DESCRIPTION

[Title of Invention] REFRIGERATOR

[Technical Field]

[0001]

The present invention relates to a refrigerator.

[Background Art]

[0002]

The mainstream of domestic refrigerators has been shifted to refrigerators having separated compartments with different temperature zones in tandem with the diversification of diet. Some of such refrigerators enable a user to control a temperature in each compartment depending on user's preference such that a set temperature is slightly higher or lower. In addition, some refrigerators have a versatile compartment whose temperature can be set in the range of a refrigeration temperature at or above the freezing point to a freezing temperature below the freezing point. Further, some refrigerators have, for example, a fast cooling function of temporarily increasing a cooling capacity and a power saving function of reducing power consumption.

[0003]

A refrigerator hitherto proposed enables to control a temperature and set various functions by operating an operation device disposed on a surface of a door (refer to Patent Literature 1, for example).

[0004]

The refrigerator disclosed in Patent Literature 1 includes the operation device provided with buttons for compartment selection, temperature control, supercool freezing, and ice-making setting and indicating means for indicating a state in which the implementation of a function is set. This refrigerator is configured such that operating any of the above-described buttons changes indication for setting of various functions in turn to establish setting and, when setting is established, the indicating means is illuminated or not illuminated to indicate a state after setting.

[Citation List]

[Patent Literature]

[0005]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2011-47550 ([0049] to [0052], Fig. 8)

[Summary of Invention]

[Technical Problem]

[0006]

In the operation device of the refrigerator disclosed in Patent Literature 1, when any of the buttons is operated, indication is changed and setting is completed. The completion of setting, however, is not indicated by text. Disadvantageously, the user may become uneasy because the user does not determine whether setting has been normally established.

[0007]

Furthermore, setting changed by operation of any of the buttons is established as it is. Unfortunately, those unused to electronic equipment like an elderly person may be unwilling to operate the operation device because the person is afraid of wrong operation.

[0008]

Although the user can perform various settings by operating the buttons, the user does not know how the refrigerator is affected by setting on the operation device. Disadvantageously, the user may not know what function is available and what will happen due to button operation without reading a user manual.

[0009]

The present invention has been made to solve the above-described disadvantages and provides a refrigerator including a user-friendly operation device that a user can operate at ease.

[Solution to Problem]

[0010]

The present invention provides a refrigerator including an icon operation unit that has an icon and receives an operation input, a function display unit that, when

the icon operation unit is operated, displays characters explaining a function associated with the icon of the icon operation unit, an input receiving display unit that, when the icon operation unit is operated, displays indication of whether to implement the function associated with the icon of the icon operation unit and receives an input indicating a determination to or not to implement the function, and a setting display unit that, when the input receiving display unit receives the input indicating the determination to implement the function, displays characters indicating that the implementation of the function is set.

[Advantageous Effects of Invention]

[0011]

According to the present invention, since the refrigerator includes the function display unit that, when the icon operation unit is operated, displays characters explaining the function associated with the icon of the icon operation unit, a user can grasp what function can be implemented and set by operation and how the refrigerator is affected by the function. Furthermore, since the refrigerator includes the input receiving display unit that, when the icon operation unit is operated, displays indication of whether to implement the function associated with the icon of the icon operation unit and receives an input indicating a determination to or not to implement the function, the user can perform an operation without being afraid of wrong setting. In addition, since the refrigerator includes the setting display unit that, when the input receiving display unit receives an input indicating a determination to implement the function, displays characters indicating that the implementation of the function is set, the user can determine whether setting of the implementation of the function has been normally completed.

Accordingly, the refrigerator including a user-friendly operation device which the user can use at ease can be provided.

[Brief Description of Drawings]

[0012]

[Fig. 1] Fig. 1 is a front view of a refrigerator according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is a diagram illustrating an operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a diagram illustrating an initial state of the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 4] Fig. 4 includes diagrams illustrating illuminated and unilluminated states of icons of icon operation units in the refrigerator according to Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a schematic diagram illustrating a sectional structure of the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 6] Fig. 6 is a schematic diagram illustrating a sectional structure of the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 7] Fig. 7 is a diagram illustrating the positional relationship between light guide plates and second lighting means of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 8] Fig. 8 includes diagrams illustrating images of illuminated and unilluminated states of an icon of the icon operation unit in the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 9] Fig. 9 is an operation flow diagram illustrating an operation for setting the implementation of a function in the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 10] Fig. 10 is an operation flow diagram illustrating an operation for setting the cancellation of a function in the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 11] Fig. 11 is an operation flow diagram illustrating a cancellation operation in the operation device of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 12] Fig. 12 is a schematic diagram illustrating shift of gaze of a user operating the operation device of the refrigerator according to Embodiment 2 of the present invention.

