[Name of Document] DESCRIPTION

[Title of Invention] REFRIGERATOR

[Technical Field]

[0001]

The present invention relates to an operating portion provided, for example, on the front of a door of a refrigerator.

[Background Art]

[0002]

There has been known a conventional refrigerator that has an operating portion (for example, push-buttons) on the front of a door. By operating the operating portion, functions such as changes in the temperature setting of the freezing compartment and the refrigerating compartment (selection between "low," "medium," and "high" power), quick freezing, and quick cooling are performed.

For example, operation buttons on which names of storage compartments, such as "freezer" and "refrigerator," are written are disposed in the operating portion. Every time any one of the operation buttons is pressed, the temperature setting of the target storage compartment is changed, and the setting is displayed as the degree of power such as "low," "medium," or "high" (see, for example, Patent Literature 1).

[Citation List]

[Patent Literature]

[0003]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 2011-38712 (Fig. 2)

[Summary of Invention]

[Technical Problem]

[0004]

In the above-described conventional refrigerator, the user needs to set the temperature (cooling capacity) and functions that can be set by pressing the operation buttons of the operating portion, according to their own judgment. If the user does not understand all the temperature settings and functions of the

refrigerator, it is difficult for the user to set an optimum temperature suitable for their lifestyle and diet, and the functions of the refrigerator cannot be used effectively.

[0005]

Specifically, few users understand when or what situation is suitable to set the refrigerating compartment "low", for example. Therefore, many users have an image of being difficult to understand how to use and then give up operation, and the operating portion of the refrigerator is likely to be used very little.

[0006]

The present invention is made to solve the above problem, and it is an object of the present invention to provide a refrigerator having an operating portion with improved function and appearance.

[Solution to Problem]

[0007]

A refrigerator according to the present invention includes a plurality of storage compartments provided in a refrigerator main body, doors for opening and closing front openings of the storage compartments, an operating portion provided on the front of the uppermost one of the doors, a display switching button provided in the operating portion, and a plurality of operation buttons that are arranged near the display switching button in an invisible state and are displayed visibly by illumination when the display switching button is turned on. The display switching button is formed with an icon displayed visibly. The operation buttons are formed with icons that showing setting changes of cooling capacity of the storage compartments, and temporarily settable additional functions of the storage compartments through pictures associated with effects obtained by setting, pictures of foods that are expected to have an effect by storing under the setting, or pictures associated with scenes and situations required by the user.

[Advantageous Effects of Invention]

[0008]

According to the present invention, when the display switching button is turned on, the plurality of operation buttons that have been invisible are displayed visibly by

illumination. Therefore, the operation buttons are prevented from looking complicated, and then the feeling of dislike to the operation of the operation buttons can be reduced, rather, which causes the user to want to use the operation buttons.

The operation buttons are formed with icons that showing setting changes of cooling capacity of the storage compartments, and temporarily settable additional functions of the storage compartments through pictures associated with effects obtained by setting, pictures of foods that are expected to have an effect by storing under the setting, and pictures associated with scenes and situations required by the user. Therefore, the user can intuitively understand when and which operation button is to be operated.

[Brief Description of Drawings]

[0009]

[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 front view showing an example of a display switching button and a plurality of operation buttons displayed on an operating portion in the refrigerator of Fig. 1.

[Fig. 3] Fig. 3 is an enlarged front view showing the display switching button and the plurality of operation buttons of Fig. 2.

[Fig. 4] Fig. 4 illustrates the types of icons (pictures) of the plurality of operation buttons of Fig. 2, and the functions set for the operation buttons.

[Fig. 5] Fig. 5 is an example diagram showing tones emitted when operation buttons of an operating portion in a refrigerator of Embodiment 2 of the present invention are operated.

[Fig. 6] Fig. 6 is an example diagram showing an audio description provided when one of operation buttons of an operating portion in a refrigerator of Embodiment 3 of the present invention is operated.

[Description of Embodiments]

[0010]

Embodiment 1

Fig. 1 is a front view of a refrigerator according to Embodiment 1 of the present invention. Fig. 2 is a front view showing an example of a display switching button and a plurality of operation buttons displayed on an operating portion in the refrigerator of Fig. 1. Fig. 3 is an enlarged front view showing the display switching button and the plurality of operation buttons of Fig. 2.

