

DESCRIPTION

REFRIGERATOR

5 TECHNICAL FIELD

[0001]

The present invention relates to a refrigerator.

BACKGROUND ART

10 [0002]

PTL 1 discloses a configuration in which a refrigerator that detects that a high-temperature food is stored in a storage compartment automatically starts cooling the food.

[0003]

15 A rapid cooling function of the refrigerator as disclosed in PTL 1 allows a user to cool a high-temperature food. However, there are various purposes for which the user uses the rapid cooling function of the refrigerator. For example, there are considered a case where it is desired to freeze and store a food and a case where it is desired to remove intense heat of a food after heating cooking.

20 Conventional refrigerators cannot cope with such various use purposes.

Citation List

Patent Literature

[0004]

PTL 1: Unexamined Japanese Patent Publication No. 2010-025532

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SUMMARY OF THE INVENTION

[0005]

The present disclosure provides a refrigerator that executes a rapid cooling function according to a use purpose of a user.

[0006]

A refrigerator provided by the present disclosure is a refrigerator having
5 a storage compartment, and the refrigerator includes a rapid cooling fan that is provided at a ceiling surface of the storage compartment and discharges cool air, and a control unit that executes a rapid cooling function using the rapid cooling fan based on a rapid cooling time set by a user. In the refrigerator, the control unit is configured to stop rotation of the rapid cooling fan when a door of the
10 storage compartment is opened during execution of the rapid cooling function.

BRIEF DESCRIPTION OF DRAWINGS

[0007]

FIG. 1 is a diagram illustrating an outline of a system for controlling a
15 refrigerator.

FIG. 2 is an external view of refrigerator 100.

FIG. 3 is a cross-sectional view of refrigerator 100 as viewed from the right.

FIG. 4 is a diagram for explaining ice-making compartment 202 and
20 upper freezing compartment 203.

FIG. 5 is a diagram for explaining upper freezing compartment 203.

FIG. 6 is a diagram illustrating operation panel 600.

FIG. 7 is a flowchart illustrating processing executed by refrigerator 100.

FIG. 8 is a flowchart illustrating processing executed by refrigerator 100.

25 FIG. 9 is a flowchart illustrating processing executed by refrigerator 100.

DESCRIPTION OF EMBODIMENTS

[0008]

Hereinafter, exemplary embodiments of the present disclosure will be described with reference to the drawings. Note that the following exemplary embodiments do not limit the invention according to the claims, and not all combinations of features described in the exemplary embodiments are essential to the solving means of the present invention.

[0009]

(First exemplary embodiment)

FIG. 1 is a diagram for explaining an outline of a system for controlling a refrigerator by a communication device via a network such as the Internet. Communication device 110 is, for example, a smartphone or a tablet terminal. Communication device 110 establishes a wireless local area network (LAN) connection between communication device 110 and access point 120 and communicates with server 130 on a network such as the Internet. Refrigerator 100 also establishes the wireless LAN connection between refrigerator 100 and access point 120 and communicates with server 130 on the network.

[0010]

FIG. 2 is an external view of refrigerator 100. Refrigerator 100 includes a plurality of storage compartments, specifically, refrigerating compartment 201, ice-making compartment 202, upper freezing compartment 203, lower freezing compartment 204, and vegetable compartment 205. A temperature inside refrigerating compartment 201 is maintained in a refrigerating temperature zone (3°C to 6°C). A temperature inside vegetable compartment 205 is maintained in a temperature zone (3°C to 8°C) slightly higher than the temperature inside refrigerating compartment 201. Temperatures inside upper freezing compartment 203 and lower freezing compartment 204 are both maintained in a freezing temperature zone (-20°C to -18°C). In refrigerating

compartment 201, switching compartment 310 (see FIG. 3) capable of switching a temperature between a partial temperature zone (-3°C to -1°C) and a chilled temperature zone (0°C to 2°C) is provided. A door that closes refrigerating compartment 201 is a casement type door. Doors that close ice-making compartment 202, upper freezing compartment 203, lower freezing compartment 204, and vegetable compartment 205 are drawer-type doors.

[0011]

As illustrated in FIG. 2, refrigerating compartment 201 is provided at an uppermost portion of refrigerator 100. Ice-making compartment 202 and upper freezing compartment 203, which is one of the storage compartments, are provided side by side below refrigerating compartment 201.