[Fig. 13] Fig. 13 is a schematic diagram illustrating shift of gaze of the user operating the operation device of the refrigerator according to a modification of Embodiment 2 of the present invention.

[Fig. 14] Fig. 14 includes enlarged views of part of the refrigerator according to Embodiment 2 of the present invention and illustrates the positional relationship between a setting display unit and an input receiving display unit.

[Fig. 15] Fig. 15 is an enlarged view of part of the operation device of the refrigerator according to a modification of Embodiment 2 of the present invention, the operation device including a dedicated function cancellation unit.

[Description of Embodiments]

[0013]

Embodiment 1

Fig. 1 is a front view of a refrigerator 50 according to Embodiment 1 of the present invention.

As illustrated in Fig. 1, the refrigerator 50 includes a refrigerator body 1, a refrigeration compartment 2 positioned in a top portion of the refrigerator body 1, an ice-making compartment 3, a versatile compartment 4 whose set temperature can be changed in the range from freezing to refrigeration temperatures, a freezing compartment 5, and a crisper compartment 6. A refrigeration-compartment right door 2a and a refrigeration-compartment left door 2b are arranged on a front surface of the refrigeration compartment 2 and the doors are attached to the refrigerator body 1 by upper and lower hinges such that the doors are pivotably openable and closable. An operation device 10 is disposed on a front surface of the refrigeration-compartment right door 2a. The ice-making compartment 3 is configured to automatically make ice on condition that water is stored in a water tank (not illustrated) disposed in the refrigeration compartment 2. The ice made in this manner is stored in an ice storage casing (not illustrated) disposed inside the ice-making compartment 3.

[0014]

Fig. 2 is a diagram illustrating the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention. Fig. 2 illustrates a state in which all of display items in the operation device 10 are displayed.

As illustrated in Fig. 2, the operation device 10 includes an icon block 25, a function display unit 26, an input receiving display unit 27, a setting display unit 29, and a compartment display unit 30.

[0015]

The icon block 25 includes an initial icon operation unit 25A disposed at the center of the icon block 25 such that the initial icon operation unit 25A can be visually identified at any time, and icon operation units 25a to 25h arranged around the initial icon operation unit 25A. The initial icon operation unit 25A serves as a start button to be initially pressed by a user. Each of the icon operation units 25a to 25h has an icon and functions as input means for receiving an operation input from the user. As regards the icons of the icon operation units 25a to 25h, each icon has a figure (design) associated with a function to be set when the icon is pressed or a situation where the function is used.

[0016]

The function display unit 26 is configured to, when any of the icon operation units 25a to 25h is operated, display characters explaining the function associated with the icon of the operated one of the icon operation units 25a to 25h. The characters correspond to text 26a. The text 26a includes a question for the user, the question being about whether to set the implementation of the function. The text 26a includes words with a question mark as the combination of an explanation for the function and the question for the user. For example, words "FAST COOLING OF BEER?" are used as the text 26a.

[0017]

The correspondence relationship between the icon operation units 25a to 25h and the text 26a in the function display unit 26 will be described below. The icon operation unit 25a corresponds to "FAST COOLING/FREEZING?" in the function

display unit 26. The icon operation unit 25b corresponds to "AUTOMATIC POWER SAVING?" in the function display unit 26. The icon operation unit 25c corresponds to "FRESH STORAGE OF VEGETABLES?" in the function display unit 26. The icon operation unit 25d corresponds to "FAST ICE MAKING?" in the function display unit 26. The icon operation unit 25e corresponds to "FAST COOLING OF BEER?" in the function display unit 26. The icon operation unit 25f corresponds to "CHILLED COOLING?" in the function display unit 26. The icon operation unit 25g corresponds to "FAST FREEZING OF HOT FOOD?" in the function display unit 26. The icon operation unit 25h corresponds to "SUPERCOOL FREEZING?" in the function display unit 26. The designs of the icon operation units 25a to 25h and the text in the function display unit 26 in Fig. 2 are examples. Any design and text can be used in association with functions of the refrigerator 50.

[0018]

The input receiving display unit 27 is configured to, when any of the icon operation units 25a to 25h is operated, display indication of whether to implement the function associated with the icon of the operated one of the icon operation units 25a to 25h and receive an input indicating a determination to or not to implement the function. The input receiving display unit 27 includes a set button 27a used to set the implementation of a function and a cancel button 27b used to set the cancellation of the implemented function. The set button 27a and the cancel button 27b have words meaning answers to the text 26a (question) displayed in the function display unit 26 on surfaces of the buttons. For example, the surface of the set button 27a has a word "YES" and the surface of the cancel button 27b has a word "NO."

