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Inventor(s)	Murata; Yasukiyo et al.

Refrigerator

Abstract

A door driving system and a refrigerator having the door driving system according to the present invention are provided with a motor, a power transmitting device for transmitting the power generated by the motor to the hinge, and an auxiliary device for receiving the power generated by the motor and generating an auxiliary force to move a door positioned in a closing position in an opening direction, so that the torque to be applied to the hinge of the door for opening and closing the door may be reduced.

Inventors:	Murata; Yasukiyo (Kanagawa, JP), Yoshimoto; Morio (Kanagawa, JP)
Applicant:	Samsung Electronics Co., Ltd. (Suwon-si, KR)
Family ID:	1000008766683
Assignee:	Samsung Electronics Co., Ltd. (Suwon-si, KR)
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References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
9285162	12/2015	Ryu et al.	N/A	N/A
2002/0123359	12/2001	Wei	455/414.4	H04L 67/04
2004/0164844	12/2003	Maeda et al.	N/A	N/A
2014/0180473	12/2013	Otzen et al.	N/A	N/A
2014/0195374	12/2013	Bassemir et al.	N/A	N/A
2014/0293060	12/2013	Ryu	348/159	F25D 29/00
2015/0002660	12/2014	Lee et al.	N/A	N/A
2016/0047587	12/2015	Sasaki	348/82	F25D 17/042
2016/0138860	12/2015	Kang et al.	N/A	N/A
2016/0217531	12/2015	Ishikawa	N/A	N/A
2017/0116618	12/2016	George	N/A	G06Q 30/0201

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
2784419	12/2013	EP	N/A
H01179885	12/1988	JP	N/A
H03295991	12/1990	JP	N/A
H11303970	12/1998	JP	N/A
2001294308	12/2000	JP	N/A
2002243335	12/2001	JP	N/A
2003207258	12/2002	JP	N/A
2004183987	12/2003	JP	N/A
2010230207	12/2009	JP	N/A
2014070740	12/2013	JP	N/A

2014206321	12/2013	JP	N/A
2015014401	12/2014	JP	N/A
2015087041	12/2014	JP	N/A
2015111026	12/2014	JP	N/A
2015154259	12/2014	JP	N/A
2016006379	12/2015	JP	N/A
2016011797	12/2015	JP	N/A
2016023830	12/2015	JP	N/A
2016023892	12/2015	JP	N/A
20140120386	12/2013	KR	N/A
20140121684	12/2013	KR	N/A
20150026412	12/2014	KR	N/A
20150124155	12/2014	KR	N/A

OTHER PUBLICATIONS

Office Action dated Sep. 25, 2023, in connection with Korean Patent Application No. 10-2023-1003473, 12 pages. cited by applicant

Notice of Patent Allowance dated Nov. 24, 2021, in connection with Korean Application No. 10-2018-7022341, 3 pages. cited by applicant

Notice of Reasons for Refusal dated Feb. 6, 2020, in connection with Japanese Application No. 2016-119511, 20 pages. cited by applicant

Notice of Preliminary Rejection dated Apr. 27, 2022, in connection with Korean Application No. 10-2022-7003361, 8 pages. cited by applicant

International Search Report dated Jun. 1, 2017 in connection with International Patent Application No. PCT/KR2017/002429. cited by applicant

Written Opinion of the International Searching Authority dated Jun. 1, 2017 in connection with International Patent Application No. PCT/KR2017/002429. cited by applicant

Communication pursuant to Article 94(3) EPC dated Jun. 28, 2016 in connection with European Patent Application No. 17 763 530.7, 7 pages. cited by applicant

European Patent Office, "Supplementary European Search Report," Application No. 17763530.7, Jan. 31, 2019, 8 pages. cited by applicant

Office Action dated May 25, 2021 in connection with Korean Patent Application No. 10-2018-7022341, 7 pages. cited by applicant

Primary Examiner: Tran; Thai Q

Assistant Examiner: Mesa; Jose M

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) This application is a continuation of U.S. patent application Ser. No. 17/463,351 filed on Aug. 31, 2021, which is a continuation of U.S. patent application Ser. No. 16/083,478 filed on Sep. 7, 2018, now U.S. Pat. No. 11,112,170 issued Sep. 7, 2021, which is a 371 of International Application No. PCT/KR2017/002429 filed on Mar. 7, 2017, which claims priority to Japanese Patent Application No. 2016-043393 filed on Mar. 7, 2016 and Japanese Patent Application No. 2016-119511 filed on Jun. 16, 2016, the disclosures of which are herein incorporated by reference in their entirety.

