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Refrigerator and method for controlling same

Abstract

A refrigerator is provided. The refrigerator includes a body comprising a first storage compartment, a door coupled to the body so as to open/close the first storage compartment and provided with a second storage compartment other than the first storage compartment, a weight sensing unit capable of being disposed in at least one of the first and second storage compartments so as to sense the weight of an item stored in the at least one of the first and second storage compartments, a communication unit for communicating with the weight sensing unit, and a control unit for generating, on the basis of the state of a communication connection between the weight sensing unit and communication unit, an output signal that distinguishes the state of the communication connection.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S) (1) This application is a continuation application, claiming priority under § 365(c), of an International application No. PCT/KR2021/000552, filed on Jan. 14, 2021, which is based on and claims the benefit of a Korean patent application number 10-2020-0017483, filed on Feb. 13, 2020, in the Korean Intellectual Property Office, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND
1. Field
(1) The disclosure relates to a refrigerator and method of controlling the same. More particularly, the disclosure relates to a technology for figuring out a remaining amount of a food in a refrigerator.
2. Description of Related Art
(2) Refrigerators are devices for storing items such as foods, drinks, and other perishable items, for a long time to prevent the items from being spoiled, and are commonly equipped with a refrigeration chamber for refrigerating the items and a freezer chamber for freezing the items.
(3) The user needs to check inside of the refrigerator to check remains of a food, a drink, and other perishable items, stored in the refrigerator, and may determine a remaining amount of a drink contained in a transparent container by his or her naked eye.
(4) For drinks, in particular, contained in an opaque container or in a thick glass bottle, there is a problem that it is difficult to make accurate decision on the remaining amount of the drink.
(5) The above information is presented as background information only to assist with an understanding of the disclosure. No determination has been made, and no assertion is made, as to whether any of the above might be applicable as prior art with regard to the disclosure.
SUMMARY
(6) Aspects of the disclosure are to address at least the above-mentioned problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of the disclosure is to provide a refrigerator coupled to a weight detector capable of accurately figuring out a remaining amount of a content, and a method of controlling the refrigerator.
(7) Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented embodiments.
(8) In accordance with an aspect of the disclosure, a refrigerator is provided. The refrigerator includes a main body including a first storeroom, a door coupled to the main body to open or close the first storeroom and equipped with a second storeroom apart from the first storeroom, a weight detector allowed to be arranged in at least one of the first storeroom or the second storeroom for detecting weight of an item stored in the at least one of the first storeroom or the second storeroom, a communication module configured to perform communication with the weight detector, and a controller configured to generate an output signal based on a connection state of the communication between the weight detector and the communication module, the output signal identifying the connection state of the communication.

(9) The weight detector may include an indicator indicating the output signal, and the controller may control the output signal to be output through the indicator.

(10) The controller may control the indicator to output a first mode in response to the weight detector not connected to the communication module, a second mode in response to the weight detector being connected to the communication module, and a third mode in response to the weight detector connected to the communication module.

(11) In an embodiment, the refrigerator further includes a display arranged in at least one portion of the door for displaying a screen to select connection between the weight detector and the communication module and the output signal, and the controller may generate the output signal based on receiving a connection command from the user.

(12) The controller may control the screen to select connection between the weight detector and the communication module to be output to a user terminal, and generate the output signal based on receiving a connection command from the user through the user terminal.

(13) The controller may issue an identity (ID) to the weight detector in response to the weight detector connected to the communication module, and control the ID and information about an output signal corresponding to the ID to be output to the user terminal.

(14) In accordance with another aspect of the disclosure, a refrigerator is provided. The refrigerator includes a main body including a first storeroom, a door coupled to the main body to open or close the first storeroom and equipped with a second storeroom apart from the first storeroom, a weight detector arranged in at least one of the first storeroom or the second storeroom for detecting weight of an item, and a controller configured to determine a remaining amount of content included in the item through the weight detector.

(15) In an embodiment, the refrigerator further includes a communication module configured to perform communication with a user terminal with which to transmit or receive information about the item, and the controller may obtain weight of a container storing the content and determine a remaining amount of the content based on a final weight of the item and the weight of the container, in response to receiving the information about the item.

(16) The controller may control the communication module to transmit information about the remaining amount of the content to the user terminal.

(17) The controller may control the communication module to transmit a message recommending purchase of the item or a command for automatic purchase of the item to the user terminal in response to the remaining amount of the content being equal to or less than a preset amount.

(18) The controller may control the communication module to transmit a message inducing to write information about the item to the user terminal in response to the weight detector detecting that the item is placed.

(19) The message may include at least one of a notification message, a push message, or an in-app message.

(20) The controller may control the communication module to transmit a command to execute a camera function for capturing an image of the item to the user terminal in response to the weight detector detecting that the item is placed.

(21) The controller may obtain information about the item based on an image of the item captured by the user terminal, and control the communication module to transmit an ID of the weight detector and a remaining amount of the content of the item to the user terminal in response to the weight detector detecting that the item is placed.