[0019]

The setting display unit 29 is configured to display characters indicating that the implementation of the function associated with the icon of the operated one of the icon operation units 25a to 25h is set. The characters correspond to text 29a. For example, a word "SET" is used as the text 29a.

[0020]

The compartment display unit 30 has figures 30a illustrating the shapes and positions of the refrigeration compartment 2, the ice-making compartment 3, the versatile compartment 4, the freezing compartment 5, and the crisper compartment 6 arranged in the refrigerator 50. The figures 30a corresponding to the compartments can be individually operated to change a display state. When any one of the icon operation units 25a to 25h is operated, the figure 30a of the compartment to be affected by the function associated with the icon of the operated one of the icon operation units 25a to 25h is displayed so as to be identified.

[0021]

Fig. 3 is a diagram illustrating an initial state of the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

Referring to Fig. 3, in the initial state of the operation device 10, display items other than the initial icon operation unit 25A are not displayed. The initial icon operation unit 25A is displayed such that it can be visually identified at any time and serves as the start button to be initially pressed by the user. The operation device 10 is configured such that user operation of the initial icon operation unit 25A triggers appearance of, for example, the icon operation units 25a to 25h.

[0022]

Fig. 4 includes diagrams illustrating illuminated and unilluminated states (displayed and hidden states) of the icons of the icon operation units 25a to 25h in the refrigerator 50 according to Embodiment 1 of the present invention.

As regards the icon operation units 25a to 25h in Embodiment 1, whether each icon operation unit is operable or inoperable is determined in accordance with the displayed or hidden state. Specific examples will be described below.

[0023]

Fig. 4(a) illustrates a state where all of the icons of the icon operation units 25a to 25h included in the icon block 25 are displayed. If the implementation of each of the functions associated with the icons in the icon operation units 25a to 25h can be set, all of the icons of the icon operation units 25a to 25h are displayed as illustrated

in Fig. 4(a). Accordingly, the user can recognize the icon operation units 25a to 25h as being operable.

[0024]

Fig. 4(b) illustrates a display example in which some of the icon operation units are inoperable.

In the example of Fig. 4(b), the icons of the operable icon operation units of the units 25a to 25h in the icon block 25 are displayed and the icons of the inoperable icon operation units are hidden. In some cases, the implementation of all of the functions associated with the icons of the icon operation units 25a to 25h cannot be set depending on operating condition of the refrigerator 50. Accordingly, the icons of the inoperable icon operation units are hidden. Since the icons of the inoperable icon operation units are hidden, the user can determine that the functions associated with the hidden icons of the icon operation units cannot be set.

[0025]

Fig. 4(c) illustrates another display example in which some of the icon operation units are inoperable.

Although all of the icons of the icon operation units 25a to 25h in the icon block 25 are displayed in Fig. 4(c), the icons of the inoperable icon operation units are displayed so as to be darker than the icons of the operable icon operation units. Specifically, the icons of the icon operation units 25c and 25f associated with the functions which cannot be implemented if these icon operation units are operated are illuminated darker than the icons of the icon operation units 25a, 25b, 25d, 25e, 25g, and 25h associated with the functions which can be implemented. Specifically, the icons of the operable icon operation units are displayed so as to be clearly identified and the icons of the inoperable icon operation units are displayed so as to enable the user to recognize these icon operation units as being inoperable. Accordingly, the user can distinguish the operable icon operation units from the inoperable icon operation units. In the case where the icons of the inoperable icon operation units are hidden as illustrated in Fig. 4(b), the user may misunderstand that the icons of the icon operation units are not displayed due to failure. In the case of Fig. 4(c), such

misunderstanding does not tend to occur. Either a display mode for the icons of the inoperable icon operation units in Fig. 4(b) or that in Fig. 4(c) can be used.

[0026]

Fig. 5 is a schematic diagram illustrating a sectional structure of the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention. Fig. 6 is a schematic diagram illustrating a sectional structure of the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

As illustrated in Fig. 5, the operation device 10 includes a housing 11 on a user side. The housing 11 includes a first print layer 11a positioned on the user side of the housing 11 and a second print layer 11b closer to an inner side of the refrigerator 50 than the first print layer 11a. The first print layer 11a is used for expression of a base color or pattern of the operation device 10. The second print layer 11b is used for expression of the icon operation units 25a to 25h, the various buttons, the text, and the figures. Each of the two print layers is formed in one piece of transparent resin and constitutes the housing 11. Since any transparent material may be used for the housing 11, the print layer can be formed using, for example, glass or acryl. For example, first LEDs 12a, a printed circuit board 13, electrodes 14, shielding walls 15, and light guide plates 16 are arranged behind the housing 11 (on the inner side of the refrigerator 50 or lower portion of the drawing sheet of Fig. 5).