[0012]

Next, an air passage configuration of refrigerator 100 will be described with reference to FIG. 3. FIG. 3 is a longitudinal sectional view of refrigerator 100. A left side of FIG. 3 corresponds to a front side of refrigerator 100, and a right side of FIG. 3 corresponds to a back side of refrigerator 100.

[0013]

Compressor 301 is provided at an upper portion of refrigerator 100 and on the rear side of refrigerator 100. Cooling compartment 302 is provided behind lower freezing compartment 204. Cooling compartment 302 has at least cooler 303, cooling fan 304, and defrosting heater 305. Partition plate 306 partitions refrigerating compartment 201 and ice-making compartment 202 (see FIG. 1), and refrigerating compartment 201 and upper freezing compartment 203. Partition plate 306 is provided with a twin damper including a refrigerating compartment damper and a switching compartment damper. A portion of cool air generated by cooler 303 is supplied to refrigerating compartment duct 307 via the refrigerating compartment damper. Then, the

cool air is supplied from refrigerating compartment duct 307 to refrigerating compartment 201 via discharge port 308 and discharge port 309. A portion of cool air generated by cooler 303 is supplied to the switching compartment duct via the switching compartment damper, and the cool air is supplied from the switching compartment duct to switching compartment 310 via the discharge port. A temperature sensor is provided in each of refrigerating compartment 201 and switching compartment 310, and opening and closing operations of the refrigerating compartment damper and the switching compartment damper are controlled based on temperatures detected by these temperature sensors.

10 [0014]

A portion of cool air generated by cooler 303 is supplied to a vegetable compartment duct. The vegetable compartment duct is provided with the vegetable compartment damper, and cool air is supplied to vegetable compartment 205 via the vegetable compartment damper. A temperature sensor is provided in vegetable compartment 205, and opening and closing operation of a vegetable compartment damper is controlled based on a temperature detected by this temperature sensor.

[0015]

A portion of cool air generated by cooler 303 is supplied to freezing compartment duct 311. Then, the cool air is supplied from freezing compartment duct 311 to lower freezing compartment 204 via discharge port 312 and discharge port 313. Discharge port 314 is provided at an upper portion of freezing compartment duct 311 and on a back surface of upper freezing compartment 203. Cool air discharged from discharge port 314 is supplied to ice-making compartment 202 (see FIG. 1) and upper freezing compartment 203. Duct cover 401 (see FIGS. 4 and 5) to be described later is attached to ceiling surface 203A of upper freezing compartment 203 using a screw. Cool air passage

315 is formed by duct cover 401. Rapid cooling fan 316 is provided in front of duct cover 401. Cool air supplied from discharge port 314 to upper freezing compartment 203 is guided to rapid cooling fan 316 by cool air passage 315. A method of attaching duct cover 401 to ceiling surface 203A of upper freezing compartment 203 is not limited to the screw, and other methods such as welding may be used.

[0016]

Upper freezing compartment 203 will be described in detail below with reference to FIGS. 4 and 5. FIG. 4 is a view in which ice-making compartment 202 and upper freezing compartment 203 are viewed from above. FIG. 5 is a longitudinal sectional view of upper freezing compartment 203. A left side of FIG. 5 corresponds to the front side of refrigerator 100, and a right side of FIG. 5 corresponds to the back side of refrigerator 100.

[0017]

Duct cover 401 is attached to ceiling surface 203A of upper freezing compartment 203, and cool air passage 315 is formed in a space between duct cover 401 and ceiling surface 203A of upper freezing compartment 203. As illustrated in FIG. 4, a portion of cool air discharged from discharge port 314 is supplied to ice-making compartment 202 as indicated by arrow 402. A portion of cool air discharged from discharge port 314 is supplied to cool air passage 315 as indicated by arrow 403.

[0018]

Rapid cooling fan 316 is provided in front of cool air passage 315. When rapid cooling fan 316 starts rotating, most of cool air discharged from discharge port 314 flows along cool air passage 315 and concentrates on rapid cooling fan 316. Then, rapid cooling fan 316 discharges the cool air vertically downward from rapid cooling fan 316. This cool air is cool air in the freezing temperature

zone. When a food is placed immediately below rapid cooling fan 316 by a user, the food can be cooled rapidly. In the following description, a function of rapid cooling using rapid cooling fan 316 may be referred to as a rapid cooling function.