(22) In accordance with another aspect of the disclosure, a computer program is provided. The computer program is stored in a recording medium to perform, in conjunction with a computing device, detecting placement of an item through a weight detector arranged in a refrigerator and obtaining weight of the item, receiving information about the item from a user terminal, and obtaining weight information of a container storing a content based on the information about the item, and determining a remaining amount of the content based on a final weight of the item and

the weight information of the container.

(23) The computer program further includes generating a message recommending purchase of the item or a command for automatic purchase of the item to the user terminal in response to the remaining amount of the content being equal to or less than a preset amount.

(24) The computer program further includes generating a message inducing to write information about the item in response to the weight detector detecting that the item is placed.

(25) The message may include at least one of a notification message, a push message, or an in-app message.

(26) The computer program further includes generating a command to execute a camera function for capturing the item, in response to the weight detector detecting that the item is placed.

(27) The computer program further includes obtaining information about the item based on an image of the item captured by the user terminal, and indicating an ID of the weight detector and a remaining amount of the content of the item to the user terminal in response to the weight detector detecting that the item is placed.

(28) According to the disclosure, the user may obtain accurate information about a remaining amount of a content in a refrigerator without checking the remaining amount of the content with his/her naked eye.

(29) Other aspects, advantages, and salient features of the disclosure will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses various embodiments of the disclosure.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) The above and other aspects, features, and advantages of certain embodiments of the disclosure will be more apparent from the following description taken in conjunction with the accompanying drawings, in which:

(2) FIG. **1** illustrates a system in which a refrigerator and method of controlling the same is implemented, according to an embodiment of the disclosure;

(3) FIG. **2** illustrates a refrigerator, according to an embodiment of the disclosure;

(4) FIG. **3** is a control block diagram of a refrigerator, according to an embodiment of the disclosure;

(5) FIG. **4** illustrates a weight detector, according to an embodiment of the disclosure;

(6) FIG. **5** illustrates connection of a weight detector, according to an embodiment of the disclosure;

(7) FIG. **6** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure;

(8) FIGS. **7** and **8** are diagrams for describing output signals identifying connection states of a weight connector according to various embodiments of the disclosure;

(9) FIG. **9** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure;

(10) FIG. **10** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure; and

(11) FIG. **11** illustrates information of items output through a display or a user terminal according to an embodiment of the disclosure.

(12) The same reference numerals are used to represent the same elements throughout the drawings.

DETAILED DESCRIPTION

(13) The following description with reference to the accompanying drawings is provided to assist

in a comprehensive understanding of various embodiments of the disclosure as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the various embodiments described herein can be made without departing from the scope and spirit of the disclosure. In addition, descriptions of well-known functions and constructions may be omitted for clarity and conciseness.

(14) The terms and words used in the following description and claims are not limited to the bibliographical meanings, but, are merely used by the inventor to enable a clear and consistent understanding of the disclosure. Accordingly, it should be apparent to those skilled in the art that the following description of various embodiments of the disclosure is provided for illustration purpose only and not for the purpose of limiting the disclosure as defined by the appended claims and their equivalents.

(15) It is to be understood that the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a component surface" includes reference to one or more of such surfaces.

(16) The term 'unit, module, member, or block' may refer to what is implemented in software or hardware, and a plurality of units, modules, members, or blocks may be integrated in one component or the unit, module, member, or block may include a plurality of components, depending on the embodiment of the disclosure.

(17) It will be further understood that the term "connect" or its derivatives refer both to direct and indirect connection, and the indirect connection includes a connection over a wireless communication network.

(18) The term "include (or including)" or "comprise (or comprising)" is inclusive or open-ended and does not exclude additional, unrecited elements or method steps, unless otherwise mentioned.

(19) Throughout the specification, when it is said that a member is located "on" another member, it implies not only that the member is located adjacent to the other member but also that a third member exists between the two members.

(20) It will be understood that, although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section.

(21) It is to be understood that the singular forms "a," "an," and "the" include plural references unless the context clearly dictates otherwise.

(22) Reference numerals used for method steps are just used for convenience of explanation, but not to limit an order of the steps. Thus, unless the context clearly dictates otherwise, the written order may be practiced otherwise.

(23) Several terms used in the specification will be clearly defined before describing the disclosure.

(24) In the disclosure, an item is a concept including a content to be eaten by the user and a container that contains the content. For example, milk is stored in a refrigerator while being contained in a milk carton. In this case, the content corresponds to the milk, the milk carton corresponds to the container, and the milk and the milk carton may be collectively defined as the item.

(25) In the disclosure, a remaining amount of a content itself may be accurately figured out by obtaining material information, volume information, weight information, etc., of the container based on information about the item and reflecting the weight information of the container in the entire weight measured by the weight detector.

(26) Reference will now be made in detail to embodiments of the disclosure, which are illustrated in the accompanying drawings.

(27) FIG. **1** illustrates a system in which a refrigerator and method of controlling the same is

implemented, according to an embodiment of the disclosure.