[0011]

In Fig. 1, the refrigerator main body 1 has a refrigerating compartment 2 in the highest tier, a vegetable compartment 6 in the lowest tier, a freezing compartment 5 above the vegetable compartment 6, and an ice compartment 3 and a temperature changeable compartment 4 arranged side by side between the refrigerating compartment 2 and the freezing compartment 5. The front openings of these storage compartments are provided with doors 2a, 2b, 3a, 4a, 5a, and 6a for opening and closing the openings. The doors 2a and 2b of the refrigerating compartment 2 are double doors rotatably supported by upper and lower hinges provided on both sides of the refrigerator main body 1. The doors 3a, 4a, 5a, and 6a of the ice compartment 3, the temperature changeable compartment 4, the freezing compartment 5, and the vegetable compartment 6 are each a drawer-type door and can be each pulled out together with a container of the storage compartment.

[0012]

When a water supply tank (not shown) with water is placed in the refrigerating compartment 2, the above-described ice compartment 3 automatically makes ice and stores ice in an ice storage case detachably provided in the ice compartment 3. The temperature changeable compartment 4 is a storage compartment, the temperature setting of which can be changed from freezing to refrigerating.

[0013]

An operating portion 10 is provided on the front of the door 2a of the refrigerating compartment 2. The operating portion 10 is provided with a plurality of operation buttons (not shown) for setting the temperature of the refrigerating compartment 2, the temperature of the temperature changeable compartment 4, the temperature of the freezing compartment 5, and the like, and a display portion that

turns on based on the operation of the operation buttons. In addition, in the operating portion 10, as shown in Fig. 1, an iconized display switching button 20 is visibly displayed. As will hereinafter be described in detail, when the display switching button 20 is turned on, eight iconized operation buttons 30a to 30h are displayed around the display switching button 20, which is the center thereof, as shown in Fig. 2 and Fig. 3.

[0014]

The display switching button 20 is made of a light-transmissive material, such as transparent resin or glass forming the surface of the operating portion 10, with a picture visibly printing on the surface thereof. The eight operation buttons 30a to 30h are made of the above-described material with a picture printing on the surface thereof, and are formed by covering the printed parts with a color or patterned print layer so that the pictures cannot be seen. The display switching button 20 and the operation buttons 30a to 30h are provided with, for example, capacitance-type touch sensors therebehind. Owing to this configuration, the surface of the operating portion 10 is not hubbly, and therefore has a good appearance and is easy to clean.

[0015]

One or two LEDs (not shown) are placed behind and near each of the eight operation buttons 30a to 30h. The LEDs are turned on when the display switching button 20 is turned on (touched with a finger), and illuminate the eight operation buttons 30a to 30h so that they become visible. When, in that state, the display switching button 20 is touched again, the LEDs are turned off, the eight operation buttons 30a to 30h become invisible, and only the display switching button 20 is displayed (see Fig. 1).

[0016]

The display switching button 20 and the operation buttons 30a to 30h are arranged as a block within a height range of 1200 mm to 1700 mm from the installation floor surface of the refrigerator main body 1 as shown in Fig. 2. Therefore, the buttons are easily viewable and operable for a Japanese adult of average height.

[0017]

As shown in Fig. 3, the display switching button 20 and the operation buttons 30a to 30h are each a square 12 mm to 15 mm on a side, and the interval between each pair of the buttons 20 and 30a to 30h is 5 mm to 7 mm. The average width of distal joint of index finger of Japanese adults is about 15 mm. The contact area of fingertip when any one of the display switching button 20 and the operation buttons 30a to 30h is touched with such a finger is nearly a circular area with a diameter of about 10 mm although it depends on the pressing force. Therefore, when for example the operation button 30b is touched, there are such intervals that the left and right adjacent operation buttons 30a and 30c can be sufficiently seen, and the possibility of wrong operation by an accidental touch can be reduced. The area of each of the buttons 20 and 30a to 30h is sufficient relative to the contact area of fingertip, and false detection can be suppressed.

[0018]

When as described above, the size of each of the buttons 20 and 30a to 30h is a square 12 mm to 15 mm on a side, and the interval between each pair of the buttons 20 and 30a to 30h is 5 mm to 7 mm, the outer size of the block is a square 41 mm to 59 mm on a side. When the size is within this range, the buttons 20 and 30a to 30h are easily viewable, the pictures of the buttons 20 and 30a to 30h are easily distinguished, and the difficulty of touch operation can be reduced. In addition, the appearance can be improved, and the expectation for functional operation can be heightened.

[0019]

Next, the pictures of the operation buttons 30a to 30h, and the functions in the storage compartments set for the operation buttons 30a to 30h will be described with reference to Fig. 4.

Fig. 4 illustrates the types of icons (pictures) of the plurality of operation buttons of Fig. 2, and the functions set for the operation buttons.

[0020]

The icon 100a represents a function that preserves food such as meat in the temperature changeable compartment 4 by setting the temperature to about -7°C so that the food is frozen but can be cut with a knife.

