

[Name of Document] DESCRIPTION

[Title of Invention] REFRIGERATOR

[Technical Field]

[0001]

5 The present invention relates to refrigerators, and more specifically, it relates to the operability of an operation panel thereof.

[Background Art]

[0002]

10 In recent years, as dietary habits have become more diverse, refrigerators having a plurality of chambers (storage compartments) of different temperature bands have become mainstream among refrigerators used by users. The temperature of each of the chambers of such a refrigerator can be set slightly lower or slightly higher in accordance with the user's preference. Further, many refrigerators have a temperature-switching compartment whose temperature can be freely set in the range
15 from a refrigeration temperature of about 3°C to a freezing temperature of about -18°C.

[0003]

25 In a refrigerator having a plurality of chambers (storage compartments) as described above, the temperature setting of each chamber can be controlled via an operation panel provided on the surface or the like of the door of the refrigerator. If, however, a control switch was provided for each of the chambers, switches of the operation panel would increase in number by the number of chambers with making the operation complicated, which would result in an increase in the size of the operation panel and thus a broader installation space being needed and also an increase in cost.

[0004]

 Moreover, since the sizes of the operation panel and the installation space thereof cannot be greatly increased from a design standpoint, in the case where the numbers of switches and display elements are increased, the sizes of characters and

numbers or the space for each display element need to be reduced, which may lead to reduced visibility or erroneous operation.

[0005]

As a refrigerator having temperature control switches for respective chambers, there has been proposed a refrigerator that includes a temperature display unit and a temperature setting switch for each of a refrigerator compartment and a freezer compartment on the front surface of the refrigerator compartment (see Patent Literature 1, for example). In this refrigerator, one switch is operated for the setting of only one chamber, and one temperature display unit performs display for only one chamber. While a temperature display unit usually displays the current interior temperature, the above refrigerator is configured such that, if the temperature setting switch is operated, the temperature display unit temporarily stops displaying the interior temperature, and displays a target set temperature instead. If the setting switch is operated again after the set temperature is displayed, the temperature setting level is changed by one level. After completion of adjustment through the operation of the temperature setting switch, if the temperature setting switch is not pressed for a predetermined time period or more, the display is switched back to the interior temperature. The operation panel having the configuration described above can display two information items, the current interior temperature and the target set temperature, in one display area, resulting in a reduction in the display area of the operation panel and an increase in size being suppressed.

[0006]

However, since the above refrigerator is configured to include the switches dedicated to the respective chambers, if the number of chambers which are desired to be set is increased, switches need to be increased in number by that increment, and also the size of the operation panel needs to be increased. As an example refrigerator that solves this problem, there is a refrigerator which includes a changeover switch for switching between screens for a plurality of chambers, such as a refrigerator compartment, a vegetable compartment, a switching compartment, and a freezer compartment, each of the screens displaying the interior temperature, the

set temperature, the operation status, and the like of the corresponding chamber, and which can display the settings, the interior temperature, the set temperature, the operation status, and the like of the selected chamber switched over via the changeover switch (see Patent Literature 2, for example). Because this refrigerator has a screen for each chamber and is configured such that by switching between the screens via the changeover switch, the contents displayed at one time can be restricted, the size of and space for each display element can be set larger. Moreover, because the refrigerator need only have the same number of switches as the number of functions, common to the chambers, of changing the set temperature, putting in a rapid cooling mode, and the like, instead of having the same number of switches as the number of chambers, it is possible to suppress an increase in the size, complication, and an increase in the cost of the operation panel due to an increase in the number of switches.

[Citation List]

[Patent Literature]

[0007]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2000-266454 (Page 3, Fig. 1)

[Patent Literature 2] Japanese Unexamined Patent Application Publication No. 2003-65654 (Page 4, Fig. 2)

[Summary of Invention]

[Technical Problem]

[0008]

According to Patent Literature 2, the disclosed refrigerator includes a changeover switch for switching between screens for a plurality of chambers, such as a refrigerator compartment, a vegetable compartment, a switching compartment, and a freezer compartment, each of the screens displaying the interior temperature, the set temperature, the operation status, and the like of the corresponding chamber, and which includes an operation panel that displays the settings, the interior temperature, the set temperature, the operation status, and the like of a specific chamber switched

over via this changeover switch, so that it is possible to suppress an increase in the size, complication, and an increase in the cost of the operation panel.

However, there is the problem that, since the switch for switching between the screens for the respective chambers (storage compartments) and the switch for changing the temperature setting exist separately, it is hard to realize which switches are to be operated in what order.

[0009]

Also, there is the problem that, since only the chamber currently selected and the setting information thereof are displayed when the switch for switching between the screens for the respective chambers or the switch for changing the temperature setting is operated, it is hard to realize what operation can be performed via which switch.

[0010]

The present invention was made to solve the above problems, and an object thereof is to provide a refrigerator which can make a user realize in what order to operate a plurality of switches provided in the operation panel, so that the operability of the operation panel can be improved.

Another object of the present invention is to provide a refrigerator which can make a user realize what operation can be performed via the switches provided in the operation panel, so that the operability of the operation panel can be improved.

[Solution to Problem]

[0011]

A refrigerator according to the present invention comprises a plurality of storage compartments; and an operation panel configured to allow performing operation setting on each of the storage compartments. The operation panel includes a selection switch configured to allow selecting one of the plurality of storage compartments for which operation setting is to be performed; one or more setting switches to be operated to perform the operation setting on the storage compartments; a selected-chamber display unit to display information indicating the storage compartment selected by use of the selection switch; and a setting display

unit to display information about the operation settings of the storage compartments. Information to be displayed is sequentially displayed on the selected-chamber display unit and the setting display unit in accordance with an order in which the selection switch and the setting switches are operated.

5 [Advantageous Effects of Invention]

[0012]

The present invention can make a user realize the order in which the selection switch and the setting switches provided in the operation panel are to be operated, thereby improving the operability of the operation panel.

10 [Brief Description of Drawings]

[0013]

[Fig. 1] Fig. 1 is a schematic front view of a refrigerator according to Embodiment 1.

[Fig. 2] Fig. 2 illustrates the configuration and display states of an operation panel according to Embodiment 1.