(28) FIG. **2** illustrates a refrigerator, according to an embodiment of the disclosure.

(29) FIG. **3** is a control block diagram of a refrigerator, according to an embodiment of the disclosure.

(30) FIG. **4** illustrates a weight detector, according to an embodiment of the disclosure.

(31) Referring to FIGS. **1** to **4**, a system according to an embodiment includes a refrigerator **100**, a user terminal **200** having an application installed therein to provide information about an item based on a weight detector **110**, a cloud server **300** for receiving, from the refrigerator **100** and the user terminal **200**, and storing the information about the item, and determining a remaining amount of a content, and an external server **400** for receiving a request for an order of an item from the user terminal **200** or the cloud server **300**.

(32) The cloud server **300** is a server connected to the refrigerator **100** and the user terminal **200** over a network, and may receive data from the refrigerator **100** and the user terminal **200** and provide a result of processing the received data. In the disclosure, an operation performed by a controller **120** may surely be performed by the cloud server **300**, in which case the cloud server **300** provides in real time the process result to the user terminal **200** or a display **130**. The external server **400** refers to a food vendor's server.

(33) Although it is shown in FIG. **1** that the cloud server **300** is connected to the refrigerator **100** and the user terminal **200** to perform data processing, the disclosure may also be performed by data transmission or reception and data processing between the refrigerator **100** and the user terminal **200** not by the cloud server **300**.

(34) The refrigerator **100** may include a main body **10** with an open front, a first storeroom **20** formed in the main body **10** to refrigerate and/or freeze foods inside, and a door **30** for opening or closing the open front of the main body **10**.

(35) The main body **10** may define outer appearance of the refrigerator **100**. The main body **10** may include an inner casing **11** forming the first storeroom **20** and an outer casing **12** coupled to outer sides of the inner casing **11** to form the outer appearance. Insulation (not shown) may be filled between the inner casing **11** and the outer casing **12** of the main body **10** to prevent cold air from leaking out of the first storeroom **20**.

(36) The first storeroom **20** may be divided by a horizontal partition wall **21** and a vertical partition wall **22**. For example, as shown in FIG. **1**, the first storeroom **20** may be divided into an upper storeroom **20***a*, a first lower storeroom **20***b* and a second lower storeroom **20***c*. Shelves **23** for foods to be put thereon and airtight containers **24** for air-tightly storing foods may be provided in the first storeroom **20**.

(37) The first storeroom **20** may be opened or closed by the door **30**. For example, as shown in FIG. **1**, the upper storeroom **20***a* may be opened or closed by a first upper door **30***aa* and a second upper door **30***ab*, the first lower storeroom **20***b* may be opened or closed by a first lower door **30***b*, and the second lower storeroom **20***c* may be opened or closed by a second lower door **30***c*.

(38) A handle may be arranged on the door **30** to easily open or close the door **30**. The handle may be formed to be lengthened vertically between the first upper door **30***aa* and the second upper door **30***ab* and between the first lower door **30***b* and the second lower door **30***c*. Hence, while the door **30** is closed, the handle may appear to be in one body. The door **30** may be equipped with a second storeroom **25**, which is an accommodating space for storing drinks of foods stored in the refrigerator.

(39) Referring to FIG. **2**, although it is shown that the second storeroom **25** is at a particular location, the second storeroom **25** may be equipped in the first upper door **30***aa*, the second upper door **30***ab*, the first lower door **30***b* and the second lower door **30***c*.

(40) In the refrigerator **100** of the disclosure, the weight detector **110** may be arranged in the first storeroom **20** or the second storeroom for measuring the weight of an item. In this case, the refrigerator **100** may perform wireless communication with the weight detector **110** arranged in the

first storeroom **20** or the second storeroom **25** through a communication module **150** capable of performing short-range communication. For example, the communication module **150** may include a local wireless communication module **151** to perform communication with the weight detector **110** based on a communication standard such as wireless fidelity (Wi-Fi), Bluetooth™, Zigbee, etc.

(41) Referring to FIG. **3**, the refrigerator **100** may include the controller **120**, the display **130**, a storage **140**, the communication module **150**, a dispenser **160**, and a cooler **170**.

(42) In this case, the weight detector **110** corresponds to a detachable device in the refrigerator **100**, which may be installed by a user in the first storeroom **20** or the second storeroom **25**, constituting part of the refrigerator **100** through connection with the communication module **150**. The weight detector **110** may be a weight sensor for detecting the weight of an object. The weight detector **110** may measure the weight of an item when the item is placed. Furthermore, the weight detector **110** may allow an amount of change in content to be figured out by measuring the weight of the item at regular intervals.

(43) Referring to FIG. **4**, the weight detector **110** may be manufactured in a plate form to allow at least one item to be placed thereon. For example, the weight detector **110** may have width as wide as one item may be placed thereon or as wide as multiple items may be simultaneously placed thereon. In this case, the weight detector **110** may split sections to measure weights of different items separately.

