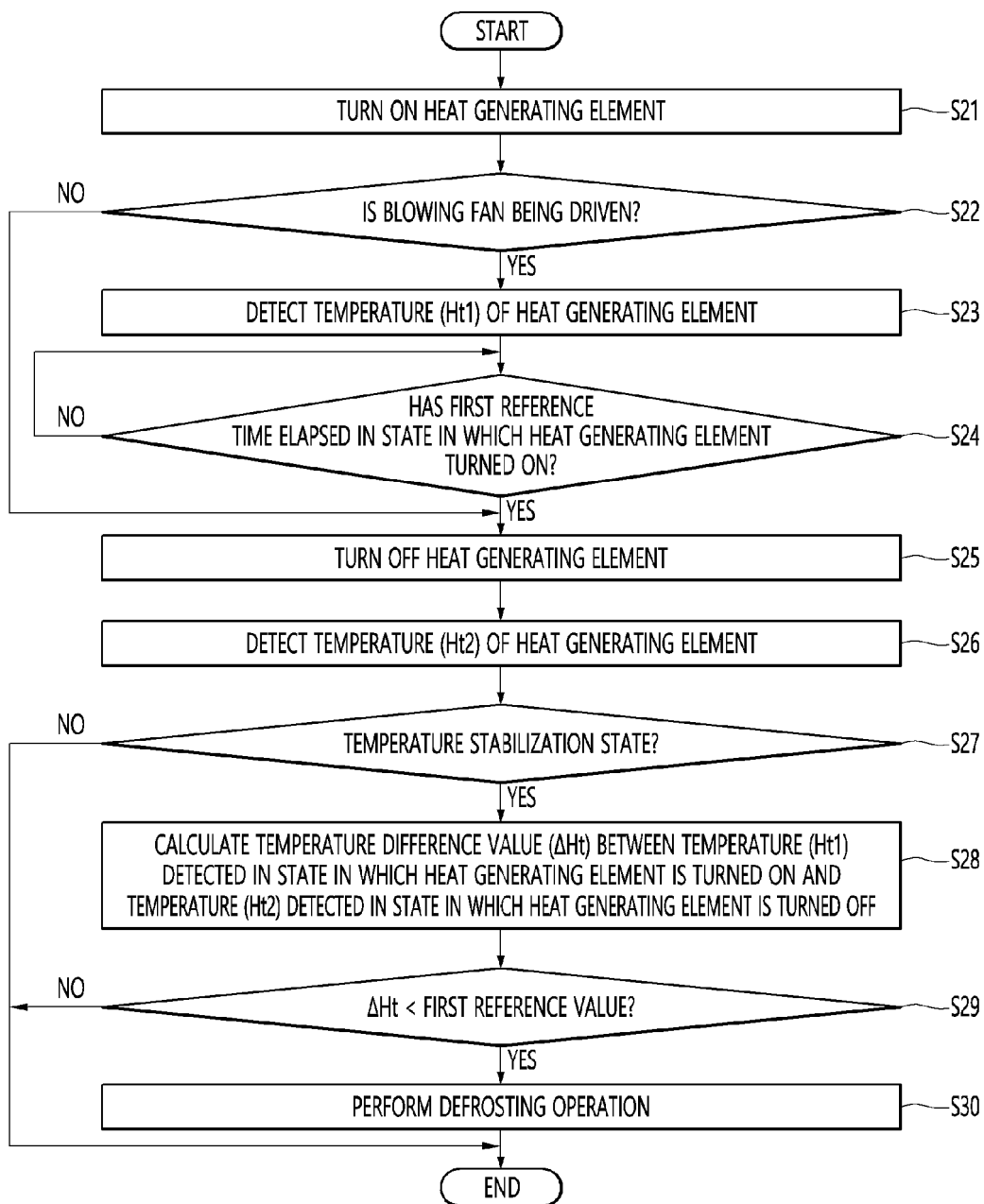


Fig. 11

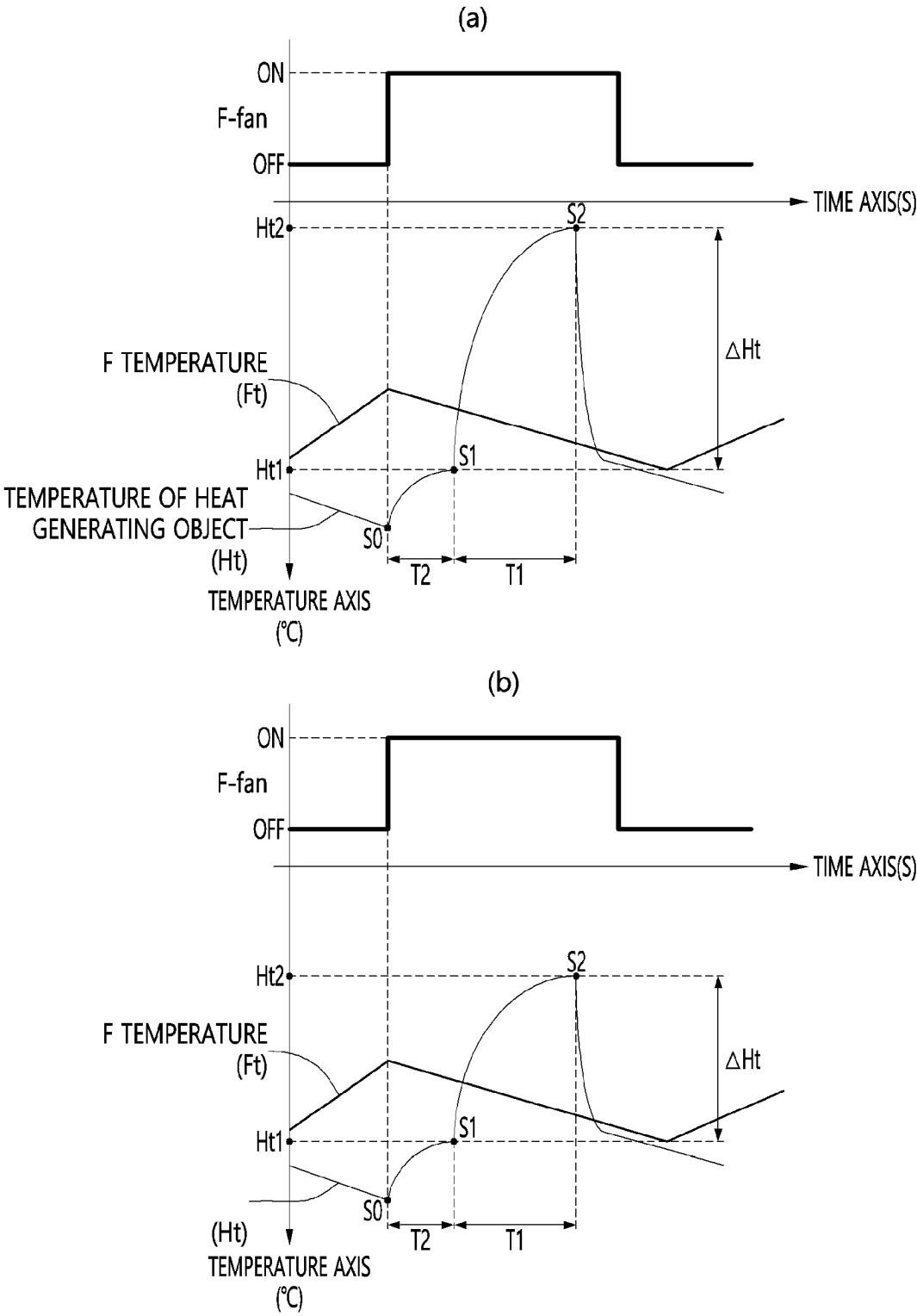
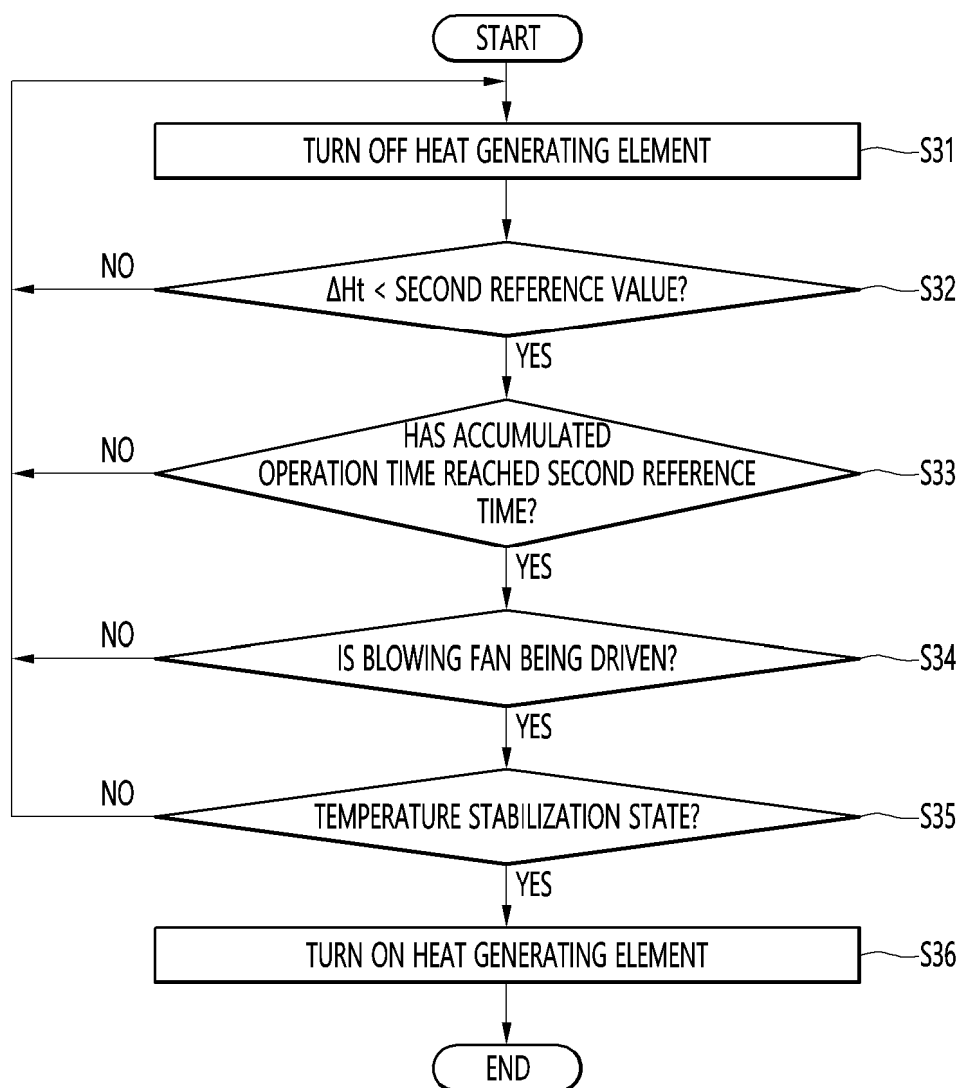


Fig. 12



REFERENCES CITED IN THE DESCRIPTION

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