The icon 100b, a picture of an electric plug, represents a function that saves electricity by lowering the cooling capacity of each storage compartment during the hours when the corresponding door of the refrigerator main body 1 is less frequently opened and closed.

The icon 100c, a picture of an ice crystal, represents a function that cools food such as meat put in the freezing compartment 5 to be in a supercool state that is below its freezing point without freezing it, freezes the food by releasing the supercool state by quick cooling, and forms minute ice crystals in the food so as to reduce deterioration of eating quality and texture due to damage such as cell destruction due to freezing.

The icons 100a, 100b, and 100c are examples of pictures associated with effects obtained by setting as described above.

[0021]

The icon 100d represents a function that keeps meat or fish fresh nearly at its freezing point by setting the temperature changeable compartment 4, for example, to about -3°C.

The icon 100e is a picture representing a function that quick-freezes just cooked hot rice or the like.

The icon 100f is a picture representing a function that sets the vegetable compartment 6 to a low-temperature and constant-humidity environment suitable for preservation of leaf vegetable.

The icons 100d, 100e, and 100f are examples of pictures representing specific foods put by the user as described above.

[0022]

The icon 100g is a picture representing a function that quickly makes ice.

The icon 100h is a picture representing a function that quickly cools drink such as juice stored in the refrigerating compartment 2.

The icon 100i is a picture representing a function that quickly cools a large amount of food purchased in bulk.

The icon 100j is a picture representing a function that saves electricity by stopping the automatic ice making function during a long absence.

The icons 100g, 100h, 100i, and 100j are examples of pictures representing scenes and situations that are likely to be required by the user.

[0023]

The types of icons have been described above. In Embodiment 1, the icon 100a is used as the operation button 30a, the icon 100b is used as the operation button 30b, the icon 100c is used as the operation button 30c, and the icon 100d is used as the operation button 30d. The icon 100e is used as the operation button 30e, the icon 100f is used as the operation button 30f, the icon 100g is used as the operation button 30g, and the icon 100h is used as the operation button 30h.

The icons of the operation buttons 30a to 30h shown in Fig. 3 and the icons shown in Fig. 4 are illustrative only and are not intended to be limiting.

[0024]

As described above, in Embodiment 1, the display switching button 20 and the eight operation buttons 30a to 30h are arranged as a square block, and when the display switching button 20 placed in the center is touched, the eight operation buttons 30a to 30h that have been invisible are displayed visibly by the illumination of LEDs. Owing to this configuration, the operation buttons 30a to 30h are prevented from looking complicated, and then the feeling of dislike to the operation of the operation buttons 30a to 30h can be reduced, rather, which cause the user to want to use the operation buttons 30a to 30h.

The operation buttons 30a to 30h are icons that showing setting changes of cooling capacity of the storage compartments, and temporary additional functions of the storage compartments through pictures associated with effects obtained by setting, pictures of foods that are expected to have an effect by storing, and pictures associated with scenes and situations required by the user. Therefore, the user can

intuitively understand when and which of the operation buttons 30a to 30h is to be operated.

[0025]

When the display switching button 20 is touched again, the eight operation buttons 30a to 30h in a visible state become invisible, and therefore the appearance design and the interior design of the refrigerator can be improved.

[0026]

Iconizing the operation buttons 30a to 30h makes it possible to use many functions easily. The user can feel a sense of accomplishment that they are selecting optimum setting tailored to them, and use value can increase.

[0027]

Embodiment 2

In Embodiment 1, when the display switching button 20 is touched, the eight operation buttons 30a to 30h arranged around it are illuminated with LEDs so that the operation buttons 30a to 30h is to be operable. In addition to this, when any one of the operation buttons 30a to 30h is touched, a buzzer sound is emitted to notify of acceptance of the touch operation.

[0028]

Fig. 5 is an example diagram showing tones emitted when operation buttons of an operating portion in a refrigerator of Embodiment 2 of the present invention are operated. In Embodiment 2, the configurations of the refrigerator main body, the display switching button, and the operation buttons are the same as those in Embodiment 1, so the same reference signs will be used.

In Embodiment 2, for example, a microcomputer (not shown) provided in the operating portion 10 has the function of a buzzer sound generator that emits a buzzer sound to notify of acceptance of touch operation every time any one of the operation buttons 30a to 30h is touched. As shown in Fig. 5, the tone (wavelength) of buzzer sound is set such that the tones of "C, D, E, F, G, A, B, C" are emitted in the order of the eight operation buttons 30a to 30h, respectively.

[0029]

Since the tone (wavelength) of buzzer sound differs according to the type of the operation buttons 30a to 30h, even the visually impaired can tell which operation button is touched, and erroneous operation can be prevented.