(44) The weight detector **110** may include an indicator **111** for indicating an output signal identifying a state of connection with the communication module **150**. The indicator **111** may be implemented by various indication devices, including e.g., a light emitting diode (LED) device, a liquid crystal display (LCD) panel, a seven-segment display device, or the like.

(45) The state of connection between the weight detector **110** and the communication module **150** may be classified into a non-connected state, a state of ongoing connection, and a state of complete connection. The indicator **111** may identify and output the respective connection states in various forms. For example, the weight detector **110** may output red light for the non-connected state, yellow light for the state of ongoing connection, and green light for the state of complete connection, when the indicator **111** is an LED device. This is, however, an example, and there may surely be other various methods of identifying the connection states. In this case, connection between the weight detector **110** and the communication module **150** may be made by the user's selection or automatic settings on an application installed in the user terminal **200**.

(46) The display **130** may include a display panel **131** for displaying an image, a touch panel **132** for receiving a touch input, and a touch screen controller **133** for driving or controlling the display panel **131** and the touch panel **132**.

(47) The display panel **131** may convert image data created by the controller **120** to an optical signal that may be visible to the user, through the touch screen controller **133**. In this case, the image data may include information about the weight detector **110** (e.g., an ID of the weight detector and information about the connection state), and information about an item (e.g., a name of the item, a storage period of the item, expiration date of the item, and a remaining amount of the content).

(48) The display panel **131** may employ a cathode ray tube (CRT) display panel, an LCD panel, an LED panel, an organic LED (OLED) panel, a plasma display panel (PDP), a field emission display (FED) panel, etc. The display panel **131** is not, however, limited thereto, and the display panel **131** may employ various displays capable of visually presenting an optical image corresponding to the image data.

(49) The touch panel **132** may receive a touch input of the user on the touch panel **132** and output an electric signal corresponding to the received touch input to the touch screen controller **133**.

(50) For example, the touch panel **132** may detect a touch of the user on the touch panel **132** from a change in resistance or capacitance and output an electric signal corresponding to coordinates of a touch point of the user to the touch screen controller **133**. The touch screen controller **133** may

determine the coordinates of the touch point of the user based on the electric signal received from the touch panel **132**.

(51) The touch panel **132** may be located on the front side of the display panel **131**. In other words, the touch panel **132** may be arranged on the surface where images are displayed. Hence, the touch panel **132** may be formed of a transparent material to prevent distortion of the image displayed on the display panel **131**.

(52) The touch panel **132** may employ a resistive touch panel or a capacitive touch panel. The touch panel **132** is not, however, limited thereto, and the touch panel **132** may employ various touch panels capable of detecting a touch or approach of the user and outputting an electric signal corresponding to coordinates of the detected touch point or approaching point.

(53) In some embodiments, the touch screen controller **133** may determine the coordinates of the touch point of the user based on the electric signal output by the touch panel **132**, and output the coordinates of the touch point of the user to the controller **120**. Furthermore, in some embodiments, the touch screen controller **133** may send the electric signal output by the touch panel **132** to the controller **120** in order for the controller **120** to determine the coordinates of the touch point of the user.

(54) The touch screen controller **133** may include a memory that stores a program and data for controlling operations of the display panel **131** and the touch panel **132**, and a microprocessor for performing computations to control operations of the display panel **131** and the touch panel **132** according to the program and data stored in the memory. The memory and processor of the touch screen controller **133** may be provided in separate chips or in a single chip.

(55) In this case where the display **130** corresponds to a touchscreen display, the display **130** may receive a touch input from the user and display an image based on the touch input of the user.

(56) The display **130** may be installed on the door **30** for user convenience. For example, the display **130** may be installed on the second upper door **30***ab*. Although the display **130** is shown as being installed on the second upper door **30***ab* in the following description, the installation position of the display **130** is not limited to the second upper door **30***ab*. For example, the display **130** may be installed anywhere visible to the user, such as on the first upper door **30***aa*, the first lower door **30***b*, the second lower door **30***c*, the outer casing **12** of the main body **10**, etc.

(57) The dispenser **160** may discharge water or ice depending on the user input. In other words, the user may directly take out water or ice through the dispenser **160** without opening the door **30**.

(58) The dispenser **160** may include a dispenser lever (not shown) for receiving a discharge command from the user, a dispenser nozzle for discharging water or ice, and a dispenser indication panel (not shown) for indicating an operation state of the dispenser **160**.

(59) The dispenser **160** may be installed on an outer side of the door **30** or the main body **10**. For example, the dispenser **160** may be installed on the first upper door **30***aa*. Although the dispenser **160** installed on the first upper door **30***a* will now be described, the dispenser **160** is not limited to being installed on the first upper door **30***a* but may be installed anywhere that the user is able to take out water or ice, such as the second upper door **30***ab*, the first lower door **30***b*, the second lower door **30***c*, the outer casing **12** of the main body **10**, etc.

(60) The cooler **170** may supply cold air into the first storeroom **20**. Specifically, the cooler **170** may keep the temperature of the first storeroom **20** within a certain range by using evaporation of refrigerants.