[0027]

Each of the initial icon operation unit 25A, the icon operation units 25a to 25h, text items 26a in the function display unit 26, the set button 27a and the cancel button 27b in the input receiving display unit 27, the text 29a in the setting display unit 29, and the figures 30a in the compartment display unit 30 is provided with a pair of first lighting means 12. While each first lighting means 12 is turned off, for example, the corresponding icon or text printed in the second print layer 11b is hidden by the first print layer 11a for expression of the base color or pattern. While the first lighting means 12 is turned on, the design of the corresponding icon or text appears while being illuminated. In addition, since each shielding wall 15 is disposed between the adjacent first lighting means 12, the icons and the buttons can be individually

switched between the illuminated and unilluminated states. In this manner, each icon can be switched between the displayed and hidden states by turn-on/off of the first lighting means 12. Since the first lighting means 12 for illuminating the various buttons and the display items are individually provided for the respective items, the illuminated and unilluminated states of the buttons and the display items can be individually established.

[0028]

In Fig. 5, the first LEDs 12a are used as the first lighting means 12. Each of the first LEDs 12a is of a side-emitting type which emits light laterally. Each first LED 12a emits light to a side of the light guide plate 16 and the light guide plate 16 deflects the light by 90° by reflection to guide the light toward the first print layer 11a and the second print layer 11b. The housing 11 has to have a thickness of 2 mm or more because of molding constraints and, accordingly, has a certain amount of thickness. The housing 11 and the light guide plates 16, arranged behind the housing 11, constitute a light guide layer. Partial light passing through the light guide layer corresponding to the housing 11 reaches, for example, the adjacent icons or text. In the second print layer 11b, therefore, portions in each of which the icon or text is not printed are colored in black to block light, thereby preventing light leakage to the adjacent icons or text.

[0029]

The initial icon operation unit 25A and the icon operation units 25a to 25h each include a capacitive touch sensor that detects a change in capacitance when the user touches the surface of the operation device 10. The electrodes 14 for capacitance detection arranged on a surface of the printed circuit board 13 are positioned behind the initial icon operation unit 25A and the icon operation units 25a to 25h. When the user presses the surface of any icon operation unit, a change in capacitance is conveyed through the housing 11 and the light guide plate 16 to the corresponding electrode 14 for capacitance detection, so that a press by the user is determined.

[0030]

Although the first LEDs 12a of the side-emitting type are used as the first lighting means 12 for the initial icon operation unit 25A, the icon operation units 25a to 25h, and the like in Fig. 5, the lighting means are not limited to this type. For example, as illustrated in Fig. 6, a first LED 12b of a top-emitting type may be used for each display item which does not serve as input means, instead of the first LED 12a. The light guide plate 16 may be placed above the first LED 12b. In the case where the area of display is small, light guiding and diffusion can be performed by only the transparent resin of the housing 11. In this case, the light guide plate 16 may be omitted.

[0031]

Fig. 7 is a diagram illustrating the positional relationship between the light guide plates 16 and second lighting means 40 of the refrigerator 50 according to Embodiment 1 of the present invention.

As illustrated in Fig. 7, each of the icon operation units 25a to 25h is provided with the second lighting means 40 that emits light of a different color from that of the first lighting means 12 illuminating the icon operation units 25a to 25h such that the second lighting means 40 is positioned on an upper left corner of the icon operation unit. The second lighting means 40 is configured to be turned on or off to indicate that the function associated with the icon of the icon operation unit is being implemented or has been cancelled (not implemented). A case where second LEDs 40a are used as the second lighting means 40 will be described below.

[0032]

Fig. 8 includes diagrams illustrating images of illuminated and unilluminated states of the icon of each of the icon operation units 25a to 25h in the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

Fig. 8(a) illustrates an unilluminated icon state in which the first LEDs 12a and the second LED 40a are turned off. Fig. 8(b) illustrates an illuminated icon state in which the first LEDs 12a are turned on and the second LED 40a is turned off. Fig. 8(c) illustrates an icon set state in which the first LEDs 12a and the second LED 40a are turned on.