15 [Fig. 3] Fig. 3 is a cross-sectional view of the operation panel according to Embodiment 1.

[Fig. 4] Fig. 4 illustrates the range of choices and the order in which the choices are switched for each setting allowed by the operation panel according to Embodiment 1.

[Fig. 5] Fig. 5 illustrates an operation of the operation panel (when all the displays are off: Example 1) according to Embodiment 1.

[Fig. 6] Fig. 6 illustrates an operation of the operation panel (when all the displays are off: Example 2) according to Embodiment 1.

[Fig. 7] Fig. 7 illustrates an operation of the operation panel (when all the displays are off: Example 3) according to Embodiment 1.

25 [Fig. 8] Fig. 8 illustrates an operation of the operation panel (when all the displays are off: Example 4) according to Embodiment 1.

[Fig. 9] Fig. 9 illustrates an operation of the operation panel (when displays are on: Example 1) according to Embodiment 1.

[Fig. 10] Fig. 10 illustrates an operation of the operation panel (when displays are on: Example 2) according to Embodiment 1.

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[Fig. 11] Fig. 11 illustrates an operation of the operation panel (when displays are on: Example 3) according to Embodiment 1.

[Fig. 12] Fig. 12 illustrates an operation of an operation panel (when all the displays are off) according to Embodiment 2.

5 [Fig. 13] Fig. 13 illustrates an operation of the operation panel (when displays are on) according to Embodiment 2.

[Fig. 14] Fig. 14 illustrates the configuration and display state of an operation panel according to Embodiment 3.

10 [Fig. 15] Fig. 15 illustrates an operation of the operation panel (when a switching compartment is selected) according to Embodiment 3.

[Fig. 16] Fig. 16 illustrates an operation of the operation panel (when a freezer compartment is selected) according to Embodiment 3.

[Fig. 17] Fig. 17 is a schematic front view of a refrigerator according to Embodiment 4.

15 [Fig. 18] Fig. 18 illustrates an operation of an operation panel (when no door opening/closing is performed) according to Embodiment 4.

[Fig. 19] Fig. 19 illustrates an operation of the operation panel (when the door opening/closing of the switching compartment is performed) according to Embodiment 4.

[Description of Embodiments]

[0014]

Embodiment 1.

(Configuration of Refrigerator 1)

Fig. 1 is a schematic front view of a refrigerator 1 according to Embodiment 1.

25 As illustrated in Fig. 1, the refrigerator 1 includes, as storage compartments, a refrigerator compartment 2 at the top thereof, an ice making compartment 3 and a switching compartment 4 that are disposed on the left and right respectively as viewed from the front under the refrigerator compartment 2, a freezer compartment 5 disposed under them, and a vegetable compartment 6 disposed further below. The

refrigerator compartment 2 includes a pair of right and left hinged doors. An operation panel 7 is disposed on the surface of the left door as viewed from the front.

It should be noted that the configuration of the storage compartments of the refrigerator 1 described above is only for illustration. The refrigerator 1 may have a different storage compartment from the compartments in the configuration described above, or may include only some of the above storage compartments. Further, the arrangement of these storage compartments is not limited to the above.

It should be noted that each storage compartment is also referred to as a "chamber" in the description below.

[0015]

(Configuration of Operation Panel 7)

Fig. 2 illustrates the configuration and display states of the operation panel 7 according to Embodiment 1.

Fig. 2 (A) shows the state where all the display elements displayed on a display unit 9 and a switch display unit 10 (both described below) of the operation panel 7 are turned on.

As illustrated in Fig. 2 (A), the operation panel 7 includes at least a switch unit 8 with which to perform various setting operation and the like, the display unit 9 that displays settings and the like, and the switch display unit 10 that displays the actions done by operating the switches (the functions of the switches).

[0016]

The switch unit 8 includes at least a chamber selection switch 8a, a temperature control switch 8b, a flash freezing switch 8c, and an ice making mode change switch 8d.

The chamber selection switch 8a is for switching between a plurality of chambers to select a chamber for which to perform operation setting, and switching between the chambers to select a chamber for which the settings and the like are to be displayed on the display unit 9. It should be noted that the operation settings refer to settings for the cooling operation of each chamber, such as temperature control

settings, on/off of a flash freezing function, and settings of an automatic ice making function, which will be described below.

It should be noted that the chamber selection switch 8a corresponds to a "selection switch" in the present invention.

5 [0017]

The temperature control switch 8b is for controlling the temperature of the chamber selected with use of the chamber selection switch 8a.

The flash freezing switch 8c is for performing setting for the flash freezing function of the switching compartment 4.

10 The ice making mode change switch 8d is for performing setting for the automatic ice making function of the ice making compartment 3.

It should be noted that the temperature control switch 8b, the flash freezing switch 8c, and the ice making mode change switch 8d correspond to "setting switches" in the present invention.

15 [0018]

The display unit 9 includes at least a currently-selected-chamber display 9a, a temperature setting level display 9b, a flash freezing display 9c, and an ice making setting display 9d.

The currently-selected-chamber display 9a displays information specifying the chamber selected from the plurality of chambers by use of the chamber selection switch 8a. For example, as illustrated in Fig. 2, the currently-selected-chamber display 9a displays the names of the respective chambers in association with the arrangement positions of the respective chambers (storage compartments).

25 It should be noted that the currently-selected-chamber display 9a corresponds to a "selected-chamber display unit" in the present invention.

[0019]

The temperature setting level display 9b displays the set temperature level of each chamber, such as "L", "H", "SOFT FREEZING", and "FREEZING".

30 The flash freezing display 9c displays the setting of the flash freezing function of the switching compartment 4, such as "FLASH".

The ice making setting display 9d displays the setting, of the ice making compartment 3 having an automatic ice making function, whether to make regular ice, to make very clear ice, to make ice quickly, or to suspend the automatic ice making function.

5 It should be noted that the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d correspond to a "setting display unit" in the present invention.

[0020]

10 The switch display unit 10 displays information indicating the actions done by operating the respective switches (the functions of the switches) of the switch unit 8.

As illustrated in Fig. 2 (A), the switch display unit 10 is provided close to (immediately above) the switch unit 8, and includes a chamber selection switch display 10a, a temperature control switch display 10b, a flash freezing switch display 10c, and an ice making mode change switch display 10d.