[0019]

5 As illustrated in FIG. 5, a portion of ceiling surface 203A of upper freezing compartment 203, which faces rapid cooling fan 316, is recessed upward. This shape forms space 501 between rapid cooling fan 316 and ceiling surface 203A of upper freezing compartment 203. Space 501 guides cool air to rapid cooling fan 316 with less resistance.

10 [0020]

 When rapid cooling fan 316 starts rotating, cool air discharged from discharge port 314 concentrates on rapid cooling fan 316, so that an amount of cool air supplied to ice-making compartment 202 decreases. Accordingly, a function of concentrating cool air in ice-making compartment 202 to make ice

15 faster than normal time cannot be used while the rapid cooling function is executed. In the following description, the function of making ice faster than normal time may be referred to as a quick ice-making function. When the quick ice-making function is started while the rapid cooling function is executed, the rapid cooling function is canceled.

20 [0021]

 Duct cover 401 is provided with discharge port 404. Discharge port 404 is provided at a position close to discharge port 314. When rapid cooling fan 316 is stopped, cool air supplied to cool air passage 315 is supplied from discharge port 404 to upper freezing compartment 203. Cool air discharged from discharge

25 port 404 to upper freezing compartment 203 flows along a surface of duct cover 401. Accordingly, frost generated in duct cover 401 can be removed.

[0022]

FIG. 6 illustrates operation panel 600. Operation panel 600 is provided inside refrigerating compartment 201 (see FIG. 2). The user uses operation panel 600 and changes a temperature setting of each storage compartment of refrigerator 100, makes a setting related to an ice-making function, or inputs an instruction to execute the rapid cooling function to refrigerator 100. For example, when the user presses quick ice-making button 606, refrigerator 100 starts the quick ice-making function.

[0023]

The user can use the rapid cooling function in a time corresponding to any one of “cool”, “rapid cool”, and “rapid freeze” according to a use purpose of the user. When the user presses rapid cooling button 601, light-emitting diode (LED) 602 corresponding to “cool” is turned on, and as a rapid cooling time indicating a time for executing the rapid cooling function, “5 minutes” is displayed on display 605. In addition, when the user presses rapid cooling button 601 while “5 minutes” is displayed on display 605, LED 602 is turned off, and LED 603 corresponding to “rapid cool” is turned on. Then, “10 minutes” is displayed as the rapid cooling time on display 605. In addition, when the user presses rapid cooling button 601 while “10 minutes” is displayed on display 605, while LED 603 corresponding to “rapid cool” is turned on, “15 minutes” is displayed as the rapid cooling time on display 605. In addition, when the user presses rapid cooling button 601 while “15 minutes” is displayed on display 605, LED 603 is turned off, and LED 604 corresponding to “rapid freeze” is turned on. Then, “45 minutes” is displayed as the rapid cooling time on display 605. In addition, when the user presses rapid cooling button 601 while “45 minutes” is displayed on display 605, while LED 604 corresponding to “rapid freeze” is turned on, “60 minutes” is displayed as the rapid cooling time on display 605. In addition, when the user presses rapid cooling button 601 while “60 minutes”

is displayed on display 605, LED 604 is turned off, and the display of the rapid cooling time by display 605 is ended. A state in which display 605 does not display the rapid cooling time indicates that refrigerator 100 does not execute the rapid cooling function.

5 [0024]

By using operation panel 600, the user can set a desired time according to a use purpose of the user as a time for using the rapid cooling function of refrigerator 100. Specifically, the user can set a desired time from among five candidates including 5 minutes corresponding to “cool”, 10 minutes and 15
10 minutes corresponding to “rapid cool”, and 45 minutes and 60 minutes corresponding to “rapid freeze”. For example, when the user wants to remove intense heat of a food after heating cooking, the user may select 5 minutes corresponding to “cool”. When the user wants to shorten time required for cooling a food which has been conventionally cooled inside the refrigerating
15 compartment in a certain period of time, the user may select 10 minutes or 15 minutes corresponding to “rapid cool”. When the user wants to freeze and store a food such as rice (white rice) or meat, the user may select 45 minutes or 60 minutes corresponding to “rapid freeze”.