[0033]

Although not illustrated, third lighting means is provided for each of the figures 30a in the compartment display unit 30. The third lighting means is, for example, an LED. The LEDs for the figures 30a are controlled so as to be individually turned on. When any of the icon operation units 25a to 25h in the icon block 25 is operated, the third lighting means corresponding to the figure 30a of the compartment to be affected by the function associated with the operated one of the icon operation units 25a to 25h is turned on. The third lighting means is turned on or off to indicate that the corresponding figure 30a is related to or not related to the compartment to be affected by the function associated with the icon of the operated icon operation unit.

[0034]

Function Setting

Fig. 9 is an operation flow diagram illustrating an operation for setting the implementation of any function of the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

A procedure of setting the implementation of any function of the operation device 10 will be described below with reference to Fig. 9.

[0035]

Initial State

In the initial state before the operation device 10 is operated, only the first lighting means 12 for the initial icon operation unit 25A is turned on and the other first lighting means 12 are turned off. In other words, the display items other than the initial icon operation unit 25A, which can be visually identified at any time, cannot be visually identified in the initial state. The initial state is illustrated in step 000 in Fig. 9.

[0036]

Step 000 to Step 010

First, when the initial icon operation unit 25A is pressed in step 000, the procedure proceeds to step 010 and the icon operation units 25a to 25h in the icon block 25 are illuminated.

[0037]

Step 010 to Step 020

Subsequently, for example, when the icon operation unit 25e is pressed in step 010, the procedure goes to step 020 and (i) the text 26a in the function display unit 26 associated with the icon operation unit 25e, (ii) the set button 27a and the cancel button 27b, and (iii) the corresponding figure 30a in the compartment display unit 30 are illuminated. The text 26a and the figure 30a displayed in this manner provide an explanation for the function to the user. In addition, the set button 27a and the cancel button 27b displayed as described above prompt the user to determine whether to set the implementation of the function associated with the icon of the icon operation unit 25e.

[0038]

Step 020 to Step 030

In the case where "YES" in the set button 27a is pressed in step 020, the procedure proceeds to step 030 and the setting display unit 29 is illuminated. The setting display unit 29 displays text indicating that the function is implemented. For example, "SET" is displayed. At the same time, the second LED 40a indicating that the implementation of the function associated with the icon operation unit 25e is set is turned on. Such a setting operation is completed.

[0039]

Step 030 to Step 011

After a predetermined time (for example, five seconds) has elapsed in step 030, the procedure goes to step 011 and the icon operation units 25a to 25h are illuminated. Accordingly, the user can be ready for the next setting operation.

[0040]

Step 011 to Step 000

After a predetermined time (for example, 30 seconds) has elapsed during which any of the icon operation units 25a to 25h is not operated in step 011, the procedure goes to step 000 and the first lighting means 12 for the display items other than the initial icon operation unit 25A are turned off, thus entering a standby mode. The power consumption is therefore reduced.

[0041]

Setting for Cancellation of Function

Fig. 10 is an operation flow diagram illustrating an operation for setting the cancellation of any function in the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

A procedure of setting the cancellation of any function in the operation device 10 will be described below with reference to Fig. 10.

[0042]

Step 100 to Step 110

First, when the initial icon operation unit 25A is pressed in step 100, the procedure goes to step 110 and the icon operation units 25a to 25h are illuminated. At this time, since the implementation of the function associated with the icon of the icon operation unit 25e has been set, the corresponding second LED 40a is also turned on. The state in step 100 is the same as that upon transition from the above-described step 011 to step 000.

[0043]

Step 110 to Step 120

Subsequently, when the icon operation unit 25e associated with the function of which the implementation has been set is pressed in step 110, the procedure proceeds to step 120 and (i) the text 26a in the function display unit 26, (ii) the set button 27a and the cancel button 27b, and (iii) the corresponding figure 30a in the compartment display unit 30 are illuminated. The text 26a and the figure 30a displayed in this manner provide an explanation for the function to the user. In addition, the set button 27a and the cancel button 27b displayed as described above prompt the user to determine whether to set the implementation of the function associated with the icon of the icon operation unit 25e. When the user selects "YES" in the set button 27a, the user's intention to continuously set the implementation of this function is reflected and the implementation of fast cooling of beer is set. When the user selects "NO" in the cancel button 27b, the user's intention to cancel this function is reflected and fast cooling of beer is stopped.

[0044]

Step 120 to Step 130

In the case where "NO" in the cancel button 27b is pressed in step 120, the procedure goes to step 130 and setting of the implementation of the function associated with the icon of the icon operation unit 25e is cancelled. The user is informed of the cancellation of the setting by turn-off of the second LED 40a indicating that the cancellation of the function associated with the icon operation unit 25e is set. Such a cancellation operation is completed. At this time, the text 29a, which is to be displayed when the implementation of any function is set, is not displayed.

