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(54) **REFRIGERATOR WITH A FUNCTION TO CONFIRM ITEMS STORED THEREIN**

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(57) **ABSTRACT**

The refrigerator has a reader/writer for writing information in and reading information from a contactless memory medium, an information holding device for storing information read by the reader/writer, and an information display device for displaying the information stored by the information holding device. As a result of the invention of the refrigerator, the number of items such as foods that can be unconsumed and discarded because of the arrival of their consume-by dates is reduced in a refrigerator, and items such as foods stored in the refrigerator can be confirmed without opening the door.

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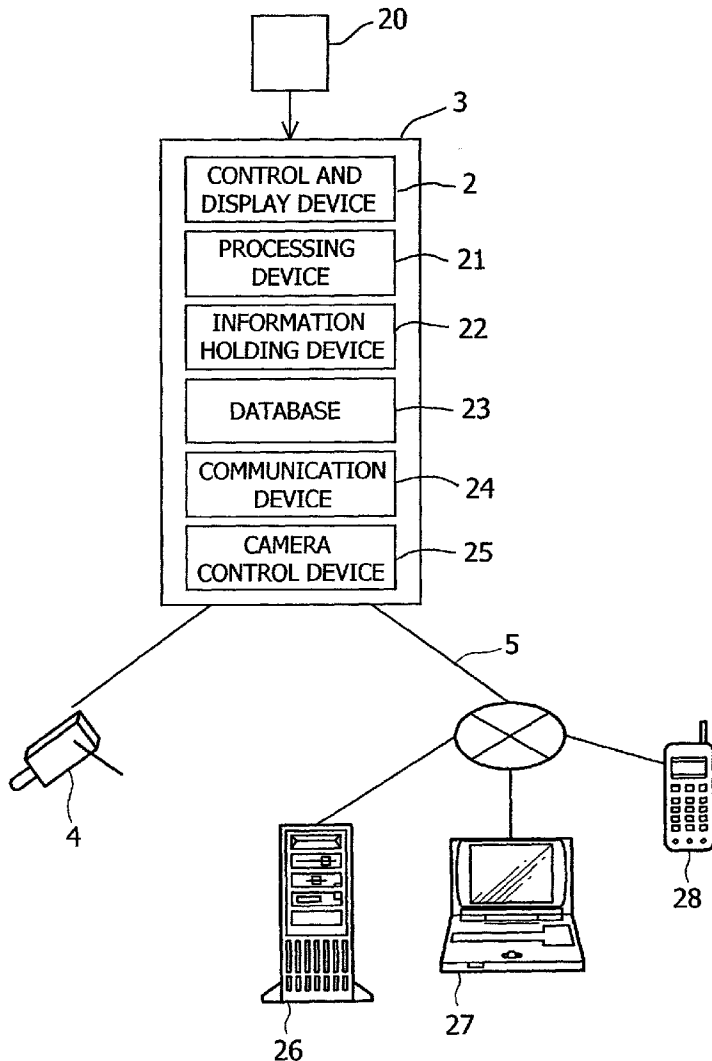