[0025]

20 Next, processing when refrigerator 100 executes the rapid cooling function will be described with reference to a flowchart of FIG. 7. Refrigerator 100 includes control board 317 (see FIG. 3) configured by a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM), and the like. Each step illustrated in the flowchart of FIG. 7 is achieved by the CPU
25 deploying a program stored in the ROM to the RAM, and then executing it. In the present exemplary embodiment, control board 317 is disposed on a top surface portion of refrigerator 100. Control board 317 corresponds to a control

unit that executes the rapid cooling function.

[0026]

First, in step 701, refrigerator 100 determines whether to start the rapid cooling function. In the present exemplary embodiment, when the door of upper freezing compartment 203 is closed while the rapid cooling time is displayed on display 605 of operation panel 600, refrigerator 100 determines to start the rapid cooling function. Refrigerator 100 may determine to start the rapid cooling function at a timing when the user selects any one of “cool”, “rapid cool”, and “rapid freeze” on operation panel 600 without using the condition that the door of upper freezing compartment 203 is closed.

[0027]

In the present exemplary embodiment, the user can instruct refrigerator 100 to start the rapid cooling function from communication device 110 (see FIG. 1). The user inputs designation of the rapid cooling time and the start instruction of the rapid cooling function to communication device 110 using, for example, a refrigerator application installed in communication device 110. Communication device 110 transmits the designation of the rapid cooling time and the start instruction of the rapid cooling function to server 130 (see FIG. 1) via access point 120 (see FIG. 1). Then, server 130 transmits the designation of the rapid cooling time and the start instruction of the rapid cooling function to refrigerator 100 via access point 120. Even when refrigerator 100 receives the designation of the rapid cooling time and the start instruction of the rapid cooling function from server 130, refrigerator 100 determines to start the rapid cooling function.

[0028]

When refrigerator 100 determines in step 701 that the rapid cooling function is started (Yes in step 701), the processing proceeds to step 702. In step

702, refrigerator 100 starts the rapid cooling function. More specifically, refrigerator 100 specifies the rapid cooling time designated by the user, and starts rotation of rapid cooling fan 316. At this time, refrigerator 100 makes a rotation speed of cooling fan 304 slower than usual. In the present exemplary
5 embodiment, the term “usual” refers to a state in which refrigerator 100 is operating without executing the rapid cooling function. In addition, refrigerator 100 closes all of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper. Refrigerator 100 increases a rotation speed of compressor 301. These controls facilitate
10 concentration of cool air on rapid cooling fan 316, thereby improving cooling efficiency by the rapid cooling function. A remaining time of the rapid cooling time is displayed on display 605. When refrigerator 100 starts the rapid cooling function while executing the quick ice-making function, the quick ice-making function is canceled because cool air concentrates on rapid cooling fan 316.

15 [0029]

Next, in step 703, refrigerator 100 determines whether to cancel the rapid cooling function being executed. Refrigerator 100 determines to cancel the rapid cooling function when refrigerator 100 starts the quick ice-making function, when a predetermined cancel operation is input on operation panel 600,
20 or when refrigerator 100 receives a cancel instruction, transmitted by communication device 110, via server 130. When refrigerator 100 determines to cancel the rapid cooling function (Yes in step 703), the processing proceeds to step 706. On the other hand, when refrigerator 100 determines not to cancel the rapid cooling function (No in step 703), the processing proceeds to step 704.

25 [0030]

Next, step 704 will be described. In step 704, refrigerator 100 determines whether or not a time elapsed from the start of rotation of rapid

cooling fan 316 in step 702 (this time may be referred to as the elapsed time in the following description) has reached the rapid cooling time specified in step 702. When refrigerator 100 determines that the elapsed time has reached the rapid cooling time specified in step 702 (Yes in step 704), the processing proceeds to step 705. On the other hand, when the elapsed time does not reach the rapid cooling time specified in step 702 (No in step 704), the processing returns to step 703.

[0031]

Next, step 705 will be described. In step 705, refrigerator 100 completes the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 notifies the user that the rapid cooling function is completed by playing a voice message or a predetermined melody indicating the completion of the rapid cooling function. At this time, refrigerator 100 returns the rotation speed of cooling fan 304 to a normal rotation speed. Refrigerator 100 returns control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to a normal control. Refrigerator 100 returns the rotation speed of compressor 301 to a normal rotation speed.