(61) The cooler **170** may include a compressor (not shown) for compressing a gaseous refrigerant, a condenser (not shown) for changing the compressed gaseous refrigerant into a liquid state, an expander (not shown) for depressurizing the liquid refrigerant, and an evaporator (not shown) for changing the depressurized liquid refrigerant into a gaseous state.

(62) The cooler **170** may cool the air in the first storeroom **20** using a phenomenon in which a liquid refrigerant absorbs thermal energy of ambient air while changing from liquid to gaseous state.

(63) For example, the cooler **170** may include a Peltier device using the Peltier effect. The Peltier effect is that a current flowing on a junction between different types of metals causes an exothermic phenomenon at one metal while causing endothermic phenomenon at the other metal. The cooler **170** may cool the air in the first storeroom **20** by using the Peltier device.

(64) In another example, the cooler **170** may include a magnetic cooling device using a magneto-caloric effect. The magneto-caloric effect is to emit heat when a certain material (a magneto-caloric material) is magnetized, and to absorb heat when the certain material is demagnetized. The cooler **170** may cool the air in the first storeroom **20** using the magnetic cooling device.

(65) The communication module **150** may receive a connection command from the user terminal **200** and perform communication with the weight detector **110**. Furthermore, the communication module **150** may play a role in providing a remaining amount of an item to the user terminal **200** or the cloud server **300** so that the user terminal **200** or the cloud server **300** sends a purchase request to the external server **400**, thereby purchasing the item required.

(66) The communication module **150** may include a local wireless communication module **151**, which is capable of wirelessly exchanging data with an external device within a relatively short distance. The local wireless communication module **151** may perform communication based on a communication standard e.g., Wi-Fi, Bluetooth, Zigbee, etc. Furthermore, the communication module **150** may perform wireless communication with a distant server apart from the local wireless communication. Accordingly, the communication module **150** may transmit information about a remaining amount of a content detected by the weight detector **110** directly to the cloud server **300** or the external server **400**.

(67) The local wireless communication module **151** may include an antenna that transmits a radio signal to free space or receives a radio signal from the free space, a modulator/demodulator for modulating data for transmission or demodulating a received radio signal, etc.

(68) FIG. **5** illustrates connection of a weight detector, according to an embodiment of the disclosure.

(69) Referring to FIG. **5**, the communication module **150** connected to a plurality of weight detectors **110-1**, **110-2** and **110-3** receives weight of a detected item from the plurality of weight detectors **110-1**, **110-2** and **110-3** and transmits information about the weight of the item to the controller **120**. The controller **120** may determine a remaining amount of the content based on the information about the weight of the item received from the communication module **150** and information about weight of a container received from the user terminal **200**.

(70) The storage **140** may include a non-volatile memory that stores a program or power and preserves the stored program or data even when the power is out. For example, the storage **140** may include a bulk flash memory, a solid state drive (SSD) **141**, or the like.

(71) The storage **140** may store a control program and control data for controlling operations of the refrigerator **100** and store various application programs and application data for performing various functions in response to inputs from the user.

(72) For example, the storage **140** may store an operating system (OS) program that manages components and resources (in software and hardware) included in the refrigerator **100**, an online shopping application allowing the purchase of a product online, an application that may work with an application installed in the user terminal **200**, etc.

(73) The controller **120** may include a memory **122** for storing a program and data for controlling operations of the refrigerator **100**, and a processor **121** for generating control signals to control the operations of the refrigerator **100** according to the program and data stored in the memory **122**.

(74) Specifically, the controller **120** may determine a remaining amount of a content based on information about the weight of an item and information about the item input by the user, when the communication module **150** connected to the weight detector **110** provides the information about the weight of the item.

(75) The memory **122** may temporarily store touch input data of the user input through the display

130 and data stored in the storage **140**. For example, the memory **122** may store a screen and/or an image to be displayed on the touch screen display **130**, a control command corresponding to the touch input of the user and coordinates of the touch input of the user through the touch screen display (i.e., display **130**).

(76) The memory **122** may include a volatile memory for temporarily storing data, such as a static random access memory (SRAM), a dynamic random access memory (DRAM), or the like. The memory **122** may also include a non-volatile memory for storing data for a long time, such as a read-only memory (ROM), an erasable programmable ROM (EPROM), an electrically erasable programmable ROM (EEPROM), etc.

(77) The processor **121** and the memory **122** may be implemented in separate chips or in a single chip.

(78) As such, the controller **120** may control operations of the refrigerator **100** according to a user input received through the display **130** and/or the program and data stored in the storage **140**. Operations of the refrigerator **100** as will be described below may be performed under the control of the controller **120**.

(79) The weight detector **110**, the controller **120**, the display **130**, the storage **140**, the communication module **150**, the dispenser **160** and the cooler **170** included in the refrigerator **100** have thus far been described, but a new component may be added thereto or some of the aforementioned components may be omitted as required.

(80) FIG. **6** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure.