FIG.1

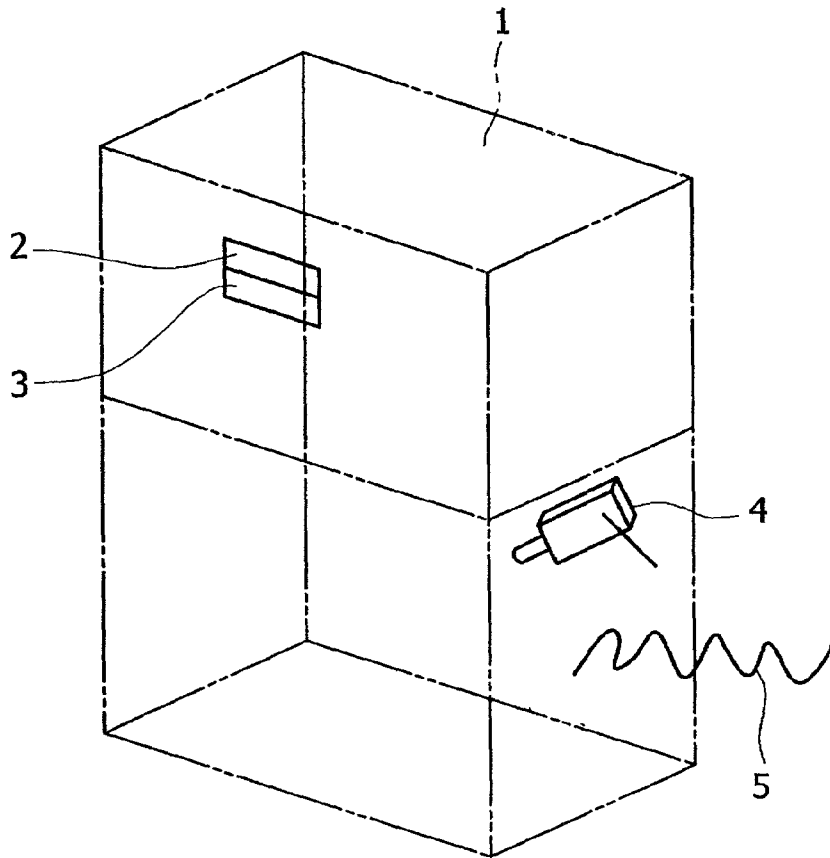


FIG.2

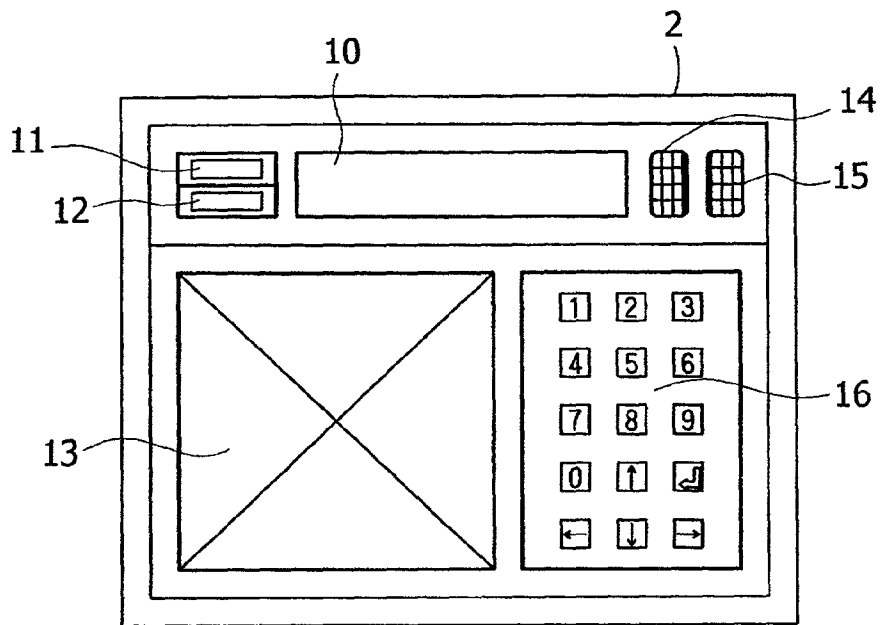


FIG.3

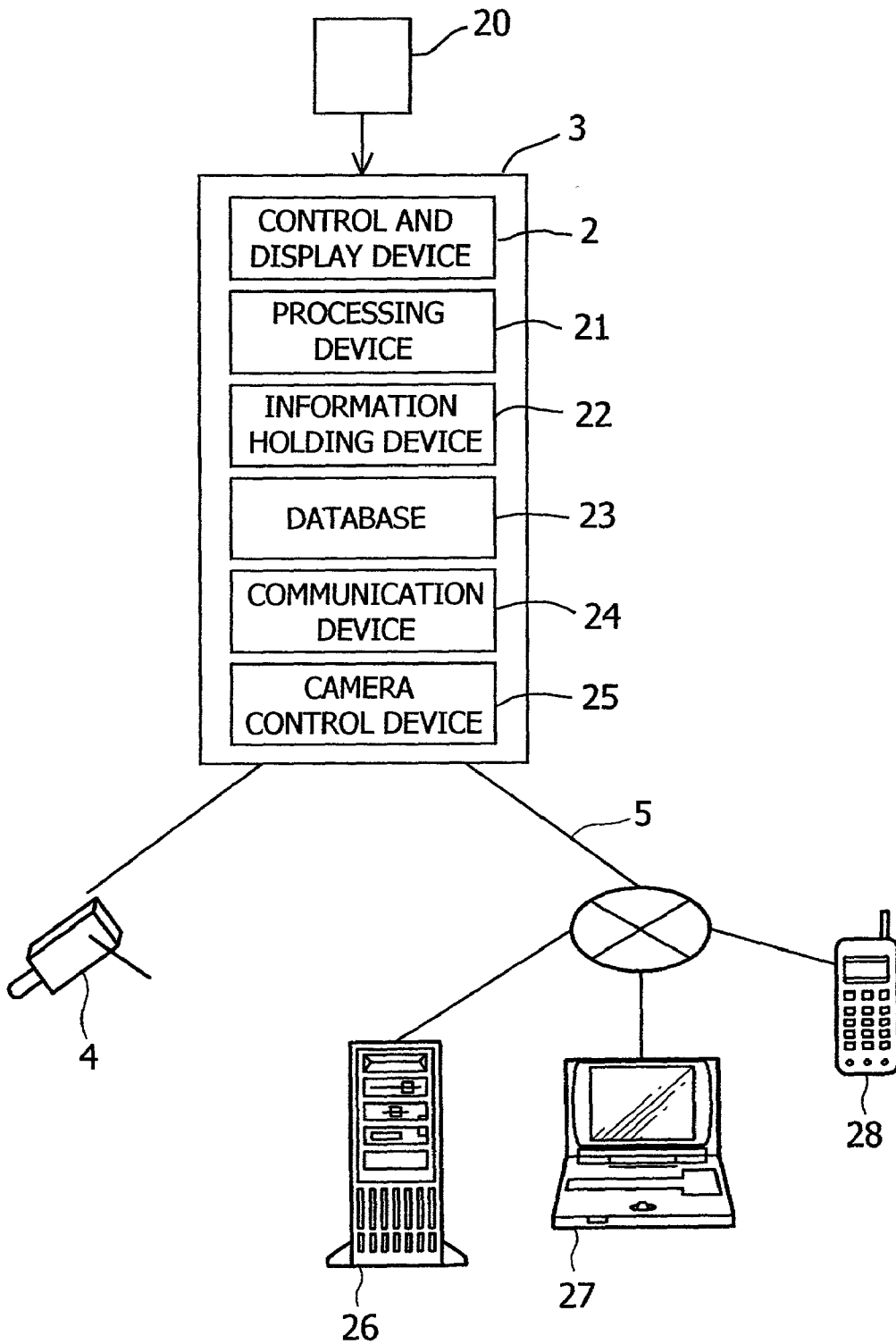


FIG.5

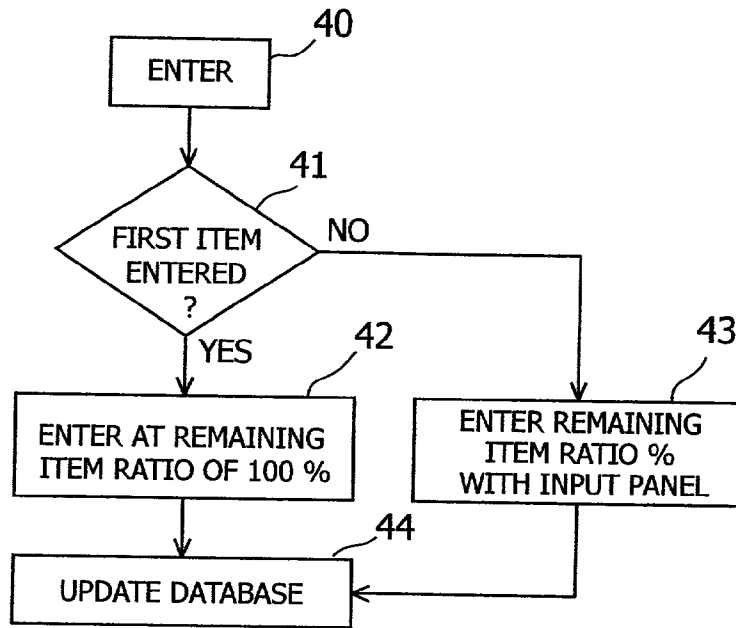


FIG.6

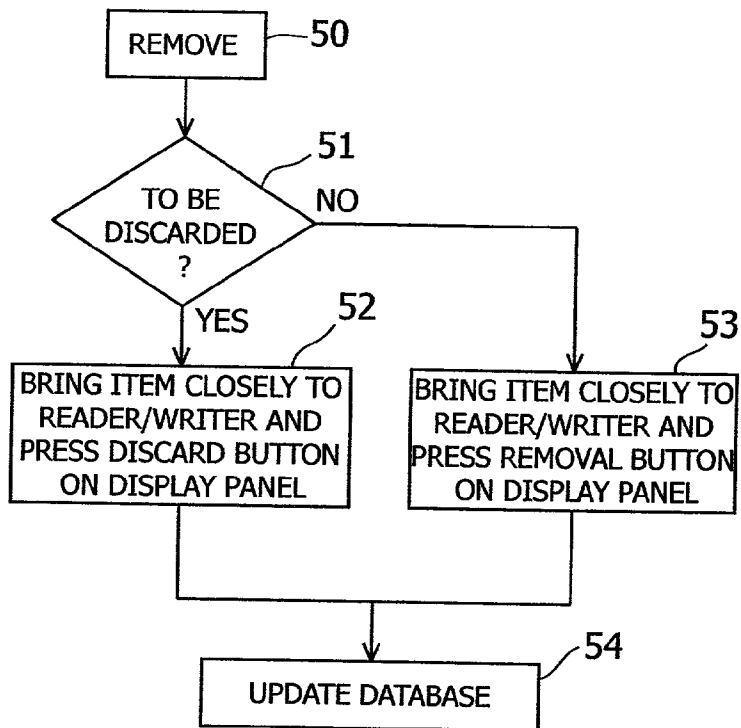


FIG.7

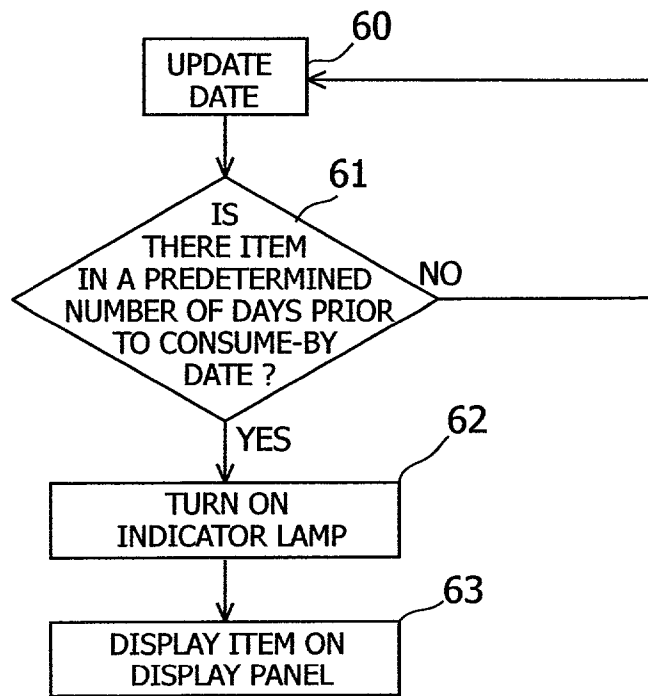


FIG.8

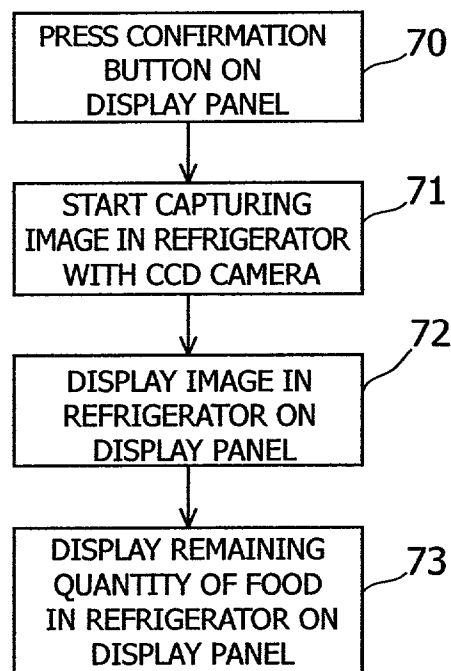


FIG. 9

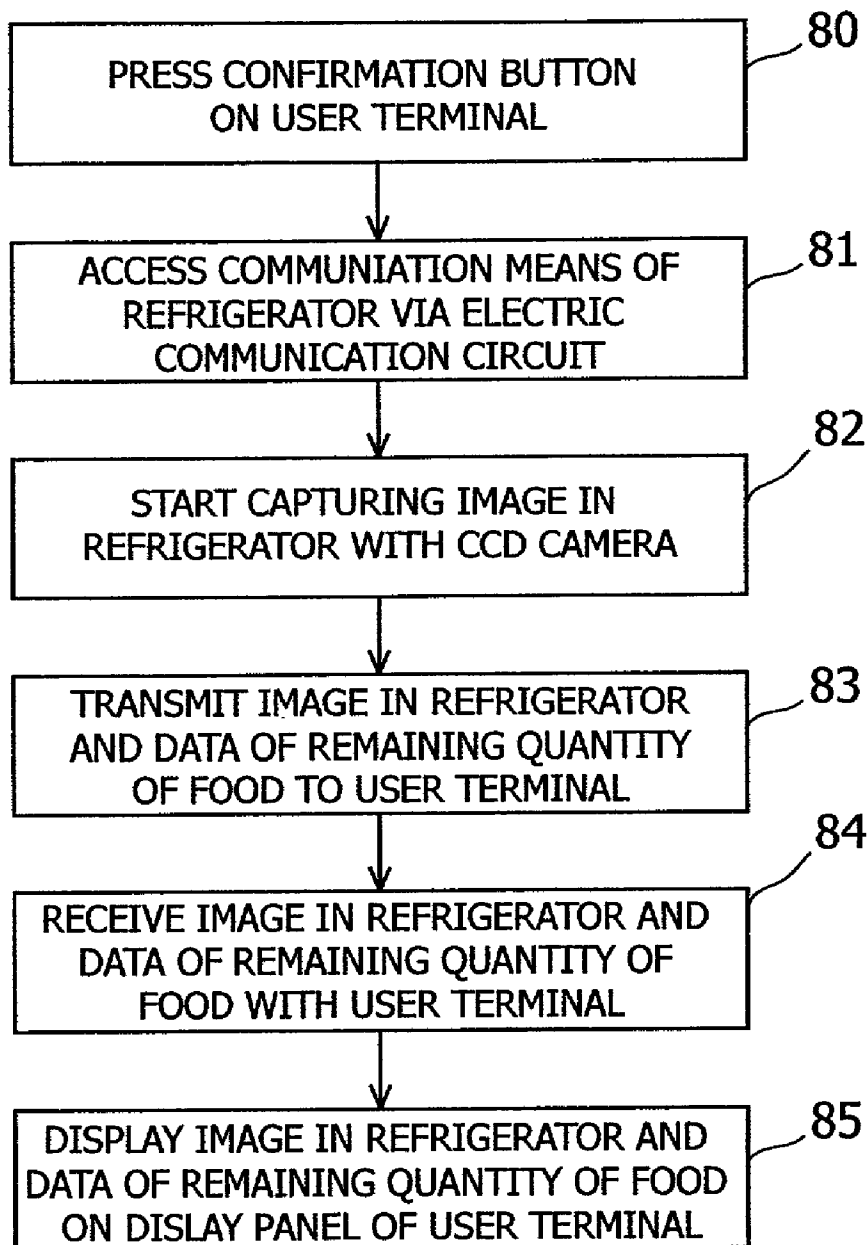
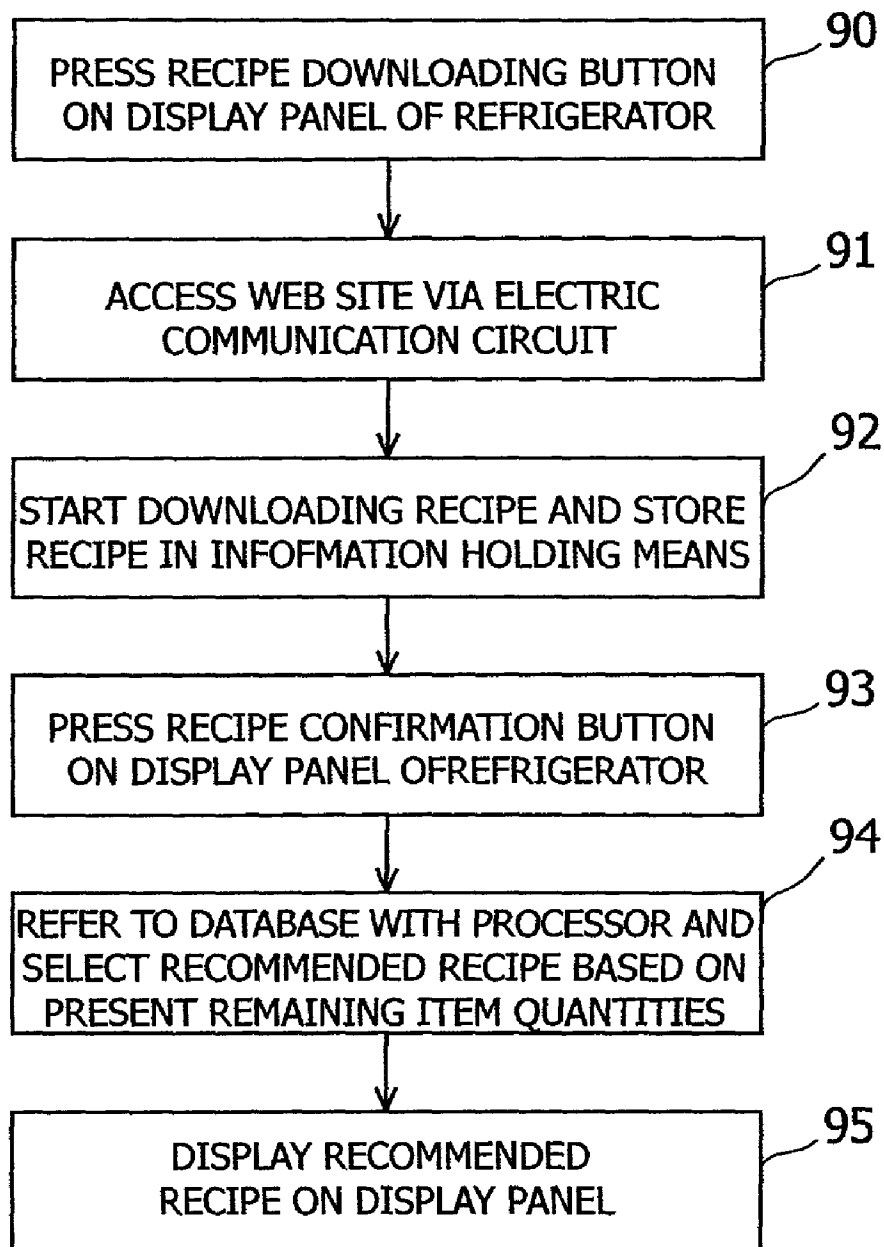


FIG. 10



REFRIGERATOR WITH A FUNCTION TO CONFIRM ITEMS STORED THEREIN

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a refrigerator, and more particularly to a refrigerator having an item display device which uses contactless memory media such as contactless label tag ICs.

[0003] 2. Description of the Related Art

[0004] Electric refrigerators having a sound recording/reproducing device are presently available. The sound recording/reproducing device is used for taking audio memos. For example, a user of such a refrigerator records a message such as "Consume the milk today because its consume-by date is today" in the sound recording/reproducing device of the refrigerator, and another user hears the recorded message and consume the milk when he or she comes home.

[0005] Many items such as foods stored in refrigerators tend to remain unconsumed and become discarded because of the arrival of their consume-by dates. If a large amount of foods are stored in a refrigerator, the user often does not recognize types, quantities, and consume-by dates of those stored food items. When the user goes shopping for foods, the user needs to confirm the items stored in the refrigerator, determine today's recipe depending on the types and quantities of foods in the refrigerator, and buy necessary foods that are not stored in the refrigerator. However, many consumers do not follow such a practice. Particularly in double-income families, the user of a refrigerator is unable to confirm contents of the refrigerators in advance as the user often goes shopping in retail stores, such as supermarkets, specialty stores, etc., directly after work. As a result, the user tends to buy items that have already been bought and stored in the refrigerator, and forget their consume-by dates and fail to consume foods prior to the arrival of their consume-by dates. Those excessive and unconsumed foods are frequently thrown away, which represents a waste of food materials.