[0032]

Next, step 706 will be described. In step 706, refrigerator 100 cancels the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 notifies the user that the rapid cooling function is canceled by playing a voice message indicating the cancellation of the rapid cooling function. Refrigerator 100 returns the rotation speed of cooling fan 304 to the normal rotation speed. Refrigerator 100 returns control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to a normal control. Refrigerator 100

returns the rotation speed of compressor 301 to a normal rotation speed.

[0033]

As described above, the user can select and input one candidate time from among a plurality of candidate times (5 minutes, 10 minutes, 15 minutes, 45 minutes, and 60 minutes) corresponding to “cool”, “rapid cool”, and “rapid freeze”, thereby designating a desired rapid cooling time according to a use purpose of the rapid cooling function. Control board 317 executes the rapid cooling function using rapid cooling fan 316 based on the rapid cooling time set by the input from the user. Therefore, it is possible to provide a refrigerator that executes the rapid cooling function according to the use purpose of the user.

[0034]

The plurality of candidate times in the present exemplary embodiment are examples, and can be determined according to performance and the like of the refrigerator.

[0035]

As a method in which the user selects and inputs one candidate time among the plurality of candidate times, the user may select and input one display from among displays associated with the plurality of candidate times.

[0036]

(Second exemplary embodiment)

In the present exemplary embodiment, an example of changing control of rapid cooling fan 316 when the user designates “cool” in the rapid cooling function will be described. A configuration of refrigerator 100 is similar to that of the first exemplary embodiment. That is, the configuration of refrigerator 100 is similar to the configuration described with reference to FIGS. 1 to 6.

[0037]

The processing when refrigerator 100 executes the rapid cooling function

will be described with reference to flowcharts of FIGS. 8 and 9. Refrigerator 100 includes a control board including a CPU, a ROM, a RAM, and the like. Each step illustrated in the flowcharts of FIGS. 8 and 9 is achieved by the CPU deploying a program stored in the ROM to the RAM, and then executing it.

5 [0038]

First, in step 801 of FIG. 8, refrigerator 100 determines whether to start the rapid cooling function. When the door of upper freezing compartment 203 (see FIG. 2) is closed while the rapid cooling time is displayed on display 605 (see FIG. 6) of operation panel 600 (see FIG. 6), refrigerator 100 determines to
10 start the rapid cooling function. Even when refrigerator 100 receives the designation of the rapid cooling time and the start instruction of the rapid cooling function from server 130 (see FIG. 1), refrigerator 100 determines to start the rapid cooling function.

[0039]

15 When refrigerator 100 determines in step 801 that the rapid cooling function is started (Yes in step 801), the processing proceeds to step 802. In step 802, refrigerator 100 determines whether a rapid cooling mode of the rapid cooling function is “cool”. If the user designates “cool”, refrigerator 100 determines that the rapid cooling mode is “cool” (Yes in step 802), and the
20 processing proceeds to step 901 in FIG. 9. On the other hand, if the user designates “rapid cool” or “rapid freeze”, refrigerator 100 determines that the rapid cooling mode is not “cool” (No in step 802), and the processing proceeds to step 803.

[0040]

25 Processing in a case where the user designates “rapid cool” or “rapid freeze” will be described. In step 803, refrigerator 100 starts the rapid cooling function. More specifically, refrigerator 100 specifies the rapid cooling time

designated by the user. Refrigerator 100 starts rotation of rapid cooling fan 316. At this time, refrigerator 100 makes a rotation speed of cooling fan 304 slower than usual. In addition, refrigerator 100 closes all of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper. In addition, refrigerator 100 increases the rotation speed of compressor 301. These controls facilitate concentration of cool air on rapid cooling fan 316, thereby improving cooling efficiency by the rapid cooling function.

[0041]

Next, in step 804, refrigerator 100 determines whether to cancel the rapid cooling function being executed. Refrigerator 100 determines to cancel the rapid cooling function when refrigerator 100 starts the quick ice-making function, when a predetermined cancel operation is input on operation panel 600, or when refrigerator 100 receives a cancel instruction, transmitted by communication device 110, via server 130. When refrigerator 100 determines to cancel the rapid cooling function (Yes in step 804), the processing proceeds to step 807. On the other hand, when refrigerator 100 determines not to cancel the rapid cooling function (No in step 804), the processing proceeds to step 805.