(81) FIGS. **7** and **8** are diagrams for describing output signals identifying connection states of a weight connector according to various embodiments of the disclosure.

(82) These are merely desirable embodiments to attain the goal of the disclosure, but it is, of course, possible that some operations may be added thereto or omitted therefrom.

(83) Referring to FIG. **6**, the controller **120** searches for the weight detector **110** in the refrigerator **100** through the communication module **150** capable of performing communication with the weight detector **110**, in operation **601**. In this case, the communication module **150** detects the weight detector **110** through short-range wireless communication such as Bluetooth when the user places the weight detector **110** in the refrigerator **100**.

(84) When the weight detector **110** is present in the refrigerator **100** in operation **602**, the controller **120** outputs a screen to select connection to the weight detector **110** searched for to the display **130** or the user terminal **200**, in operation **603**. FIG. **7** illustrates an example of a screen displayed on the display **130** or the user terminal **200**. For example, the display **130** or the user terminal **200** may display search results of the plurality of weight detectors **110-1**, **110-2**, **110-3** and **110-4** on a screen, and receive a connection command for at least one of the plurality of weight detectors **110-1**, **110-2**, **110-3** and **110-4** from the user.

(85) The controller **120** may receive the connection command of the user, in operation **604**. In this case, the connection command of the user may be input through the display **130** or the user terminal **200**.

(86) When the weight detector **110** is connected to the communication module **150** in operation **605**, the controller **120** may generate an output signal to identify a connection state between the weight detector **110** and the communication module **150** based on the connection state. The output signal may also be output in other various methods through the indicator **111** equipped in the weight detector **110**.

(87) When no connection command is received from the user through the display **130** or the user terminal **200**, the controller **120** may generate an output signal to indicate that connection to the weight detector **110** is not made, in operation **606**.

(88) When connection between the weight detector **110** and the communication module **150** are underway after a connection command is received through the display **130** or the user terminal **200**,

the controller **120** may generate an output signal to indicate that connection to the weight detector **110** is underway, in operation **607**.

(89) Furthermore, when connection between the weight detector **110** and the communication module **150** by a connection command of the user is completed, the controller **120** may generate an output signal to indicate that connection to the weight detector is completed in operation **608**.

(90) FIG. **8** illustrates indications of a weight detector based on output signals generated by a controller according to an embodiment of the disclosure.

(91) Referring to FIG. **8**, the first weight detector **110-1**, which has been connected according to a connection command of the user, outputs green light, the second weight detector **110-2**, which is being connected, outputs yellow light, and the third weight detector **110-3**, which is not connected, outputs red light. This may allow the user to check the output signal indicated on the weight detector **110** and places an item, for which the user wants to know the remaining amount in real time, on the weight detector **110**. However, FIG. **8** is merely an example, and the indicator **111** may identify a connection state through other indication devices apart from the LEDs. The indicator **111** includes the indicators **111-1**, **111-2**, **111-3** associated respectively with weight detectors **110-1**, **110-2** and **110-3**.

(92) In addition to the controlling method referring to FIG. **6**, when the weight detector **110** is connected to the communication module **150**, the controller **120** may issue an ID to the weight detector **110** to which connection is completed. By issuing the ID to the weight detector **110**, the controller **120** may distinguish the weight detector **110** from other weight detectors on a screen of the user terminal **200** or the display **130**. Furthermore, the controller **120** may control information about an output signal corresponding to the ID to be output so that the user may check from the outside of the refrigerator **100** whether the weight detector **110** is connected. Moreover, when IDs are issued by the controller **120** to the plurality of weight detectors, respectively, the user may prioritize the plurality of weight detectors on the user terminal **200** or the display **130** to make it easy for management.

(93) In connection with FIGS. **6** to **8**, a method of controlling displaying of connection procedures and connection states between the refrigerator **100** and the weight detector **110** has been described. Methods for figuring out a remaining amount of a content using the connected weight detector **110** and then managing the item will now be described in detail.

(94) FIG. **9** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure.

(95) These are merely desirable embodiments to attain the goal of the disclosure, but it is, of course, possible that some operations may be added thereto or omitted therefrom.

(96) Referring to FIG. **9**, the controller **120** detects placement of an item through the weight detector **110** arranged in the refrigerator **100**, in operation **901**. The user may place the item on the weight detector **110** arranged in the first storeroom **20** or the second storeroom **25** of the refrigerator **100**, and upon detection of the placement of the item on the weight detector **110** in operation **902**, the controller **120** may obtain weight of the item in operation **903**.

(97) When the controller **120** detects the placement of the item on the weight detector **110** in operation **902**, the controller **120** creates a message inducing the user to write information about the item through the user terminal **200** or the display **130**, in operation **904**.

(98) The message generated in operation **904** may employ various methods. For example, the message may be a notification message displayed with e.g., an icon in a portion of a screen of the user terminal **200** or the display **130**, a push message or an in-app message displayed based on inactivation or activation of a corresponding application in the user terminal **200**.