[0030]

Embodiment 3

In Embodiment 2, the tone of buzzer sound differs according to the type of the operation buttons 30a to 30h. In Embodiment 3, each function is described audibly.

[0031]

Fig. 6 is an example diagram showing an audio description provided when one of operation buttons of an operating portion in a refrigerator of Embodiment 3 of the present invention is operated. In Embodiment 3, the configurations of the refrigerator main body, the display switching button, and the operation buttons are the same as those in Embodiment 1, so the same reference signs will be used.

In Embodiment 3, for example, a microcomputer (not shown) provided in the operating portion 10 has the function of an audio description generator that provides a different audio description of function every time any one of the operation buttons 30a to 30h is touched. For example, as shown in Fig. 6, when, of the operation buttons 30a to 30h brought into a visible state by touching the display switching button 20, the operation buttons 30h is touched, an audio description of function "the vegetable compartment 6 is set to a temperature suitable for reservation of leaf vegetable" is provided to the user.

[0032]

Since audio descriptions of functions related to icons (pictures) are provided in response to the touch operation of the operation buttons 30a to 30h, even the visually impaired can be prevented from making erroneous operation and setting. There may be users who cannot imagine what function setting and operation are made by touching iconized operation buttons 30a to 30h. The users may have a fear of touching the operation buttons 30a to 30h. Voice guidance reduces such a fear, and an easier-to-use operating portion 10 can be provided.

[0033]

In Embodiments 1, 2, and 3, the display switching button 20 and the eight operation buttons 30a to 30h are arranged as a square block. However, the present invention is not limited to this. For example, the eight operation buttons 30a to 30h may be arranged in two vertical lines, and the display switching button 20 may be placed at the top of any one of the two lines. Alternatively, the eight operation buttons 30a to 30h may be arranged in a single vertical line, and the display switching button 20 may be placed at the top of the line.

[Reference Signs List]

[0034]

1: refrigerator main body, 2: refrigerating compartment, 2a: door of refrigerating compartment (right), 2b: door of refrigerating compartment (left), 3: ice compartment, 3a: door of ice compartment, 4: temperature changeable compartment, 4a: door of temperature changeable compartment, 5: freezing compartment, 5a: door of freezing compartment, 6: vegetable compartment, 6a: door of vegetable compartment, 10: operating portion, 20: display switching button, 30a to 30h: operation buttons, 100a to 100j: examples of icons of operation buttons and descriptions of functions.

[Name of Document] CLAIMS

[Claim 1]

A refrigerator comprising:

a plurality of storage compartments provided in a refrigerator main body;

doors for opening and closing front openings of the storage compartments;

an operating portion provided on the front of the uppermost one of the doors;

a display switching button provided in the operating portion; and

a plurality of operation buttons that are arranged near the display switching button in an invisible state and are displayed visibly by illumination when the display switching button is turned on,

wherein the display switching button is formed with an icon displayed visibly, and

the operation buttons are formed with icons that showing setting changes of cooling capacity of the storage compartments, and temporarily settable additional functions of the storage compartments through pictures associated with effects obtained by setting, pictures of foods that are expected to have an effect by storing under the setting, or pictures associated with scenes and situations required by the user.

[Claim 2]

The refrigerator of Claim 1, wherein the display switching button and the plurality of operation buttons are arranged in an array of n rows and n columns at regular intervals, and the display switching button is placed in a center of the array.

[Claim 3]

The refrigerator of Claim 1 or 2, further comprising LEDs that are placed near the plurality of operation buttons, and that are turned on when the display switching button is turned on, so as to display the plurality of operation buttons visibly.

[Claim 4]

The refrigerator of any one of Claims 1 to 3, wherein the display switching button and the plurality of operation buttons have capacitance-type touch sensors.

[Claim 5]

The refrigerator of any one of Claims 1 to 4, wherein the plurality of operation buttons have a buzzer sound generator that emits, when each of the plurality of operation buttons is turned on, a corresponding different buzzer sound to notify of acceptance of the ON operation.

[Claim 6]

The refrigerator of any one of Claims 1 to 5, wherein the plurality of operation buttons have a voice generator that provides, when each of the plurality of operation buttons is turned on, a different audio description for a function corresponding to the operation button.

[Claim 7]

The refrigerator of any one of Claims 1 to 6, wherein the display switching button and the plurality of operation buttons are each a square 12 mm to 15 mm on a side, and the interval between the operation buttons is 5 mm to 7 mm.

[Claim 8]

The refrigerator of any one of Claims 1 to 7, wherein the display switching button and the plurality of operation buttons are arranged as a block in a height range of 1200 mm to 1700 mm from the installation floor surface of the refrigerator main body.