[0042]

Next, step 805 will be described. In step 805, refrigerator 100 determines whether or not a time elapsed from the start of rotation of rapid cooling fan 316 in step 803 (this time may be referred to as the elapsed time in the following description) has reached the rapid cooling time specified in step 803. When refrigerator 100 determines that the elapsed time has reached the rapid cooling time specified in step 803 (Yes in step 805), the processing proceeds to step 806. On the other hand, when the elapsed time does not reach the rapid cooling time specified in step 803 (No in step 805), the processing returns to step

804.

[0043]

Next, step 806 will be described. In step 806, refrigerator 100 completes the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 further notifies the user that the rapid cooling function is completed by playing a voice message or a predetermined melody indicating the completion of the rapid cooling function. At this time, refrigerator 100 returns the rotation speed of cooling fan 304 to a normal rotation speed. Refrigerator 100 returns the control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to the normal control. Refrigerator 100 returns the rotation speed of compressor 301 to the normal rotation speed.

[0044]

Next, step 807 will be described. In step 807, refrigerator 100 cancels the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 further notifies the user that the rapid cooling function is canceled by playing a voice message indicating the cancellation of the rapid cooling function. Refrigerator 100 returns the rotation speed of cooling fan 304 to the normal rotation speed. Refrigerator 100 returns the control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to the normal control. Refrigerator 100 returns the rotation speed of compressor 301 to the normal rotation speed.

[0045]

Next, processing in a case where the user designates “cool” will be described. In step 901 of FIG. 9, refrigerator 100 starts the rapid cooling function. More specifically, refrigerator 100 specifies the rapid cooling time

designated by the user, and starts rotation of rapid cooling fan 316. At this time, refrigerator 100 makes a rotation speed of cooling fan 304 slower than usual. Refrigerator 100 further closes all of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper.

5 Refrigerator 100 further increases the rotation speed of compressor 301. These controls facilitate concentration of cool air on rapid cooling fan 316, thereby improving cooling efficiency by the rapid cooling function.

[0046]

Next, in step 902, refrigerator 100 determines whether to cancel the rapid cooling function being executed. When refrigerator 100 determines to

10 cancel the rapid cooling function (Yes in step 902), the processing proceeds to step 911. On the other hand, when refrigerator 100 determines not to cancel the rapid cooling function (No in step 902), the processing proceeds to step 903.

[0047]

Next, in step 903, refrigerator 100 determines whether or not a time elapsed from the start of rotation of rapid cooling fan 316 in step 901 (this time may be referred to as the elapsed time in the following description) has reached T1. T1 is, for example, 1 minute. When refrigerator 100 determines that the elapsed time has reached T1 (Yes in step 903), the processing proceeds to step

15 904. On the other hand, when the elapsed time does not reach T1 (No in step 903), the processing returns to step 902.

20

[0048]

Next, step 904 will be described. In step 904, refrigerator 100 stops rotation of rapid cooling fan 316.

25 [0049]

Next, in step 905, refrigerator 100 determines whether to cancel the rapid cooling function being executed. When refrigerator 100 determines to

cancel the rapid cooling function (Yes in step 905), the processing proceeds to step 911. On the other hand, when refrigerator 100 determines not to cancel the rapid cooling function (No in step 905), the processing proceeds to step 906.

[0050]

5 Next, in step 906, refrigerator 100 determines whether the elapsed time has reached T2. T2 is, for example, 4 minutes. When refrigerator 100 determines that the elapsed time has reached T2 (Yes in step 906), the processing proceeds to step 907. On the other hand, when the elapsed time does not reach T2 (No in step 906), the processing returns to step 905.

10 [0051]

 Next, step 907 will be described. In step 907, refrigerator 100 restarts rotation of suspended rapid cooling fan 316.

[0052]

 Next, in step 908, refrigerator 100 determines whether to cancel the
15 rapid cooling function being executed. When refrigerator 100 determines to cancel the rapid cooling function (Yes in step 908), the processing proceeds to step 911. On the other hand, when refrigerator 100 determines not to cancel the rapid cooling function (No in step 908), the processing proceeds to step 909.

[0053]

20 Next, in step 909, refrigerator 100 determines whether the elapsed time has reached the rapid cooling time specified in step 901. When refrigerator 100 determines that the elapsed time has reached the rapid cooling time specified in step 901 (Yes in step 909), the processing proceeds to step 910. On the other
hand, when the elapsed time does not reach the rapid cooling time specified in
25 step 901 (No in step 909), the processing returns to step 908.