[0006] When the user of a refrigerator opens its door in order to confirm contents of the refrigerator, the temperature in the refrigerator rises, resulting in a reduction in the ability to keep food cool and an increase in the electric power consumption.

[0007] In order to solve this problem, there has been a demand for a means for allowing the user of a refrigerator to confirm items such as foods stored in the refrigerator without opening the door.

SUMMARY OF THE INVENTION

[0008] It is therefore an object of the present invention to provide a refrigerator which is arranged to reduce the number of items such as foods stored therein that remain unconsumed and become discarded due primarily to the arrival of their consume-by dates.

[0009] Another object of the present invention is to provide a refrigerator which allows the user to confirm items stored therein without opening the door of the refrigerator.

[0010] In order to achieve the above object, there is provided in accordance with the present invention a refrigerator comprising a reader/writer for writing information in and reading information from a contactless memory medium, an information holding device for storing information read by the reader/writer, and an information display device for displaying the information stored by the information holding device. Preferably, the refrigerator further comprises an input device for manually inputting the information or inputting the information with a voice. Preferably, the refrigerator further comprises a camera for capturing an image in the refrigerator, and an image display device for displaying the image in the refrigerator captured by the camera. The information display device and the image display device are preferably the same display device. The display device preferably comprises means for displaying an impending arrival of the consume-by date of an item stored in the refrigerator, a predetermined number of days prior to the consume-by date. The information holding device preferably comprises means for storing a recipe, and the display device preferably comprises means for displaying an item or items that lack for the recipe based on the information stored by the information holding device.

[0011] Preferably, the refrigerator further comprises communication device for downloading or uploading information including recipes via an electric communication circuit. The communication device preferably comprises means for transmitting at least one item of information selected from the group consisting of the information, the image in the refrigerator captured by the camera, and the item or items that lack for the recipe, to a display device on a user terminal which is connected to the refrigerator via the electric communication circuit, so as to display the transmitted item of information on the display device on the user terminal.

[0012] The information preferably includes at least one item of information selected from the group consisting of the identification code of an item, the name of the item, the retail price desired by the manufacturer of the item, the actual retail price, the date of production, the consume-by date, the purchased date, the date when the package of the item is opened, the predetermined number of days before the date when an impending arrival of the consume-by date is to be indicated, information of ingredients and additives used in the item, the name of the manufacturer, the name of the factory, the remaining item ratio indicative of the amount of the item after it is consumed, and information about whether the item is present in the refrigerator or not. Preferably, the information includes the name of the item and the actual retail price. The information display device comprises means for displaying the minimum actual retail price in the past of each item or the transition of actual retail prices in the past of each item or both based on the information.

[0013] The contactless memory medium comprises an IC chip as an information storage medium for contactless updating of information with an external information reading and writing device (reader/writer). Insofar as the contactless memory medium is kept out of contact with the external reading and writing device, it may communicate with the external reading and writing device with radio waves of any wavelengths and at any distances therebetween. The contactless memory medium includes those which obtain operating electric power by way of electromagnetic induction from the radio wave received from the

reader/writer that is used to read information from the contactless memory medium, and which exchange data with the reader/writer using radio waves. The contactless memory medium also includes memory media of the on-chip coil type which incorporate an antenna coil to meet demands for smaller components and more multi-function capabilities. The contactless memory medium also includes those which have an antenna, e.g., an antenna coil, for transmitting and receiving radio waves, as a separate member. The contactless memory medium further includes IC chips referred to as contactless label tag ICs (integrated circuits or more generally as contactless IC devices). A contactless memory medium may not be applied to an item which is not an item such as food purchased from a certain store. For such an item, the user may operate on a control unit in the refrigerator to enter necessary items of information into a database that is stored in the information holding device. The user may apply a contactless memory medium to such an item, and enter information into the contactless memory medium by means of the reader/writer, so that the database may be managed based on the information stored in the contactless memory medium. Alternatively, necessary information may be entered into the database by the user each time when an item is used.

[0014] The reader/writer comprises an information reading and writing device for reading and writing information. The reading information is such as item information from the contactless memory medium. The writing information is such as item information into the contactless memory medium. The reader/writer may be installed outside of the refrigerator. The reader/writer may also be installed within the refrigerator for monitoring label tag ICs in the refrigerator at all times for thereby automatically detecting foods as they are entered into and removed from the refrigerator.

[0015] The information holding device comprises a computer-readable recording medium such as a RAM, a flash memory, a hard disk, or the like for storing information such as item information read by the reader/writer and stored in the contactless memory medium and information such as item information that has been manually entered or entered with the voice of the user.

[0016] The display device comprises a liquid crystal display unit for displaying information such as item information and for displaying an image showing the inside of the refrigerator.

[0017] The refrigerator refers all casings and chambers capable of keeping their interior space cool so as to cool and reserve foods therein. According to the present invention, the refrigerator includes a freezer for reserving foods in a frozen state, and also covers a wide range of home refrigerators and commercial large-size refrigerators and refrigerating chambers.

[0018] The input device comprises a keyboard for entering numerals and letters for entering information such as item information to be stored in the information holding device and other means for entering numerals and letters to control the refrigerator, e.g., a microphone for entering speech information. The input device may be displayed as command keys on the display device for the user to operate on those keys.

[0019] The electric communication circuit includes radio circuit networks for portable telephone or PHS, telephone

circuit networks, digital circuit networks, analog circuit networks, and the Internet interconnecting networks using the TCI/IP protocol.

[0020] The user terminal comprises a terminal which the user uses to transmit and receive information and images via the computer of the refrigerator and the electric communication circuit. The user terminal is such as a computer, a portable telephone set, a PHS set, or a portable information terminal also known as a PDA (personal digital assistant)

[0021] The display device on the user terminal comprises a display unit for displaying information and images with a liquid crystal or a cathode-ray tube.