[0045]

Step 130 to Step 111

After a predetermined time (for example, five seconds) has elapsed in step 130, the procedure goes to step 111 and the icon operation units 25a to 25h are illuminated. Thus, the user is ready for the next setting operation.

[0046]

Step 111 to Step 100

After a predetermined time (for example, 30 seconds) has elapsed during which any of the icon operation units 25a to 25h is not operated in step 111, the procedure goes to step 100 and the first lighting means 12 for the display items other than the initial icon operation unit 25A are turned off, thus entering the standby mode. The power consumption is therefore reduced.

[0047]

Setting for Cancelling Implementation of Function or Cancellation of Function

Fig. 11 is an operation flow diagram illustrating a cancellation operation on the operation device 10 of the refrigerator 50 according to Embodiment 1 of the present invention.

A procedure of canceling an operation in the middle of the operation will be described below with reference to Fig. 11.

[0048]

Step 200 to Step 210

First, when the initial icon operation unit 25A is pressed in step 200, the procedure proceeds to step 210 and the icon operation units 25a to 25h are illuminated. At this time, since the implementation of the function associated with the icon of the icon operation unit 25e has been set, the corresponding second LED 40a is also turned on. The state in step 200 is the same as that upon transition from the above-described step 011 to step 000.

[0049]

Step 210 to Step 220

Subsequently, when the icon operation unit 25e associated with the function of which the implementation has been set is pressed in step 210, the procedure proceeds to step 220 and (i) the text 26a in the function display unit 26, (ii) the set button 27a and the cancel button 27b, and (iii) the corresponding figure 30a in the compartment display unit 30 are illuminated. The text 26a and the figure 30a displayed in this manner provide an explanation for the function to the user. In addition, the set button 27a and the cancel button 27b displayed as described above prompt the user to determine whether to set the implementation of the function associated with the icon of the icon operation unit 25e. In step 220, the initial icon operation unit 25A functions as a cancel button. If the user becomes aware that the user is performing an operation for setting a different function from the intended one while reading the explanation for the function or the user intends to stop the cancellation of setting, the initial icon operation unit 25A will be pressed.

[0050]

Step 220 to Step 210

Subsequently, when the initial icon operation unit 25A is pressed in step 220, the procedure goes to step 210 and each of the function display unit 26 and the input receiving display unit 27 is returned to a state before being displayed. In other words, the second LED 40a is turned on, setting of the implementation of the function is not cancelled, and the state is returned to the preceding state (in which the icon operation units 25a to 25h are illuminated).

[0051]

Step 210 to Step 200

After a predetermined time (for example, 30 seconds) has elapsed during which any of the icon operation units 25a to 25h is not operated in step 210, the procedure goes to step 200 and the first lighting means 12 for the display items other than the initial icon operation unit 25A are turned off, thus entering the standby mode. The power consumption is therefore reduced.

[0052]

As described above, the refrigerator 50 according to Embodiment 1 includes the icon operation units 25a to 25h each of which has the icon and receives an operation input, and the function display unit 26 that, when any of the icon operation units 25a to 25h is operated, displays characters explaining the function associated with the icon of the operated one of the icon operation units 25a to 25h. Accordingly, the user can grasp what function can be implemented and set by operation and how the refrigerator is affected by the function without reading a user manual.

[0053]

Furthermore, the refrigerator 50 according to Embodiment 1 includes the input receiving display unit 27 that, when any of the icon operation units 25a to 25h is operated, displays indication of whether to implement the function associated with the icon of the operated one of the icon operation units 25a to 25h and receives an input indicating a determination to or not to implement the function. Accordingly, the user can perform an operation without being afraid of wrong setting.

[0054]

In addition, the refrigerator 50 according to Embodiment 1 includes the setting display unit 29 that, when the input receiving display unit 27 receives an input indicating a determination to implement any function, displays characters indicating that the implementation of the function is set. Accordingly, the user can determine whether setting of the implementation of the function has been normally completed.

[0055]

The refrigerator 50 according to Embodiment 1 includes the touch sensors as operation means. Unlike mechanical switches, the touch sensors have no movable

parts. Accordingly, the touch sensors can be used for a long period of time because degradation caused by wear and tear of the touch sensors is avoided. In addition, since the touch sensors have no movable parts, the touch sensors have no grooves used for operation of switches, such as mechanical switches. Since the touch sensors have no path for entry of, for example, moisture, therefore, the water resistance of the touch sensors is improved. Furthermore, since the touch sensors have no grooves as described above, the entry of static electricity into the touch sensors can be prevented.