15 The chamber selection switch display 10a displays "CHAMBER SELECT" to indicate the action done by operating the chamber selection switch 8a.

The temperature control switch display 10b displays "TEMPERATURE CONTROL" to indicate the action done by operating the temperature control switch 8b.

20 The flash freezing switch display 10c displays "FLASH FREEZING" to indicate the action done by operating the flash freezing switch 8c.

The ice making mode change switch display 10d displays "ICE MAKING MODE CHANGE" to indicate the action done by operating the ice making mode change switch 8d.

25 It should be noted that the display contents of the switch display unit 10, not being limited to these, may be any information indicating the actions done by operating the respective switches, such as symbols or figures.

[0021]

30 Fig. 2 (B) shows the state where all the display elements displayed on the display unit 9 and the switch display unit 10 of the operation panel 7 are turned off. It

should be noted that the display elements of the display unit 9 may be configured to be turned on for a predetermined time period only when any of the switches is operated on the operation panel 7 or only when the opening/closing of any chamber door is detected. With this configuration, when the operation panel 7 is not in use, the operation panel 7 appears as shown in Fig. 2 (B) so as to be less conspicuous assimilating into the door of the refrigerator 1, and thus improved design can be obtained where the operation panel 7 is less conspicuous.

It should be noted that the configurations of the switch unit 8, the display unit 9, and the switch display unit 10 shown in Fig. 2 are only for illustration, and that switches having other functions or display elements for displaying other information may be included.

[0022]

Fig. 3 is a cross-sectional view of the operation panel 7 according to Embodiment 1.

As illustrated in Fig. 3, a tactile switch 12 and an LED 13 are mounted on the surface of a substrate 11. An electric part box 14 is disposed so as to surround the tactile switch 12 and the LED 13.

A surface component 16 including a display surface 17 with character-shaped cuts is disposed on the surface of the electric part box 14 opposite from the substrate 11 so as to form the surface of the operation panel 7.

Further, a button 15 with an operation portion extending through the surface component 16 is disposed above the tactile switch 12 (on the opposite side from the mount surface of the substrate 11). When a user presses the button 15 in the direction of the tactile switch 12, operation for various settings or the like is performed. The tactile switch 12 and the button 15 constitute each of the switches of the above-mentioned switch unit 8.

[0023]

The back surface of the surface component 16 is colored by printing or the like, and has a color and a thickness sufficient to block light. The display surface 17 with

character-shaped cuts is formed such that the areas of the character-shaped cuts are open or have a lighter color than the other areas.

When the above-described LED 13 is turned on, the light from the LED 13 passes through only the character-shaped cut in the display surface 17 so that characters, numbers, or shapes desired to be displayed become visible. When the LED 13 is turned off, the character-shaped cut in the display surface 17 becomes invisible so that only the surface component 16 remains visible.

In the operation panel 7, an LED 13 is provided for each of sets of characters, numbers, or shapes to be displayed independently, and each of the LEDs 13 is turned on and off independently.

[0024]

It should be noted that the configuration of the operation panel 7 is not limited to that described above. For example, the display unit 9 and the switch display unit 10 may be formed of an LCD (Liquid Crystal Display), and the switch unit 8 may be formed of touch switches disposed on the upper side of the LCD.

In the description below, "turning on the display" refers to turning on the LED 13 so that the light from the LED 13 passes through the character-shaped cut in the display surface 17, and "turning off the display" refers to turning off the LED 13. In the case where the display unit 9 and the switch display unit 10 are formed of an LCD or another display device, "displaying information on the display device" corresponds to "turning on the display unit", and "not displaying information on the display device" corresponds to "turning off the display unit".

[0025]

(Operating Procedure of Operation Panel 7)

Next, a description will be given of the operating procedure of the operation panel 7.

Fig. 4 illustrates the range of choices and the order in which the choices are switched for each setting allowed by the operation panel according to Embodiment 1.

It should be noted that the settings and the order in which to be changed shown in Fig. 4 are only for illustration, and the present invention is not limited to this.

[0026]

When the chamber selection switch 8a is pressed by the user, the chambers are selected in the order shown in Fig. 4 (a). The currently-selected-chamber display 9a displays information specifying the selected chamber.

5 [0027]

Subsequently, when the temperature control switch 8b is pressed, the temperature settings of the selected chamber are changed in the order shown in Fig. 4 (b). The temperature setting level display 9b displays the temperature control level set on the selected chamber.

10 [0028]

The flash freezing switch 8c is valid only when the switching compartment 4 is selected. When the switching compartment 4 is selected by operating the chamber selection switch 8a, pressing the flash freezing switch 8c sets the flash freezing function of the switching compartment 4 to be on/off in the order shown in Fig. 4 (c).

15 The flash freezing display 9c is turned on/off in accordance with the on/off of the flash freezing function.

On the other hand, when a chamber other than the switching compartment 4 is selected by operating the chamber selection switch 8a, the operation of the flash freezing switch 8c is invalid.

Further, when the switch operation of the flash freezing switch 8c is valid, the flash freezing switch display 10c is turned on. When the switch operation is invalid, the flash freezing switch display 10c is turned off, thereby making the user realize that the operation of the flash freezing switch 8c is invalid.

[0029]

25 The ice making compartment 3 is a chamber having an automatic ice making function. The ice making methods include, for example, a method of making regular ice, a method of making very clear ice, and a method of quickly making ice.

The setting of the ice making function of the ice making compartment 3 can be changed using the ice making mode change switch 8d regardless of which chamber is selected. When the ice making mode change switch 8d is pressed, the setting of

30

the ice making function is changed in the order shown in Fig. 4 (d). The ice making setting display 9d displays at which the ice making function is set.

[0030]

As such, the switches of the operation panel 7 need to be operated in a predetermined order depending on the setting to be performed.

That is, in the case of performing operation of changing the temperature setting of a certain chamber, a user first selects the certain chamber viewing the currently-selected-chamber display 9a, and then selects a desired temperature level by operating the temperature control switch 8b. Further, in the case of switching on/off the flash freezing function of the switching compartment 4, the user first selects the switching compartment 4 viewing the currently-selected-chamber display 9a, and then sets the flash freezing function to be on/off by operating the flash freezing display 9c.