[0022] The communication device comprises means in the refrigerator for transmitting and receiving information and images to and from the user terminal via the electric communication circuit, and includes a communication modem or the like.

[0023] The identification code of an item represents information for identifying the item, including characters such as numerals and alphabetical letters and symbols.

[0024] The consume-by date is a date by which the user consumes the item to enjoy the quality of the item that is guaranteed by the manufacturer. If the item is a type of food whose consume-by date becomes earlier when its package is open than when its package remains closed, then the consume-by date in the database may be changed after elapse of a preset period of time.

[0025] The predetermined number of days before the consume-by date for indicating the impending arrival of the consume-by date being the number of days prior to the consume-by date which is set to indicate the impending arrival of the consume-by date on the display device on the refrigerator and the user terminal. For example, for foods such as fish, meat, milk, etc. whose consume-by date is relatively early, the impending arrival of the consume-by date may be indicated one or two days prior to the consume-by date. For foods such as mustard and butter whose consume-by date is relatively late may be indicated 10 through 30 days prior to the consume-by date.

[0026] The information of ingredients and additives used in the item comprises a wide range of information relative to ingredients and additives, which may include not only the names of ingredients, but also the countries of origin thereof, the places of origin thereof, the names of additives such as synthetic coloring agents used, etc.

[0027] The name of the manufacturer is the name of the maker of the item, and includes the name of the final processing entity and the names of the manufacturers of the various ingredients and additives.

[0028] The name of the factory is the name of the factory of the maker of the item, and includes the name of the final processing entity and the names of the manufacturers of the various ingredients and additives.

[0029] The remaining item ratio represents the proportion of the quantity of the item which has been consumed by the user to the quantity of the item at the time it was purchased. The remaining item ratio may be indicated by a numeral for indicating a proportion such as a percentage, or a bar or circular graph which gives a visual representation of the remaining item ratio.

[0030] The camera is used as a means for capturing an image of the inventory of items in the refrigerator for the user to confirm the items without opening the door of the refrigerator. The camera should preferably be a digital camera which comprises a CCD (Charge-Coupled Device) or a CMOS (Complementary Metal Oxide Semiconductor) imaging device which is capable of electronically saving an image as digital data, but may be any of various other types of cameras insofar as they can achieve the functions of the camera according to the present invention. While a single camera may be installed in the refrigerator, a plurality of cameras may be installed in the refrigerator for allowing the user to confirm items stored in the refrigerator in detail. The camera may be mounted on a movable base and may be remotely controlled to change its orientation from outside of the refrigerator. The camera may also be installed not only in the refrigerator, but also in a freezer thereof. The camera should preferably be operated in ganged relation to an illuminating device in the refrigerator.

[0031] The minimum actual retail price in the past is the lowest actual retail price in the past which has been held by the information holding device, and which may be a database of the refrigerator, i.e., the lowest price that the user had paid for the item. The transition of actual retail prices in the past represents changes in the actual retail price in the past which have been held by the information holding device. When the minimum actual retail price in the past of each item and the transition of actual retail prices in the past of each item are displayed, the user can confirm the actual retail prices in the past, which serve as a reference material for the user to buy the item.

[0032] Since the display unit of the refrigerator indicates, to the user, the consume-by date of an item before the arrival of the consume-by date. As a result, the number of items such as foods unconsumed and discarded because of the arrival of their consume-by dates can be reduced in the refrigerator. Furthermore, the user can confirm items in the refrigerator with an image captured by the camera in the refrigerator and displayed on the display unit outside of the refrigerator without opening the door of the refrigerator. The processing device of the refrigerator checks recipes and the database of foods against each other to output, to the display unit, recipes that can be prepared from items stored in the refrigerator and information of items that lack for a certain recipe.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] FIG. 1 is a schematic perspective view of a refrigerator according to the present invention;

[0034] FIG. 2 is a front schematic view of a control and display device on the refrigerator;

[0035] FIG. 3 is a view, partly in block form, a computer in the refrigerator and various other devices that are connected thereto;

[0036] FIG. 4 is a diagram showing a database of item information representing items that are stored in the refrigerator;

[0037] FIG. 5 is a flowchart of a sequence for entering an item into the refrigerator;

[0038] FIG. 6 is a flowchart of a sequence for removing an item from the refrigerator;

[0039] FIG. 7 is a flowchart of a sequence for indicating an impending arrival of the consume-by date of an item in the refrigerator;

[0040] FIG. 8 is a flowchart of a sequence for confirming items in the refrigerator without opening the door of the refrigerator;

[0041] FIG. 9 is a flowchart of a sequence for confirming items in the refrigerator from a user terminal that is connected to the refrigerator via an electric communication circuit; and

[0042] FIG. 10 is a flowchart of a sequence for downloading a recipe into the refrigerator and indicating, to the user, a lack of items in the refrigerator for the preparation of the recipe.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0043] A refrigerator according to the present invention has a reader/writer for reading or modifying item information from a contactless memory medium in the form of a label tag IC applied to items such as foods, an information holding device, such as a recording medium for computers, for storing item information read by the reader/writer, and a display device such as a liquid crystal display panel for displaying item information that is stored in the information holding device. If no contactless memory medium has been applied to an item, then the user of the refrigerator may apply a contactless memory medium in the form of a label tag IC to the item when the item is placed into the refrigerator, enter item information with a controller on the refrigerator, and rewrite the item information in the contactless memory medium with the reader/writer.

[0044] More preferably, the refrigerator further includes a control device such as a touch panel for manually entering the item information or a microphone for entering the item information with the voice of user. The refrigerator preferably further includes a camera for capturing an image in the refrigerator, and a display device such as a liquid crystal display panel for displaying an image in the refrigerator which has been captured by the camera. Since the items stored in the refrigerator can be confirmed by the camera, the user of the refrigerator does not need to open the door of the refrigerator to confirm the items stored in the refrigerator. Therefore, the temperature in the refrigerator would not be undesirably increased, and the energy consumption by the refrigerator can be reduced.