[0056]

As described above, the refrigerator 50 including the operation device 10 which is user-friendly and which the user can operate at ease can be provided.

[0057]

As regards the manner of lighting, the first lighting means 12, the second lighting means 40, and the third lighting means provided for any display item to be identified are turned on and these lighting means for the other display items are turned off such that the states of the display items are distinguished in Embodiment 1. The manner of lighting is not limited to this case. These lighting means may emit light of different colors from one another, the turn-on state of each lighting means may be capable of switching between solid and blinking modes, or the intensity of light in the turn-on state of each lighting means may be varied such that the states of the display items can be distinguished.

[0058]

Although the figures and designs arranged on the surface of the operation device 10 are illuminated by the LEDs in Embodiment 1, the manner of lighting is not limited to this case. The operation device 10 may include liquid crystal to display the figures and designs.

[0059]

Embodiment 2

Embodiment 2 will be described with respect to an optimum arrangement of icons, buttons, and display items.

Fig. 12 is a schematic diagram illustrating shift of gaze of the user operating the operation device 10 of the refrigerator 50 according to Embodiment 2 of the present invention. Fig. 13 is a schematic diagram illustrating shift of gaze of the user operating the operation device 10 of the refrigerator 50 according to a modification of Embodiment 2 of the present invention.

[0060]

Referring to Fig. 12, the icon block 25, the function display unit 26, the compartment display unit 30, and the input receiving display unit 27 are arranged in that order from top to bottom on the surface of the operation device 10. In this arrangement on the operation device 10, the user looks at the icon block 25, selects any icon of interest from the icons of the icon operation units 25a to 25h, and operates the selected icon. The user then lowers his or her gaze to recognize the function associated with the operated icon in the function display unit 26 and further lowers his or her gaze to recognize the compartment to be affected by the function in the compartment display unit 30. After that, the user lowers his or her gaze to determine whether the function to be implemented is the function which the user intends to implement and operates the set button 27a or the cancel button 27b displayed in the input receiving display unit 27. As described above, the operation units to be operated when the user uses the operation device 10 and the display units to be viewed by the user are arranged in order and displayed.

[0061]

As illustrated in Fig. 13, the icon block 25, the compartment display unit 30, the function display unit 26, and the input receiving display unit 27 may be arranged in that order from top to bottom on the surface of the operation device 10. In this arrangement, the relationship between each icon and the corresponding compartment to be affected by the function set using the icon is emphasized.

[0062]

Fig. 14 includes enlarged views of part of the refrigerator 50 according to Embodiment 2 of the present invention and illustrates the positional relationship between the setting display unit 29 and the input receiving display unit 27.

As illustrated in Figs. 14(a) and 14(b), when the set button 27a is pressed, text in the setting display unit 29 indicating that the implementation of the function is set is illuminated.

[0063]

In the case where the input receiving display unit 27 is positioned below the setting display unit 29 as illustrated in Fig. 14(a), the setting display unit 29 is not hidden by a hand of the user operating the input receiving display unit 27. Accordingly, the user can easily determine whether the implementation of the intended function is set in the setting display unit 29.

[0064]

If the input receiving display unit 27 is positioned above the setting display unit 29 as illustrated in Fig. 14(b), the text 29a, indicating that the function is set, illuminated upon pressing of the set button 27a will be hidden by the user's hand operating the button. The user may fail to identify the text 29a. Accordingly, the arrangement of Fig. 14(a) is more preferable.

[0065]

Fig. 15 is an enlarged view of part of the operation device 10 of the refrigerator 50 according to a modification of Embodiment 2 of the present invention, the operation device 10 including a dedicated function cancellation unit 31.

In the above description, the initial icon operation unit 25A is allowed to have a function of cancellation. The function cancellation unit 31 (cancel button 31a) with printed characters "RETURN" meaning the cancellation of the implementation of the function may be separately provided as illustrated in Fig. 15. As regards the characters on the cancel button 31a, for example, characters "CANCEL" may be used instead of "RETURN." Since the dedicated cancel button 31a is disposed, an action caused by pressing the cancel button 31a is clearly specified. Accordingly, the ease of use can be further improved.