Meanwhile, among the switches on the operation panel 7, there is a switch which is always operable.

Specifically, in the case of changing the setting of the ice making function of the ice making compartment 3, the user selects a desired ice making function by operating the ice making mode change switch 8d regardless of the chamber selection.

[0031]

(Display Operation of Operation Panel 7)

Next, as to the operation panel 7 having the configuration described above, a description will be given of a display operation performed to make the user realize in what order the switches in the operation panel 7 are to be operated.

[0032]

[When All Displays are Off]

First, a description will be given of the operation of starting to turn on the displays if the switch unit 8 is operated when all the displays are off (not displayed).

Here, all the displays being off refers to the state where, for example, because no operation was performed for a predetermined time period (about 30 seconds) after

the switch unit 8 was last operated, all the displays are turned off to save power or make the design thereof better.

[0033]

Fig. 5 illustrates an operation of the operation panel 7 (when all the displays are off: Example 1) according to Embodiment 1.

When all the displays are off as shown in Fig. 5 (A), if any of the switches of the switch unit 8 is operated, only the currently-selected-chamber display 9a of the display unit 9 and the chamber selection switch display 10a of the switch display unit 10 are first displayed (turned on) as indicated by a dotted line b in Fig. 5 (B).

After a predetermined time period (about 0.5 second) has passed from when the currently-selected-chamber display 9a and the chamber selection switch display 10a started to be displayed, the other displays of the display unit 9 (the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d) and the other displays of the switch display unit 10 (the temperature control switch display 10b, the flash freezing switch display 10c, and ice making mode change switch display 10d) are displayed (turned on) as indicated by a dotted line c in Fig. 5 (C).

[0034]

As such, the currently-selected-chamber display 9a and the chamber selection switch display 10a are first displayed, thereby visually making the user know that operation of selecting a chamber is to be performed first.

[0035]

A description will be given of another example display operation that is performed when all the displays are off.

Fig. 6 illustrates an operation of the operation panel 7 (when all the displays are off: Example 2) according to Embodiment 1.

When all the displays are off as shown in Fig. 6 (A), if any of the switches of the switch unit 8 is operated, only the currently-selected-chamber display 9a of the display unit 9 is first displayed (turned on) as indicated by a dotted line b in Fig. 6 (B).

Then, after a predetermined time period (about 0.5 second) has passed from when

the currently-selected-chamber display 9a started to be displayed, only the chamber selection switch display 10a of the switch display unit 10 is displayed (turned on) as indicated by a dotted line c in Fig. 6 (C).

Then, after a predetermined time period (about 0.5 second) has passed from when the chamber selection switch display 10a started to be displayed, the other displays of the display unit 9 (the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d) are displayed (turned on) as indicated by a dotted line d in Fig. 6 (D).

After a predetermined time period (about 0.5 second) has passed from when the other displays of the display unit 9 started to be displayed, the other displays of the switch display unit 10 (the temperature control switch display 10b, the flash freezing switch display 10c, and ice making mode change switch display 10d) are displayed (turned on) as indicated by a dotted line e in Fig. 6 (E).

[0036]

As such, the switch display unit 10 may be displayed (turned on) with a delay of a predetermined time period (about 0.5 second) with respect to the display unit 9, whereby the display unit 9 indicating the states and the switch display unit 10 indicating the actions done by operating the switches (their functions) can be clearly distinguished from each other.

[0037]

A description will be given of another example display operation that is performed when all the displays are off.

Fig. 7 illustrates an operation of the operation panel 7 (when all the displays are off: Example 3) according to Embodiment 1.

When all the displays are off as shown in Fig. 7 (A), if any of the switches of the switch unit 8 is operated, only the currently-selected-chamber display 9a of the display unit 9 and the chamber selection switch display 10a of the switch display unit 10 are first displayed (turned on) as indicated by a dotted line b in Fig. 7 (B).

Then, after a predetermined time period (about 0.5 second) has passed from when the currently-selected-chamber display 9a and the chamber selection switch

display 10a started to be displayed, the temperature setting level display 9b of the display unit 9 and the temperature control switch display 10b of the switch display unit 10 are displayed (turned on) as indicated by a dotted line c in Fig. 7 (C).

Then, after a predetermined time period (about 0.5 second) has passed from when the temperature setting level display 9b and the temperature control switch display 10b started to be displayed, the other displays of the display unit 9 (the flash freezing display 9c and the ice making setting display 9d) and the other displays of the switch display unit 10 (the flash freezing switch display 10c and the ice making mode change switch display 10d) are displayed (turned on) as indicated by a dotted line d in Fig. 7 (D).

[0038]

As such, the currently-selected-chamber display 9a and the chamber selection switch display 10a may be first turned on; the temperature setting level display 9b and the temperature control switch display 10b may be displayed after a predetermined time period (about 0.5 second) has passed; and the flash freezing display 9c, the flash freezing switch display 10c, the ice making setting display 9d, and the ice making mode change switch display 10d may be turned on after another predetermined time period (about 0.5 second) has passed.

[0039]

A description will be given of another example display operation that is performed when all the displays are off.

Fig. 8 illustrates an operation of the operation panel 7 (when all the displays are off: Example 4) according to Embodiment 1.

When all the displays are off as shown in Fig. 8 (A), if any of the switches of the switch unit 8 is operated, only the currently-selected-chamber display 9a and the ice making setting display 9d of the display unit 9, and the chamber selection switch display 10a and the ice making mode change switch display 10d of the switch display unit 10 are displayed (turned on) as indicated by a dotted line b1 and a dotted line b2 in Fig. 8 (B).

Then, after a predetermined time period (about 0.5 second) has passed, the temperature setting level display 9b of the display unit 9 and the temperature control switch display 10b of the switch display unit 10 are displayed (turned on) as indicated by a dotted line c in Fig. 8 (C).

5 After a predetermined time period (about 0.5 second) has passed from when the temperature setting level display 9b and the temperature control switch display 10b started to be displayed, the flash freezing display 9c of the display unit 9 and the flash freezing switch display 10c of the switch display unit 10 are displayed (turned on) as indicated by a dotted line d in Fig. 8 (D).