[0045] Preferably, the display device displays an impending arrival of the consume-by date for an item in the refrigerator at a time which is a given number of days before the consume-by date. If the consume-by date for an item in the refrigerator is advanced by breaking the package of the item, then the item information thereof in the contactless memory medium may be rewritten by the reader/writer. Preferably, the information holding device stores a recipe, and the display device displays an item or items that lack for the recipe based on the item information stored by the information holding device. Based on the displayed information, the user buys only the item or items that lack for the recipe, and prepares the recipe using items that are already stored in the refrigerator and the bought item or items. The refrigerator preferably further includes a communication

device for downloading latest recipes provided by the refrigerator manufacturer or the like and updating existing recipes with the downloaded recipes.

[0046] The communication device preferably transmits the item information, the image in the refrigerator which is captured by the camera, the recipe, and the item or items that lack for the recipe, to a user terminal such as a portable information terminal that is connected to the refrigerator via an electric communication circuit. Then an display device of the user terminal displays the transmitted data. By viewing the data displayed on the display device of the user terminal, the user can confirm the items presently stored in the refrigerator and avoid buying the same kind of items as the stored one in the refrigerator at a supermarket that the user visits by after work. The user can also buy items identical to items whose consume-by dates are impending in the refrigerator, and items identical to items which are left in small quantities and about to be consumed in the refrigerator. By buying only an item or items that lack for a recipe based on items in the refrigerator, the user minimizes the amount of money for the item or items to be newly purchased, and the items such as foods already stored in the refrigerator are not wasted but effectively consumed.

[0047] Examples of item information stored in a database of the refrigerator include the ID of an item, the name of the item, the retail price desired by the manufacturer, the actual retail price, the date of production, the consume-by date, the purchased date, the date when the package of the item is opened, the number of days before the date when an impending arrival of the consume-by date is to be indicated, ingredients and additives information, the name of the manufacturer, the name of the factory, the remaining item ratio indicative of the amount of the item after it is consumed, and information about whether the item is present in the refrigerator or not. The display device should preferably display the lowest price of each item type using the name of the item and the actual retail price. Based on the names of the item and the actual retail price thereof in the item information, the transition of past actual retail prices may be set forth in a table or a graph, and the lowest actual retail price in the past is set forth in a lowest price table. The table or graph of the transition of past actual retail prices and the table of lowest actual retail prices may be displayed to provide the user with reference materials for confirming the actual retail price of the item and buying the item. The lowest actual retail price represents a minimum price for the item that the user has purchased so far, and serves as a reference price which is lower than the usual retail price. Using the name of the item and the actual retail price thereof in the item information, a household account book for each of different items and each of different categories (meat, wheat, etc.) may be automatically calculated.

[0048] Structure of the Refrigerator

[0049] FIG. 1 shows in schematic perspective a refrigerator 1 according to the present invention. The refrigerator 1 has a control and display device 2 which the user operates to make various control actions and which displays various items of information, a computer 3, a CCD camera 4, and an electric communication circuit 5.

[0050] FIG. 2 shows in front schematic view the control and display device 2 on the refrigerator 1. The control and display device 2 comprises a reader/writer 10 for reading

and writing item information stored in a contactless memory medium applied to an item, a display panel 13 in the form of a liquid crystal display panel or the like, a manual input panel 16 for manually entering information, a microphone 14 for entering with the voice, and a loudspeaker 15 for giving information in the form of voice to the user. The control and display device 2 also has an indicator lamp 11 comprising an LED or the like for indicating to the user information such as the arrival of a consume-by date or the like. The control and display device 2 further includes a communication lamp 12 that is turned on during a communication session to indicate to the user that the refrigerator is communicating with a user terminal or that the refrigerator is communicating with an external source such as a server 26 (see FIG. 3) for downloading a recipe from the server 26.

[0051] FIG. 3 shows the computer 3 in the refrigerator 1 and various other devices connected to the computer 3. The computer 3 comprises the control and display device 2 including the manual input panel 16 and the display panel 13, a processing device 21, an information holding device 22, a database 23 including item information, a communication device 24 for communicating with user terminals including a computer terminal 27 and a portable information terminal 28 and also with the server 26 for downloading recipes, and a camera control device 25 for controlling the CCD camera 4 in the refrigerator 1.

[0052] Item Information Database

[0053] FIG. 4 shows a database 30 of item information representing items that are stored in the refrigerator 1. The item information stored in the database 30, which is stored in the computer 3, includes the ID of each item, the name of the manufacturer, the consume-by date, the number of days before the date when an impending arrival of the consume-by date is to be indicated, the remaining item ratio indicative of the amount of the item left after the package of the item is opened, the actual retail price, and information about whether the item is present in the refrigerator or not. Characteristic functions of the refrigerator 1, which include the processing of entering and removal of an item into and out of the refrigerator 1, the indication of the consume-by date, the confirmation of an item via the electric communication circuit at the user terminal at a remote site, the display of an item or items that lack for a recipe, for example, are performed based on the database 30.

[0054] Entering an Item into the Refrigerator

[0055] FIG. 5 is a flowchart showing a sequence of entering an item into the refrigerator 1. When the user enters an item into the refrigerator, the user brings a contactless memory medium 20 applied to the item closely to the reader/writer 10 in the control and display device 2. The reader/writer 10 reads item information stored in the contactless memory medium 20 (step 40). The processing device 21 of the refrigerator 1 confirms the databases 23, 30 to determine whether the item is a first item that is to be entered or not (step 41). If the data of the item to be entered is not contained in the databases 23, 30, then the data of the item to be entered is automatically registered together with its article information including the name of the item, at a remaining quantity ratio of 100%, into the databases 23, 30 (step 42). When the item has once been entered in the refrigerator 1 and is entered again, since its data is already stored in the databases 23, 30, the user enters only the

remaining quantity ratio from the manual input panel 16 (step 43). The processing device 21 reflects the updated remaining quantity ratio in the databases 23, 30 (step 44).

[0056] Removal of an Item from the Refrigerator

[0057] FIG. 6 is a flowchart showing a sequence of removing an item from the refrigerator 1. When the user removes an item from the refrigerator (step 50), the user brings a contactless memory medium 20 applied to the item closely to the reader/writer 10 in the control and display device 2. If the item is to be discarded (step 51), then the user brings the item closely to the reader/writer 10, presses a discard button (not shown) displayed on the display panel 13 near the reader/writer 10, and then discards the item (step 52). If the item is not to be discarded, then the user brings the item closely to the reader/writer 10, and presses a removal button (not shown) displayed on the display panel 13 (step 53). After the item is removed from the refrigerator 1, the processing device 21 updates the databases 23, 30 (step 54).