(99) The user may run the corresponding application through the message once the message is created, or in person, to input information about the item. For example, the user may select a name of the item from a preset list in the corresponding application, and the application may provide weight information of a container of the item corresponding to the selected name of the item.

Furthermore, the user terminal **200** may transmit the name of the item input by the user in person to the cloud server **300** to obtain the weight information of the container of the item. In this case, the cloud server **300** may provide the weight information of the container.

(100) In addition to the user selecting the name of the item for the information about the item, the user may execute a camera function equipped in the user terminal **200** to input the information about the item in an image processing method for the image of the item. For example, the user may automatically or manually execute the camera function linked to the corresponding application to obtain an image of the item. For example, when a push message is performed, the user terminal **200** may automatically execute the camera function in response to a touch input of the user in the push message area. Information about the item may be obtained through a barcode recognition function or a quick response (QR) code recognition function, in addition to performing image processing on the image itself

(101) Upon reception of the information about the item from the user terminal **200** in the aforementioned method in operation **905**, the controller **120** obtains weight information of the container based on the information about the item in operating **906**. In this case, the weight information of the container may be data stored for each item, or data calculated based on a material and volume of the container.

(102) The controller **120** determines a remaining amount of the content based on final weight information of the item and the weight information of the container, in operation **907**. The final weight information corresponds to final weight information among pieces of weight information of the item obtained by the weight detector **110** in real time. Accordingly, the controller **120** may determine an accurate remaining amount of the content by reflecting the weight information of the container in the weight of the item itself

(103) FIG. **11** illustrates information of items output through a display or a user terminal according to an embodiment of the disclosure.

(104) In the meantime, the controller **120** may provide information about the remaining amount of the content to the user through the user terminal **200** or the display **130**.

(105) Referring to FIG. **11**, the user terminal **200** or the display **130** may display information about the remaining amount of the content in percentage or volume (not shown) along with the name of the item placed on the first weight detector **110-1**.

(106) The controller **120** may perform an additional operation based on determination of the remaining amount of the content as follows.

(107) In an embodiment, the controller **120** may create a purchase recommendation message or automatic purchase command for the item for the user terminal **200**, when the remaining amount of the content is equal to or less than a preset amount. The preset amount may be set by the user through a corresponding application. For example, when a repurchase condition of milk is met when there is 10% or 100 ml or less of the milk, the user terminal **200** may create a command to recommend the user to purchase milk or to perform automatic purchase of the milk.

(108) Furthermore, in another embodiment, when there is no change in remaining amount of the content for a preset period of time, the controller **120** may create a notification to be identified by the user terminal **200** or the display **130**. The embodiment may be applied to a case where the item placed on the weight detector **110** is a food required to be eaten at regular intervals (e.g., an internal medicine in a fluid type). Furthermore, when there is no consumption of the remaining amount of the content that exceeds a preset amount for a preset period of time, the controller **120** may create a notification to be identified by the user terminal **200** or the display **130**.

(109) FIG. **10** is a flowchart of a method of controlling a refrigerator, according to an embodiment of the disclosure.

(110) These are merely desirable embodiments to attain the goal of the disclosure, but it is, of course, possible that some operations may be added thereto or omitted therefrom.

(111) Unlike the embodiment of FIG. **9**, this embodiment is directed to a method in which the user

inputs information about an item to the user terminal **200** or the display **130** before placing the item on the weight detector **110**.

(112) Referring to FIG. **10**, first, the controller receives an image of an item captured by the user terminal **200** in operation **1001**, and obtains information about the item based on the image of the item in operation **1002**. In this case, the user terminal **200** may obtain a name of the item and weight information of a container of the item to be output on a screen based on the image of the item.

(113) The controller **120** detects placement of the item through the weight detector **110** in operation **1003**, and displays an ID of the weight detector **110** on which the item is placed and a remaining amount of the content on the user terminal **200** in response to the detecting in operation **1004**. As shown in FIG. **11**, the remaining amount of the content may be displayed along with the name of the item.

(114) Meanwhile, the embodiments of the disclosure may be implemented in the form of a recording medium for storing instructions to be carried out by a computer. The instructions may be stored in the form of program codes, and when executed by a processor, may generate program modules to perform operation in the embodiments of the disclosure. The recording media may correspond to computer-readable recording media.

(115) The computer-readable recording medium includes any type of recording medium having data stored thereon that may be thereafter read by a computer. For example, it may be a read only memory (ROM), a random access memory (RAM), a magnetic tape, a magnetic disk, a flash memory, an optical data storage device, etc.

(116) The recording medium may be provided in the form of a non-transitory storage medium. The term 'non-transitory storage medium' may mean a tangible device without including a signal, e.g., electromagnetic waves, and may not distinguish between storing data in the storage medium semi-permanently and temporarily. For example, the non-transitory storage medium may include a buffer that temporarily stores data.