10 [0040]

As mentioned above, the ice making setting can be changed regardless of the result of the chamber selection. Hence, as shown in Fig. 8, the ice making setting display 9d and the ice making mode change switch display 10d may be turned on at the same time when the currently-selected-chamber display 9a and the chamber selection switch display 10a are turned on. This can visually make the user know that
15 the ice making mode change switch 8d is operable.

[0041]

In the above description, the predetermined time period for transition of display (turning on) is set at about 0.5 second, but this time period may be of an arbitrary
20 length. If the time period is too short, the user may not be able to realize that information was sequentially displayed due to optical illusions or may miss it. On the other hand, if the time period is too long, the user may feel uncomfortable, and may mistakenly consider that a failure has occurred. Hence, a time period of about 0.1 to 1 second is considered to be appropriate.

25 [0042]

[When Displays are On]

Next, a description will be given of the operation that is performed if the chamber selection switch 8a is operated when displays are on.

[0043]

Fig. 9 illustrates an operation of the operation panel 7 (when displays are on: Example 1) according to Embodiment 1.

When the switching compartment 4 is displayed as being selected on the currently-selected-chamber display 9a as shown in Fig. 9 (A), if the chamber selection switch 8a is operated, the currently-selected-chamber display 9a shifts its display to "FZR" indicating the freezer compartment 5, next to the switching compartment 4, as indicated by the dotted line b1 in Fig. 9 (B). At this time, the displays except the currently-selected-chamber display 9a and the chamber selection switch display 10a are temporarily turned off as indicated by a dotted line b2 in Fig. 9 (B).

Then, when a predetermined time period (about 0.5 second) has passed from when the displays were turned off, the displays having been turned off (the temperature setting level display 9b, the temperature control switch display 10b, the ice making setting display 9d, and the ice making mode change switch display 10d) are turned on again as indicated by dotted lines c1 and c2 in Fig. 9 (C).

[0044]

As such, after the chamber selection switch 8a was operated, the displays are turned off, and then the displays corresponding to the switches that are to be operated next are displayed, thereby visually making the user know operations to be performed following the chamber selection.

[0045]

At this point in time, the chamber selected is the freezer compartment 5. Since the flash freezing switch 8c is valid only when the switching compartment 4 is selected as mentioned above, the flash freezing display 9c and the flash freezing switch display 10c remain off, thereby making the user know that the operation of the flash freezing switch display 10c is invalid when the freezer compartment 5 is selected.

[0046]

A description will be given of another example display operation that is performed when displays are on.

Fig. 10 illustrates an operation of the operation panel 7 (when displays are on: Example 2) according to Embodiment 1.

When the switching compartment 4 is displayed as being selected on the currently-selected-chamber display 9a as shown in Fig. 10 (A), if the chamber selection switch 8a is operated, the currently-selected-chamber display 9a shifts its display to "FZR" indicating the freezer compartment 5, next to the switching compartment 4, as indicated by the dotted line b1 in Fig. 10 (B). At this point, the displays except the currently-selected-chamber display 9a and the chamber selection switch display 10a are temporarily turned off as indicated by a dotted line b2 in Fig. 10 (B).

When a predetermined time period (about 0.5 second) has passed from when the displays were turned off, only the temperature setting level display 9b and the temperature control switch display 10b out of the displays that have been off are turned on again as indicated by a dotted line c in Fig. 10 (C).

Then, when a predetermined time period (about 0.5 second) has passed, the ice making setting display 9d and the ice making mode change switch display 10d out of the displays that have been off are turned on again as indicated by a dotted line d in Fig. 10 (D).

[0047]

As such, when turning on again the displays that have been off, the temperature setting level display 9b and the temperature control switch display 10b, which correspond to the next operation of the chamber selection switch 8a, are first turned on. Then, after a predetermined time period (about 0.5 second) has passed, the other displays (the ice making setting display 9d and the ice making mode change switch display 10d) may be turned on.

[0048]

A description will be given of another example display operation that is performed when displays are on.

Fig. 11 illustrates an operation of the operation panel 7 (when displays are on: Example 3) according to Embodiment 1.

When the switching compartment 4 is displayed as being selected on the currently-selected-chamber display 9a as shown in Fig. 11 (A), if the chamber selection switch 8a is operated, the currently-selected-chamber display 9a shifts its display to "FZR" indicating the freezer compartment 5, next to the switching compartment 4, as indicated by the dotted line b1 in Fig. 11 (B). At this point, the displays (indicated by a dotted line b2) except the currently-selected-chamber display 9a, the chamber selection switch display 10a, the ice making setting display 9d, and the ice making mode change switch display 10d, which are indicated by dotted lines b1 and b3 in Fig. 11 (B), are temporarily turned off.

Then, when a predetermined time period (about 0.5 second) has passed from when the displays were turned off, the temperature setting level display 9b and the temperature control switch display 10b out of the displays that have been off are turned on again as indicated by a dotted line c in Fig. 11 (C).

It should be noted that, in this example, since the freezer compartment 5 is selected, the flash freezing display 9c and the flash freezing switch display 10c remain off as mentioned above.

[0049]

Since the ice making setting can be operated regardless of which chamber is displayed, when the chamber selection switch 8a is operated, the ice making setting display 9d and the ice making mode change switch display 10d may remain on as shown in Fig. 11 without being turned off. This can visually make the user know that the ice making mode change switch 8d is operable.

[0050]

(Advantageous Effects)

In the present embodiment, as described above, information to be displayed is sequentially displayed on the display unit 9 in accordance with the order in which the switches of the switch unit 8 are operated.

This means can make the user realize what operation can be performed with each switch of the switch unit 8 on the operation panel 7, thereby improving the operability of the operation panel.

[0051]

Further, in the present embodiment, the switch display unit 10 that displays information indicating actions of the respective switches of the switch unit 8 is provided, and information to be displayed is sequentially displayed on the switch display unit 10 in accordance with the order in which the switches of the switch unit 8 are operated.

This means can make the user realize what operation can be performed with each switch of the switch unit 8 on the operation panel 7, thereby improving the operability of the operation panel.

[0052]

Further, in the present embodiment, from among information pieces indicating actions of the respective switches to be displayed on the switch display unit 10, information pieces indicating the actions of switches for which operation is invalid are not displayed.