[0054]

 Next, step 910 will be described. In step 910, refrigerator 100 completes

the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 further notifies the user that the rapid cooling function is completed by playing a voice message or a predetermined melody indicating the completion of the rapid cooling function. At this time, refrigerator 100 returns the rotation speed of cooling fan 304 to a normal rotation speed. Refrigerator 100 returns the control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to the normal control. Refrigerator 100 returns the rotation speed of compressor 301 to the normal rotation speed.

10 [0055]

Next, step 911 will be described. In step 911, refrigerator 100 cancels the rapid cooling function. More specifically, refrigerator 100 stops rotation of rapid cooling fan 316. Refrigerator 100 further notifies the user that the rapid cooling function is canceled by playing a voice message indicating the cancellation of the rapid cooling function. Refrigerator 100 returns the rotation speed of cooling fan 304 to the normal rotation speed. Refrigerator 100 returns the control of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper to the normal control. Refrigerator 100 returns the rotation speed of compressor 301 to the normal rotation speed.

20 [0056]

As described above, when the user designates “cool” in the rapid cooling function, operation of rapid cooling fan 316 is switched in the order of rotation, stop, and rotation. That is, “cool” is a mode (second mode) in which a period during which rapid cooling fan 316 stops occurs before the end of execution of the rapid cooling function. Accordingly, the occurrence of the period during which rapid cooling fan 316 is stopped can prevent a target food of the rapid

cooling function from being excessively cooled. As the values of T1 and T2, any value can be set within a range satisfying “ $0 < T1 < T2 < \text{rapid cooling time set by user}$ ”.

[0057]

5 When the user designates “rapid cool” or “rapid freeze” in the rapid cooling function, rapid cooling fan 316 continues to rotate without stopping. That is, “rapid cool” and “rapid freeze” are modes (first modes) in which rapid cooling fan 316 continues to rotate before the end of execution of the rapid cooling function, and cooling of a food can be promoted.

10 [0058]

 As described above, the rapid cooling function according to the present exemplary embodiment has the first mode (“rapid cool” and “rapid freeze”) in which the rapid cooling fan continues to rotate without stopping until execution of the rapid cooling function is completed, and the second mode (“cool”) in which
15 the period during which the rapid cooling fan stops occurs before execution of the rapid cooling function is completed. Each of the plurality of candidates (“cool”, “rapid cool”, and “rapid freeze”) is associated with the first mode or the second mode. At least one of the plurality of candidates is associated with each of the first mode and the second mode.

20 [0059]

 The shortest candidate time (5 minutes) among the plurality of candidate times corresponds to the second mode, and the remaining candidate times (10 minutes, 15 minutes, 45 minutes, and 60 minutes) among the plurality of candidate times correspond to the first mode.

25 [0060]

 (Third exemplary embodiment)

 Modifications of the processing described in the first exemplary

embodiment and the second exemplary embodiment will be described.

[0061]

When the door of upper freezing compartment 203 is opened during execution of the rapid cooling function, a rotation sound of rapid cooling fan 316 easily leaks to the outside of refrigerator 100. Thus, when the door of upper freezing compartment 203 is opened during execution of the rapid cooling function, refrigerator 100 may temporarily stop rotation of rapid cooling fan 316. Accordingly, it is possible to prevent the rotation sound of rapid cooling fan 316 from leaking to the outside of refrigerator 100 due to opening of the door of upper freezing compartment 203. When the door of upper freezing compartment 203 is closed again, refrigerator 100 restarts rotation of temporarily suspended rapid cooling fan 316.

[0062]

The above is not limited only to the door of upper freezing compartment 203, and when at least one of the door of refrigerating compartment 201, the door of ice-making compartment 202, the door of lower freezing compartment 204, and the door of vegetable compartment 205 is opened, refrigerator 100 may temporarily stop rotation of rapid cooling fan 316. That is, refrigerator 100 may be configured to temporarily stop rotation of rapid cooling fan 316 when at least one of the doors of the storage compartments is opened. Accordingly, it is possible to prevent the rotation sound of rapid cooling fan 316 from leaking to the outside of refrigerator 100 due to opening of the door of the storage compartment. When these doors are closed again, refrigerator 100 restarts rotation of temporarily suspended rapid cooling fan 316.