[0058] Indication of the Consume-by Date

[0059] FIG. 7 is a flowchart showing a sequence for indicating an impending arrival of the consume-by date of an item in the refrigerator 1. When it is just past midnight everyday (step 60), the processing device 21 of the refrigerator 1 confirms an item which is the given number of days before the consume-by date thereof in the database 30 (step 61). If there is no item which is the given number of days before the consume-by date, then no special functions are performed until the next day. However, if there is an item which is within the given number of days before the consume-by date, then the indicator lamp 11 is turned on and the name of the item whose consume-by date is impending is displayed, urge the user to consume the item early (steps 62, 63).

[0060] Confirmation of an Item with the Control and Display Device

[0061] FIG. 8 is a flowchart showing a sequence for confirming items in the refrigerator without opening the door of the refrigerator 1. The user presses a confirmation button (not shown) displayed on the display panel 13 (step 70). The camera control device 25 controls the CCD camera 4 to start capturing an image in the refrigerator 1 (step 71). The captured image in the refrigerator 1 is displayed on the display panel 13 (step 72). The item information of items, such as foods, in the refrigerator 1, which is stored in the database is displayed on the display panel 13 (step 73).

[0062] Confirmation of an Item with the User Terminal Connected to the Refrigerator via the Electric Communication Circuit

[0063] FIG. 9 is a flowchart showing a sequence for confirming items in the refrigerator 1 with a user terminal that is connected to the refrigerator 1 via the electric communication circuit 5. The user terminal may be the computer terminal 27, or a portable information terminal 28 which may comprise a portable telephone set, a PHS set, or the like. The user clicks a confirmation button (not shown) displayed by a software program stored in the user terminal, that is run by the computer 3 for accessing the refrigerator 1 or uses a web site browser such as Microsoft Explorer or Netscape Communicator for accessing the communication

device 24 of the refrigerator 1 via the electric communication circuit (steps 80, 81). The camera control device 25 controls the CCD camera 4 to capture an image in the refrigerator 1 (step 82). The image in the refrigerator 1 which is displayed on the display panel of the user terminal, and remaining item data such as remaining food data in the database are transmitted via the communication device 24 to the user terminal (step 83). The user terminal receives the transmitted image in the refrigerator 1 and the transmitted remaining item data such as remaining food data, and displays the received data on the display panel of the user terminal (steps 84, 85).

[0064] Recipe

[0065] FIG. 10 is a flowchart showing a sequence for downloading a recipe into the refrigerator 1 and indicating, to the user, a lack of items in the refrigerator 1 for the preparation of the recipe. The user presses a recipe downloading button (not shown) displayed on the display panel 13 of the refrigerator 1 (step 90), and accesses a web site of a refrigerator manufacturer or the like which provides recipes via the electric communication circuit (step 91). The user starts downloading a desired recipe and stores the recipe in the information holding device 22 (step 92). The user then presses a recipe confirmation button (not shown) displayed on the display panel 13 of the refrigerator 1 (step 93). The processing device 21 refers to the databases 23, 30, and selects a recommended recipe based on the present remaining item quantities (step 94). Then, the display panel 13 displays the recommended recipe and also lacking items to be purchased for the recommended recipe (step 95).

[0066] Since the display panel 13 of the refrigerator 1 thus indicates, to the user, the consume-by date of an item before the arrival of the consume-by date. As a result, the number of items such as foods unconsumed and discarded because of the arrival of their consume-by dates, can be reduced in the refrigerator. The CCD camera 4 in the refrigerator 1 allows the user to confirm the items stored in the refrigerator 1 on the display panel 13 or the user terminal at a remote site without opening the door of the refrigerator 1. For example, the user can acquire contents of the database and an image in the refrigerator 1 from a location away from home. Accordingly, the user can confirm contents of the refrigerator 1 and then buy any lacking items when the user goes on shopping directly after work. The processing device 21 of the refrigerator 1 checks recipes and the database against each other to output, to the display panel 13, recipes that can be prepared from items stored in the refrigerator 1 and information of items that lack for a certain recipe.

What is claimed is:

1. A refrigerator comprising:

- a reader/writer for writing information in and reading information from a contactless memory medium;
 - an information holding device which stores information read by said reader/writer; and
 - an information display device for displaying the information stored in said information holding device.
2. A refrigerator according to claim 1, further comprising:
- an input device for inputting said information manually or with voice.

3. A refrigerator according to claim 1 or 2, further comprising:

a camera for capturing an image in the refrigerator; and
an image display device for displaying the image in the refrigerator captured by said camera.

4. A refrigerator according to claim 3, wherein said information display device and said image display device are the same display device.

5. A refrigerator according to any one of claims 1 to 4, wherein said display device comprises means for displaying an impending arrival of the consume-by date of an item stored in the refrigerator, at a predetermined number of days prior to said consume-by date.

6. A refrigerator according to any one of claims 1 to 5, wherein said information holding device comprises means for storing a recipe, and said display device comprises means for displaying an item or items that lack for said recipe based on the information stored by said information holding device.

7. A refrigerator according to claim 6, further comprising:

a communication device for downloading or uploading information including recipes via an electric communication circuit.

8. A refrigerator according to claim 7, wherein said communication device comprises means for transmitting at least one item of information selected from the group consisting of said information, the image in the refrigerator

captured by said camera, and the item or items that lack for said recipe, to a display device on a user terminal which is connected to the refrigerator via said electric communication circuit, so as to display the transmitted item of information on the display device on the user terminal.

9. A refrigerator according to any one of claims 1 to 8, wherein said information includes at least one item of information selected from the group consisting of the identification code of an item, the name of the item, the retail price desired by the manufacturer of the item, the actual retail price, the date of production, the consume-by date, the purchased date, the date when the package of the item is opened, the predetermined number of days before the date when an impending arrival of the consume-by date is to be indicated, information of ingredients and additives used in the item, the name of the manufacturer, the name of the factory, the remaining item ratio indicative of the amount of the item after it is consumed, and information about whether the item is present in the refrigerator or not.

10. A refrigerator according to claim 9, wherein said information includes the name of the item and the actual retail price, and said information display device comprises means for displaying the minimum actual retail price in the past of each item and/or the transition of actual retail prices in the past of each item based on said information.

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