This means can make the user realize that the switch cannot be operated, if its operation is invalid, thereby improving the operability of the operation panel.

[0053]

In the present embodiment, there has been described the case where the switch display unit 10 that displays information about the actions of the switches respectively in association with the switches of the switch unit 8 is provided, but the present invention being not limited to this, the switch display unit 10 may be omitted. For example, the actions done by operating them may be printed near the switch unit 8.

Even with this configuration, sequentially displaying information to be displayed on the display unit 9 can make the user realize what operation can be performed with each switch of the switch unit 8 on the operation panel 7, thereby improving the operability of the operation panel.

[0054]

Embodiment 2.

In Embodiment 2, a mode is described in which information pieces that can be selected or set by use of the switch unit 8 are displayed for a predetermined time period upon transition of displays.

The configurations of a refrigerator 1 and an operation panel 7 of Embodiment 2 are the same as those of Embodiment 1, and the same parts are denoted by the same reference symbols.

[0055]

[When All Displays are Off]

First, a description will be given of an operation of starting to turn on the displays if the switch unit 8 is operated when all the displays are off (not displayed).

[0056]

Fig. 12 illustrates an operation of an operation panel 7 (when all the displays are off) according to Embodiment 2.

When all the displays are off as shown in Fig. 12 (A), if any switch of the switch unit 8 is operated, only the currently-selected-chamber display 9a of the display unit 9 and the chamber selection switch display 10a are first turned on as indicated by a dotted line b in Fig. 12 (B). At this time, on the currently-selected-chamber display 9a, not only the display of the chamber currently selected but also the displays of all the chambers ("REF", "SW", "FZR", and "VEG") that can be selected by use of the chamber selection switch 8a are turned on.

Then, when a predetermined time period (about 0.5 second) has passed, the display "SW" indicating the chamber selected by use of the chamber selection switch 8a remains turned on, with the other displays of the currently-selected-chamber display 9a being turned off as indicated by a dotted line c1 in Fig. 12 (C).

At the same time, the other displays of the display unit 9 (the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d) and the other displays of the switch display unit 10 (the temperature control switch display 10b, the flash freezing switch display 10c, and the ice making mode change switch display 10d) are turned on as indicated by a dotted line c2. Also when turning on the other displays of the display unit 9 and of the switch display unit

10, not only the displays selected at that point but also all the displays that can be selected are turned on.

Then, after a predetermined time period (about 0.5 second) has passed, the displays of the display unit 9 and the switch display unit 10 except those
5 corresponding to the settings are turned off as indicated by dotted lines d1 and d2 in Fig. 12 (D).

[0057]

Although the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d are turned on simultaneously in the examples
10 shown in Figs. 12 (C) and (D), the present invention being not limited to this, the displays may be sequentially turned on in accordance with the operation procedure as in Embodiment 1.

[0058]

[When Displays are On]

15 Next, a description will be given of the operation that is performed if the chamber selection switch 8a is operated when displays are on.

[0059]

Fig. 13 illustrates an operation of the operation panel 7 (when displays are on) according to Embodiment 2.

When the switching compartment 4 is displayed as being selected on the currently-selected-chamber display 9a as shown in Fig. 13 (A), if the chamber selection switch 8a is operated, the currently-selected-chamber display 9a shifts its display to "FZR" indicating the freezer compartment 5, next to the switching compartment 4, as indicated by the dotted line b1 in Fig. 13 (B). At this point, the
25 displays except the currently-selected-chamber display 9a and the chamber selection switch display 10a are temporarily turned off as indicated by a dotted line b2 in Fig. 13 (B).

Then, when a predetermined time period (about 0.5 second) has passed from when the displays were turned off, the displays having been turned off (the
30 temperature setting level display 9b, the temperature control switch display 10b, the

ice making setting display 9d, and the ice making mode change switch display 10d) are turned on again as indicated by a dotted lines c in Fig. 13 (C). At this point, not only the displays selected but also all the displays that can be set are turned on.

Then, after a predetermined time period (about 0.5 second) has passed, the displays of the display unit 9 and the switch display unit 10 except those corresponding to the settings are turned off as indicated by a dotted line d in Fig. 13 (D).

[0060]

Although the temperature setting level display 9b, the flash freezing display 9c, and the ice making setting display 9d are turned on simultaneously in the examples shown in Figs. 13 (C) and (D), the present invention being not limited to this, the displays may be sequentially turned on in accordance with the operation procedure as in Embodiment 1.

[0061]

(Advantageous Effects)

In the present embodiment, as described above, when displaying information on the display unit 9 in accordance with the order in which the switches of the switch unit 8 are operated, all information that can be selected or set via the switches of the switch unit 8 are displayed for a predetermined time period, and then the information that have been selected or set by use of the switch unit 8 is displayed.

This means can make the user realize what operation can be performed with each switch of the switch unit 8 on the operation panel 7, thereby improving the operability of the operation panel 7.

[0062]

Embodiment 3.

In Embodiment 3, a mode is described in which a plurality of operation settings are performed by operating a single switch.

[0063]

Fig. 14 illustrates the configuration and display state of an operation panel according to Embodiment 3.

Fig. 14 shows the state where all the display elements to be displayed on the display unit 9 and the switch display unit 10 of the operation panel 7 are turned on.

As illustrated in Fig. 14, the operation panel 7 of Embodiment 3 includes a rapid cooling display 9e adjacent to the flash freezing display 9c of the display unit 9, in addition to the components of the above-described Embodiment 1 (Fig. 2).

The operation panel 7 further includes a rapid cooling switch display 10e adjacent to the flash freezing switch display 10c of the switch display unit 10.

The rapid cooling display 9e displays the setting of the cooling function of the freezer compartment 5.

The rapid cooling switch display 10e displays "RAPID" to indicate the action done by operating the flash freezing switch 8c.

[0064]

The flash freezing switch 8c of Embodiment 3 serves as a switch to switch on and off the flash freezing function of the switching compartment 4 when the switching compartment 4 is selected, and serves as a switch to switch on and off the rapid cooling function when a chamber other than the switching compartment 4 is selected.

As such, the flash freezing switch 8c is operated to perform one of a plurality of operation settings in accordance with the chamber selected by use of the chamber selection switch 8a.