[0063]

Since all of the refrigerating compartment damper, the switching compartment damper, and the vegetable compartment damper are closed during

execution of the rapid cooling function, the temperature of refrigerating compartment 201, switching compartment 310, or vegetable compartment 205 may increase. Thus, when it is detected that the temperature of any one of refrigerating compartment 201, switching compartment 310, and vegetable
5 compartment 205 becomes higher than a threshold from the detection result of the temperature sensor of each storage compartment, refrigerator 100 may open the damper corresponding to the storage compartment. Refrigerator 100 may return the rotation speed of cooling fan 304 to the normal rotation speed. As a result, it is possible to prevent the temperature of the storage compartment from
10 excessively increasing during execution of the rapid cooling function. When the temperature of the storage compartment decreases, refrigerator 100 closes the damper corresponding to the storage compartment again, or closes the damper corresponding to the storage compartment again, and further makes the rotation speed of cooling fan 304 slower than usual.

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REFERENCE MARKS IN THE DRAWINGS

[0064]

100: refrigerator
110: communication device
20 120: access point
130: server
201: refrigerating compartment
202: ice-making compartment
203: upper freezing compartment
25 203A: ceiling surface
204: lower freezing compartment
205: vegetable compartment

	301: compressor
	302: cooling compartment
	303: cooler
	304: cooling fan
5	305: defrosting heater
	306: partition plate
	307: refrigerating compartment duct
	308,309: discharge port
	310: switching compartment
10	311: freezing compartment duct
	312,313,314: discharge port
	315: cool air passage
	316: rapid cooling fan
	317: control board
15	401: duct cover
	404: discharge port
	501: space
	600: operation panel
	601: rapid cooling button
20	602,603,604: LED
	605: display
	606: quick ice-making button

CLAIMS

1. A refrigerator having a storage compartment, comprising:
a rapid cooling fan that is provided at a ceiling surface of the storage
5 compartment and discharges cool air; and
a control unit that executes a rapid cooling function using the rapid
cooling fan based on a rapid cooling time set by an input from a user,
wherein when a door of the storage compartment is opened during
execution of the rapid cooling function, the control unit stops rotation of the
10 rapid cooling fan.
2. The refrigerator according to claim 1, wherein when the opened door
of the storage compartment is closed, the control unit restarts the stopped
rotation of the rapid cooling fan.
- 15 3. The refrigerator according to claim 1 or 2, wherein
the refrigerator has another storage compartment different from the
storage compartment, and
the control unit stops rotation of the rapid cooling fan when a door of the
20 other storage compartment is opened during execution of the rapid cooling
function.
4. The refrigerator according to claim 3, wherein when the opened door
of the other storage compartment is closed, the control unit restarts the stopped
25 rotation of the rapid cooling fan.
5. The refrigerator according to any one of claims 1 to 4, further

comprising:

a freezing compartment; and

a freezing compartment duct that supplies cool air to the freezing compartment,

5 wherein a back surface of the storage compartment includes a discharge port through which at least a portion of the cool air is supplied from the freezing compartment duct, and

the storage compartment includes a cool air passage on the ceiling surface, the cool air passage guiding the cool air, discharged from the discharge
10 port, to the rapid cooling fan.

6. The refrigerator according to any one of claims 1 to 5, wherein one candidate time is selected from a plurality of candidate times by the user as the input, and the one candidate time is set as the rapid cooling time.

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7. The refrigerator according to claim 6, wherein
the rapid cooling function has

a first mode in which the rapid cooling fan continues to rotate without stopping until execution of the rapid cooling function is completed and

20 a second mode in which a period during which the rapid cooling fan stops occurs before execution of the rapid cooling function is completed, and

each of the plurality of candidate times is associated with the first mode or the second mode.

25 8. The refrigerator according to claim 7, wherein

a shortest candidate time among the plurality of candidate times corresponds to the second mode, and

a remaining candidate time of the plurality of candidate times corresponds to the first mode.

5 9. The refrigerator according to any one of claims 1 to 8, wherein
an uppermost portion of the refrigerator includes a refrigerating
compartment, and

an ice-making compartment and the storage compartment are provided
side by side below the refrigerating compartment.

10 10. The refrigerator according to any one of claims 1 to 9, wherein the
storage compartment is maintained in a freezing temperature zone.