[0066]

As described above, the refrigerator 50 according to Embodiment 2 is configured such that the icon block 25, the function display unit 26, the compartment

display unit 30, and the input receiving display unit 27 are arranged in that order from top to bottom. Since the display units are arranged in order from top to bottom in accordance with the shift of the user's gaze and the operating procedure, the user can naturally operate the operation device 10 while confirming an operation input. Accordingly, the user will not know which button should be pressed next time. Further, the user can determine which compartment is to be affected by the function associated with the icon of any operated icon operation unit. Advantageously, the user can operate the operation device 10 at ease. The operation device 10 which is capable of preventing misunderstanding or poor confirmation and reducing stress on the user and which is designed in further consideration of the arrangement and positions of the important buttons and display items can be provided.

[0067]

The refrigerator 50 according to Embodiment 2 is configured such that the setting display unit 29 is positioned above the input receiving display unit 27. Accordingly, the arrangement can prevent the text 29a from being hidden by the user's hand when the user operates the set button 27a and the text 29a is illuminated and thus prevent the user from failing to identify the text 29a.

[0068]

Although Embodiment 2 has been described with respect to the arrangements of the display units as illustrated in Figs. 12 and 13, the arrangement is not limited to these examples. It is desirable to arrange the display units in order in a predetermined direction in consideration of text to be displayed or items whose relationship is intended to be emphasized.

[0069]

Although Embodiment 2 has been described on the assumption that the operation device 10 is vertically long, the shape of the operation device 10 is not limited to this case. In the case where the operation device 10 is horizontally long, it is desirable to arrange the display units in order from one end to the other end in the longitudinal direction of the operation device 10.

[Reference Signs List]

[0070]

1: refrigerator body, 2: refrigeration compartment, 2a: refrigeration-compartment right door, 2b: refrigeration-compartment left door, 3: ice-making compartment, 4: versatile compartment, 5: freezing compartment, 6: crisper compartment, 10: operation device, 11: housing, 11a: first print layer, 11b: second print layer, 12: first lighting means, 12a: first LED, 12b: first LED, 13: printed circuit board, 14: electrode, 15: shielding wall, 16: light guide plate, 25: icon block, 25A: initial icon operation unit, 25a to 25h: icon operation units, 26: function display unit, 26a: text, 27: input receiving display unit, 27a: set button, 27b: cancel button, 29: setting display unit, 29a: text, 30: compartment display unit, 30a: figure, 31: function cancellation unit, 31a: cancel button, 40: second lighting means, 40a: second LED, 50: refrigerator.

CLAIMS

[Claim 1]

A refrigerator comprising:

at least one icon operation unit wherein the icon operation unit comprises an icon and functions as an input means for receiving an operation input from a user;

a function display unit that, when the icon operation unit is operated, displays characters explaining a function associated with the icon of the icon operation unit;

an input receiving display unit that, when the icon operation unit is operated, displays indication of whether to implement the function associated with the icon of the icon operation unit and receives an input indicating a determination to or not to implement the function; and

a setting display unit that, when the input receiving display unit receives from the user the input indicating the determination to implement the function, displays characters indicating that the implementation of the function is set.

[Claim 2]

The refrigerator of claim 1, further comprising:

a function cancellation unit,

wherein when the function cancellation unit is operated during a period from the time where the icon operation unit is operated to the time where the input receiving display unit receives an input, the function associated with the icon of the icon operation unit is not implemented and each of the function display unit and the input receiving display unit is returned to a state before being displayed.

[Claim 3]

The refrigerator of any one of claims 1 to 2, further comprising:

first lighting means provided for each of the at least one icon operation unit, the first lighting means being turned on or off to indicate that the icon operation unit is operable or inoperable.

[Claim 4]

The refrigerator of any one of claims 1 to 3, further comprising:

second lighting means provided for each of the at least one icon operation unit, the second lighting means being turned on or off to indicate that the function associated with the icon of the icon operation unit is being implemented or not.

[Claim 5]

The refrigerator of any one of claims 1 to 4, wherein the at least one icon operation unit includes a capacitive touch sensor.

[Claim 6]

The refrigerator of any one of claims 1 to 5, further comprising:

a compartment display unit that displays figures corresponding to compartments arranged inside a refrigerator body; and

third lighting means provided for each of the figures in the compartment display unit,

wherein when the icon operation unit is operated, each third lighting means is turned on or off to indicate that the corresponding figure is related to or not related to the compartment to be affected by the function associated with the icon of the icon operation unit.

[Claim 7]

The refrigerator of claim 6, wherein the icon operation unit, the function display unit, the compartment display unit, and the input receiving display unit are arranged in order in a predetermined direction.

[Claim 8]

The refrigerator of claim 7, wherein the icon operation unit, the function display unit, the compartment display unit, and the input receiving display unit are arranged in order from top to bottom.

[Claim 9]

The refrigerator of any one of claims 1 to 8, wherein the setting display unit is positioned above the input receiving display unit.