[0065]

It should be noted that rapid cooling display 9e corresponds to a "setting display unit" in the present invention.

In Embodiment 3, the configuration of a refrigerator 1 and the other part of the configuration of the operation panel 7 are the same as those of Embodiment 1, and the same parts are denoted by the same reference symbols.

[0066]

Next, a description will be given of operations of the operation panel 7 having the configuration described above.

Fig. 15 illustrates an operation of the operation panel 7 (when the switching compartment is selected) according to Embodiment 3.

As illustrated in Fig. 15 (A), when the switching compartment 4 is selected by use of the chamber selection switch 8a, the operation of the flash freezing function of the switching compartment 4 is valid. Hence, the flash freezing switch display 10c is turned on with the rapid cooling switch display 10e being turned off. In this case, each time the flash freezing switch 8c is operated, the flash freezing display 9c is switched between on and off as indicated by a dotted line a in Fig. 15 (A) and a dotted line b in Fig. 15 (B).

[0067]

Fig. 16 illustrates an operation of the operation panel 7 (when the freezer compartment is selected) according to Embodiment 3.

As illustrated in Fig. 16 (A), when a chamber (e.g., the freezer compartment 5) other than the switching compartment 4 is selected by use of the chamber selection switch 8a, the flash freezing function becomes invalid and the rapid cooling function becomes valid. Hence, the flash freezing switch display 10c is turned off while the rapid cooling switch display 10e is turned on. In this case, each time the flash freezing switch 8c is operated, the rapid cooling display 9e is switched between on and off as indicated by a dotted line a in Fig. 16 (A) and a dotted line b in Fig. 16 (B).

[0068]

Although two functions, i.e., the flash freezing display 9c and the rapid cooling display 9e are switched according to the result of the currently-selected-chamber display 9a in the examples shown in Figs. 15 and 16, the present invention being not limited to this, three or more functions may be switched. Further, other functions than the flash freezing function and the rapid cooling function may be assigned thereto.

[0069]

(Advantageous Effects)

As described above, in the present embodiment, at least one of the plurality of setting switches is operated to perform one of a plurality of operation settings in accordance with the chamber selected by use of the chamber selection switch 8a. And the switch display unit 10 displays information indicating the action of the setting

switch operated to perform a plurality of operation settings, in accordance with the chamber selected by use of the chamber selection switch 8a.

Hence, one switch of the switch unit 8 can be made to have a plurality of actions (functions), and thus there is no need to add a new switch for each function.

5 Also, the system can make the user know the function that can be executed using the switch capable of a plurality of operation settings, in accordance with the selected chamber or the like.

10 Hence, it is possible to make the user realize what operation can be performed with each switch on the operation panel 7, thereby improving the operability of the operation panel 7.

[0070]

Embodiment 4.

15 In Embodiment 4, a mode is described in which a chamber for which operation setting is to be performed is selected by opening/closing the door of the chamber (storage compartment) instead of the operation of the chamber selection switch 8a.

[0071]

Fig. 17 is a schematic front view of a refrigerator according to Embodiment 4.

2 As illustrated in Fig. 17, the refrigerator 1 of Embodiment 4 includes, for each chamber, door opening/closing detecting means 18 for detecting the opening/closing of the door thereof.

Refrigerator compartment door opening/closing detecting means 18a detects the opening/closing of the door of the refrigerator compartment 2.

Ice making compartment door opening/closing detecting means 18b detects the opening/closing of the door of the ice making compartment 3.

25 Switching compartment door opening/closing detecting means 18c detects the opening/closing of the door of the switching compartment 4.

Freezer compartment door opening/closing detecting means 18d detects the opening/closing of the door of the freezer compartment 5.

30 Vegetable compartment door opening/closing detecting means 18e detects the opening/closing of the door of the vegetable compartment 6.

[0072]

In Embodiment 4, the other part of the configuration of the refrigerator 1 and the configuration of the operation panel 7 are the same as those of any of Embodiments 1 through 3, and the same parts are denoted by the same reference symbols.

[0073]

Next, a description will be given of operations of the operation panel 7 of the refrigerator 1 having the configuration described above.

[0074]

[When No Door Opening/Closing is Performed]

First, a description will be given of a display operation in the case where no door opening/closing is performed.

Fig. 18 illustrates an operation of the operation panel 7 (when no door opening/closing is performed) according to Embodiment 4.

After the switch unit 8 on the operation panel 7 was operated (Fig. 18 (A)), if the switch unit 8 is not operated during a predetermined time period (about 30 seconds), all the displays of the display unit 9 and the switch display unit 10 are turned off in order to save power or make the design thereof better (Fig. 18 (B)).

At this time, information specifying the chamber (e.g., the refrigerator compartment 2) selected on the currently-selected-chamber display 9a is stored in a not-shown storage device (a memory or the like), and then when any of the switches of the switch unit 8 is operated, the display of the chamber (the refrigerator compartment 2) which was last selected is turned on first on the currently-selected-chamber display 9a (Fig. 18 (C)).

[0075]

[When Door Opening/Closing is Performed]

Next, a description will be given of an operation performed if a door opening/closing is performed when all the displays of the operation panel 7 are off.

Fig. 19 illustrates an operation of the operation panel 7 (when the door opening/closing of the switching compartment 4 is performed) according to Embodiment 4.

After the switch unit 8 on the operation panel 7 is operated (Fig. 19 (A)), if the switch unit 8 is not operated during a predetermined time period (about 30 seconds), all the displays of the display unit 9 and the switch display unit 10 are turned off in order to save power or make the design thereof better (Fig. 19 (B)). At this point, information specifying the chamber (e.g., the refrigerator compartment 2) selected on the currently-selected-chamber display 9a is stored in a not-shown storage device (a memory or the like).

Then, for example, when the door of the switching compartment 4 is opened or closed, the switching compartment door opening/closing detecting means 18c detects the opening/closing of the door of the switching compartment 4. When the opening/closing of the door of the switching compartment 4 is detected by the switching compartment door opening/closing detecting means 18c, the operation panel 7 changes the stored chamber information from the refrigerator compartment 2 to the switching compartment 4 (Fig. 19 (C)).