(117) In an embodiment of the disclosure, the aforementioned method according to the various embodiments of the disclosure may be provided in a computer program product. The computer program product may be a commercial product that may be traded between a seller and a buyer. The computer program product may be distributed in the form of a storage medium (e.g., a compact disc read only memory (CD-ROM)), through an application store (e.g., play Store™), directly between two user devices (e.g., smart phones), or online (e.g., downloaded or uploaded). In the case of online distribution, at least part of the computer program product (e.g., a downloadable app) may be at least temporarily stored or arbitrarily created in a storage medium that may be readable to a device such as a server of the manufacturer, a server of the application store, or a relay server.

(118) While the disclosure has been shown and described with reference to various embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the disclosure as defined by the appended claims and their equivalents.

Claims

1. A refrigerator comprising: a main body including a first storeroom; a door coupled to the main body to one of open or close the first storeroom and equipped with a second storeroom apart from the first storeroom; a weight detector arranged in at least one of the first storeroom or the second storeroom for detecting weight of an item stored in the at least one of the first storeroom or the second storeroom; a communication circuit configured to perform communication with the weight detector; and a controller configured to generate an output signal based on a connection state of the communication between the weight detector and the communication circuit, the output signal

identifying the connection state of the communication, wherein the weight detector comprises an indicator on which the output signal is indicated, wherein the controller is further configured to control the output signal to be output through the indicator, and wherein the controller is further configured to control the indicator to output a first mode in response to the weight detector not connected to the communication circuit, a second mode in response to the weight detector being connected to the communication circuit, and a third mode in response to the weight detector connected to the communication circuit.

2. The refrigerator of claim 1, further comprising: a display arranged in at least a portion of the door and displaying a screen to select a connection between the weight detector and the communication circuit, and the output signal, wherein the controller is further configured to generate the output signal based on receiving a connection command from a user.

3. The refrigerator of claim 1, wherein the controller is further configured to: control a screen to select a connection between the weight detector and the communication circuit to be output to a user terminal; and generate the output signal based on receiving a connection command from a user through the user terminal.

4. The refrigerator of claim 3, wherein the controller is further configured to: issue an identity (ID) to the weight detector in response to the weight detector connected to the communication circuit; and control the ID and information about an output signal corresponding to the ID to be output to the user terminal.

5. A refrigerator comprising: a main body including a first storeroom; a door coupled to the main body to open or close the first storeroom and equipped with a second storeroom apart from the first storeroom; a weight detector arranged in at least one of the first storeroom or the second storeroom for detecting weight of an item; a communication circuit configured to perform communication with the weight detector, and a controller configured to determine a remaining amount of content included in the item through the weight detector, wherein the weight detector comprises an indicator on which an output signal is indicated; wherein the controller is further configured to control the output signal to be output through the indicator, and wherein the controller is further configured to control the indicator to output a first mode in response to the weight detector not connected to the communication circuit, a second mode in response to the weight detector being connected to the communication circuit, and a third mode in response to the weight detector connected to the communication circuit.

6. The refrigerator of claim 5, further comprising: a communication circuit configured to perform communication with a user terminal with which to transmit or receive information about the item, wherein the controller is configured to: obtain weight of a container storing the content, and determine a remaining amount of the content based on a final weight of the item and the weight of the container, in response to receiving the information about the item.

7. The refrigerator of claim 6, wherein the controller is further configured to control the communication circuit to transmit information about the remaining amount of the content to the user terminal.

8. The refrigerator of claim 6, wherein the controller is further configured to control the communication circuit to transmit a message recommending purchase of the item or a command for automatic purchase of the item to the user terminal in response to the remaining amount of the content being equal to or less than a preset amount.

9. The refrigerator of claim 6, wherein the controller is further configured to control the communication circuit to transmit a message inducing to write information about the item to the user terminal in response to the weight detector detecting that the item is placed.

10. The refrigerator of claim 9, wherein the message comprises at least one of a notification message, a push message, or an in-app message.

11. The refrigerator of claim 6, wherein the controller is further configured to control the communication circuit to transmit a command to execute a camera function for capturing an image

of the item to the user terminal in response to the weight detector detecting that the item is placed.

12. The refrigerator of claim 6, wherein the controller is further configured to: obtain information about the item based on an image of the item captured by the user terminal, and control the communication circuit to transmit an identity (ID) of the weight detector and a remaining amount of content of the item to the user terminal in response to the weight detector detecting that the item is placed.

13. A computer program including instructions stored on a non-transitory recording medium, which when executed by a computing device, perform a method of obtaining weight information of a container, the method comprising: detecting placement of an item through a weight detector arranged in a refrigerator and obtaining weight of the item; performing communication with the weight detector via a communication circuit; receiving information about the item from a user terminal; obtaining the weight information of the container storing a content based on the information about the item, and determining a remaining amount of the content based on a final weight of the item and the weight information of the container; generating an output signal corresponding to a connection state between the weight detector and the communication circuit; outputting the output signal through an indicator included in the weight detector; and controlling the indicator to display a first mode when the weight detector is not connected, a second mode when the weight detector is connected, and a third mode indicating that active communication is being performed.