BACKGROUND

1. Field

(1) The disclosure relates to a refrigerator having a door driving device used for opening and closing a door of the refrigerator and a camera.

2. Description of Related Art

(2) In the conventional technology, there is a refrigerator having a photographing device for photographing the inside of the refrigerator such that the internal storage state of the refrigerator is confirmed even in a remote place.

(3) More specifically, the photographing device is a camera installed inside a door of the refrigerator, and is configured to receive an instruction from the outside in a state where the door is closed and photograph the inside of the refrigerator.

(4) However, in such a configuration, since the inside of the refrigerator is photographed while the door is closed, the distance between a stored object and the camera is relatively close when the stored object is placed at a front area inside the refrigerator such that there is a problem that the focus may not be properly adjusted and the camera may not photograph the stored object.

(5) In addition, when photographing a storage pocket, the user needs to open both doors, so that when the user is away from the refrigerator, for example, when going out, the storage pocket may not be photographed and the storage state at that time may not be confirmed.

SUMMARY

(6) It is an aspect of the disclosure to provide a refrigerator capable of taking a photograph of a stored object in the refrigerator clearly and photographing the stored object in a storage pocket even when the user is far away from the refrigerator.

(7) In accordance with one aspect of the disclosure, a refrigerator includes a housing having a storage chamber, a door having the inside facing the storage chamber and opens and closes the storage chamber, a driving device for transmitting power to the door for automatically opening and closing the door, and a photographing device disposed in the door and photographing at least one of the storage chamber or the inside of the door when the door is opened by the driving device.

(8) Also, the door includes a first door and a second door provided in a left-right direction with respect to the storage chamber, and the photographing device includes a first camera disposed on the first door and a second camera disposed on the second door, and the first camera photographs the inside of the second door when the second door is opened by the driving device.

(9) Also, the door includes a first door and a second door provided in a left-right direction with respect to the storage chamber, and the photographing device includes a first camera disposed on the first door and a second camera disposed on the second door, and the first camera photographs the storage chamber when the first door is opened by the driving device.

(10) Also, the door includes a first door and a second door provided in a left-right direction with respect to the storage chamber, and the photographing device includes a first camera disposed on the first door and a second camera disposed on the second door, and the first camera photographs at least one of the inside of the second door or the storage chamber when the first door and the second door are opened by the driving device.

(11) Also, the driving device is provided to open the first door after opening the second door, and the first camera photographs the inside of the second door at a first position where the first door is opened and positioned by the driving device.

(12) Also, the driving device is provided to dispose the first door at a second position located between a closed position where the first door closes the storage chamber and the first position, and the first camera photographs the storage room when the first door is positioned in the second position.

(13) Also, the driving device is provided to dispose the second door at a third position in which the second door is opened, and the second camera photographs the inside of the first door when the

second door is disposed in the third position and when the first door is disposed adjacent to the first position.

(14) Also, the driving device is provided to dispose the second door at a fourth position located between the closed position where the second door closes the storage chamber and the third position, and the second camera photographs the storage room when the second door is placed in the fourth position.

(15) Also, the refrigerator further includes an information processing device for receiving the photographed information from the photographing device, and the information processing device combines the photographed information which are information that photographed by the first camera where the first camera disposed in the first position and second position respectively, and that photographed by the second camera where the first camera disposed in the third position and fourth position respectively to form one image.

(16) Also, the refrigerator further includes an information processing device for receiving the photographed information from the photographing device, and the information processing device selects optimal information corresponding to the inside of the storage chamber or the door among the information, and transmits at least one piece of information or the optimum information to the outside of the refrigerator.