After that, when any of the switches of the switch unit 8 is operated, the display of the chamber (the switching compartment 4) specified by the stored information has been stored is turned on first on the currently-selected-chamber display 9a (Fig. 19 (D)). It should be noted that the display operation is the same as that of any of Embodiments 1 through 3.

As such, according to Embodiment 4, when door opening/closing is performed, the operation panel 7 selects the chamber of which the door opening/closing has been detected by the door opening/closing detecting means 18 as a chamber for which operation setting is to be performed, instead of the operation of the chamber selection switch 8a.

[0076]

Although the example of Fig. 19 illustrates an operation that is started by the door opening/closing of the switching compartment 4, the present invention being not

limited to this, also when the opening/closing of another door is detected, likewise the stored chamber information is changed to specify the chamber whose door has been opened or closed.

[0077]

5 Not only when all the displays are off but also when a display is on, if the opening/closing of a door is detected, the selected chamber information may be changed to specify the chamber whose door has been opened or closed, but in this case, because even without operating the switch unit 8, the displays change each time a door is opened or closed, so that the user may become confused, the above
10 operation is preferably performed only when all the displays are off.

[0078]

Although in Embodiment 4 there has been described the case where the door opening/closing detecting means 18 is provided for all the chambers, the present invention being not limited to this, the opening/closing of at least one of the doors of
15 the chambers need only be detected. In this case, the above operation may be performed for only the chamber whose door opening/closing can be detected.

[0079]

Further, the above operation does not need to be performed for all the chambers for which the door opening/closing detecting means 18 is provided. The stored chamber information may be changed only when the door opening/closing of a predetermined chamber (e.g., the switching compartment 4) is performed.

[0080]

(Advantageous Effects)

25 As described above, in the present embodiment, the door opening/closing detecting means 18 for detecting the opening/closing of the door of each chamber is provided, and the operation panel 7 selects the chamber whose door opening/closing has been detected by the door opening/closing detecting means 18 as the chamber for which operation setting is to be performed, instead of the operation of the chamber selection switch 8a.

Hence, when a user operates the operation panel 7 after opening the door and putting in or taking out food, the user does not need to select the chamber using the switch unit 8, and thus the user can omit one step from the operating procedure. Thus, the operability of the operation panel can be improved.

5 [Reference Signs List]

[0081]

1 refrigerator; 2 refrigerator compartment; 3 ice making compartment; 4 switching compartment; 5 freezer compartment; 6 vegetable compartment; 7 operation panel; 8 switch unit; 8a chamber selection switch; 8b temperature control switch; 8c flash freezing switch; 8d ice making mode change switch; 9 display unit; 9a currently-selected-chamber display; 9b temperature setting level display; 9c flash freezing display; 9d ice making setting display; 9e rapid cooling display; 10 switch display unit; 10a chamber selection switch display; 10b temperature control switch display; 10c flash freezing switch display; 10d ice making mode change switch display; 10e rapid cooling switch display; 11 substrate; 12 tactile switch; 13 LED; 14 electric part box; 15 button; 16 surface component; 17 display surface; 18 door opening/closing detecting means; 18a refrigerator compartment door opening/closing detecting means; 18b ice making compartment door opening/closing detecting means; 18c switching compartment door opening/closing detecting means; 18d freezer compartment door opening/closing detecting means; and 18e vegetable compartment door opening/closing detecting means.

CLAIMS

1. A refrigerator comprising:

a plurality of storage compartments; and

5 an operation panel configured to allow performing operation setting on each of the storage compartments,

wherein the operation panel includes:

a selection switch configured to allow selecting one of the plurality of storage compartments for which operation setting is to be performed;

10 one or more setting switches to be operated to perform the operation setting on the storage compartments;

a selected-chamber display unit to display information indicating the storage compartment selected by use of the selection switch; and

15 a setting display unit to display information about the operation settings of the storage compartments, and

wherein a plurality of information to be displayed is sequentially displayed at different times on the selected-chamber display unit and the setting display unit in accordance with an order in which the selection switch and the setting switches are operated.

20

2. A refrigerator, comprising :

a plurality of storage compartments; and

an operation panel configured to allow performing operation setting on each of the storage compartments,

wherein the operation panel further includes:

a selection switch configured to allow selecting one of the plurality of storage compartments for which operation setting is to be performed;

one or more setting switches to be operated to perform the operation
5 setting on the storage compartments;

a selected-chamber display unit to display information indicating the storage compartment selected by use of the selection switch;

a setting display unit to display information about the operation settings of the storage compartments, and a switch display unit configured to
10 display information indicating an action done by operating each of the selection switch and the setting switches, and

information to be displayed is sequentially displayed on the selected-chamber display unit, the setting display unit, and the switch display unit in accordance with an order in which the selection switch and the setting
15 switches are operated.

3. The refrigerator of Claim 1 or 2,

wherein the operation panel is configured to, when displaying information on the selected-chamber display unit in accordance with an order in
20 which the selection

switch and the setting switches are operated, display information specifying the storage compartment selected by use of the selection switch after displaying all information specifying the storage compartments that can be selected by use of the selection switch for a predetermined time period.

5

4. The refrigerator of any one of Claims 1 through 3,

wherein the operation panel is configured to, when displaying information on the setting display unit in accordance with an order in which the selection switch and the setting switches are operated, display information indicating the operation setting set by use of the setting switch after displaying all information indicating the operation settings that can be performed by use of the setting switch for a predetermined time period.

10

5. The refrigerator of Claim 2,

wherein the operation panel does not display, among all information indicating actions done by operating the switches to be displayed on the switch display unit, information indicating the action done by operating a switch of which the operation is invalid.

15

6. The refrigerator of Claim 2 or 5,

wherein at least one of the plurality of setting switches is configured to allow performing one of a plurality of operation settings in accordance with the storage compartment selected by use of the selection switch; and

20

wherein the switch display unit is configured to display information indicating the action done by operating the setting switch that allows performing the plurality of operation settings, in accordance with the storage compartment selected by use of the selection switch.

25

7. The refrigerator of any one of Claims 1 through 6, further comprising:

a door opening/closing detecting means for detecting the opening/closing of at least one of doors of the storage compartments,

wherein the operation panel selects the storage compartment whose door opening/closing has been detected by the door opening/closing detecting means as

5 the storage compartment for which operation setting is to be performed, instead of the operation of the selection switch.