(17) Also, the information processing device includes a receiver for receiving an external signal, a driving device controller for controlling the driving device based on a signal input from the receiver, and a photographing device controller for controlling the photographing device based on the signal input from the receiver, and after the photographing device is driven at the first position, the driving device controller further opens or closes the door so that the photographing device is disposed at the second position by an external signal received by the receiver, and the photographing device controller drives the photographing device when the photographing device is disposed at the second position.

(18) Also, the photographing device includes a first photographing device disposed on the door and a second photographing device disposed on the housing, and the second photographing device photographs the inside of the door when the door is opened by the driving device.

(19) Also, the first photographing device photographs the storage chamber when the door is opened by the driving device.

(20) Also, the refrigerator further includes a hinge that rotatably couples the door to the housing, and the door further includes a throat portion protruding outward from the inside of the door and a storage pocket mounted to the throat portion, and the photographing device is disposed on a side of the throat portion adjacent to the hinge.

(21) Also, the refrigerator further includes a hinge that rotatably couples the door to the housing, and the door further includes a throat portion protruding outward from the inside of the door and a storage pocket mounted to the throat portion, and the first photographing device is disposed on a side of the throat portion adjacent to the hinge, and the second photographing device is disposed on an opposite side of the hinge.

(22) In accordance with one aspect of the disclosure, it is possible to clearly capture the objects housed in the refrigerator or the storage pocket of the door, so that the housed state of the refrigerator may be confirmed even when the user goes out.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. 1 is a view schematically illustrating a configuration of a refrigerator according to a first embodiment of the disclosure.

(2) FIG. 2 is a view schematically illustrating a configuration of a photographing apparatus

according to the first embodiment of the disclosure.

(3) FIG. 3 is a view for explaining an angle of view of a camera body according to the first embodiment of the disclosure.

(4) FIG. 4 is a view schematically illustrating a configuration of a drive mechanism of the first embodiment of the disclosure.

(5) FIG. 5 is a view schematically illustrating a configuration of a driving device according to the first embodiment of the disclosure.

(6) FIG. 6 is a view schematically illustrating a configuration of a moving device according to the first embodiment of the disclosure.

(7) FIGS. 7a and 7b are views schematically illustrating an operation of the moving device according to the first embodiment of the disclosure.

(8) FIG. 8 is a functional block diagram illustrating functions of an information processing device according to the first embodiment of the disclosure.

(9) FIGS. 9a, 9b, 9c, and 9d are views schematically illustrating an operation of the refrigerator of the first embodiment of the disclosure.

(10) FIGS. 10a, 10b, 10c, and 10d are views schematically illustrating an operation of the refrigerator of the first embodiment of the disclosure.

(11) FIG. 11 is a view schematically illustrating a vertical viewing angle of a photographing device according to the first embodiment of the disclosure.

(12) FIG. 12 is a view schematically illustrating processing of photographic data by the information processing device according to the first embodiment of the disclosure.

(13) FIG. 13 is a view schematically illustrating an image transmitted by the information processing device according to the first embodiment of the disclosure.

(14) FIG. 14 is a view schematically illustrating a configuration of a refrigerator according to a second embodiment of the disclosure.

(15) FIGS. 15a and 15b are views schematically illustrating an operation of the refrigerator according to the second embodiment of the disclosure.

(16) FIG. 16 is a view schematically illustrating a configuration of a refrigerator according to another embodiment of the disclosure.

DETAILED DESCRIPTION

(17) Hereinafter, an air cleaner according to one embodiment will be described in detail with reference to the drawings.

First Embodiment

(18) Hereinafter, a first embodiment of a refrigerator according to the disclosure will be described with reference to the drawings.

(19) As shown in FIG. 1, a refrigerator R according to the disclosure includes a refrigerator main body H (hereinafter also referred to as a case H) having an open front side, having a pair of doors D installed on the open front side is a so-called two-door refrigerator each door D is rotatably supported on a hinge axis of a hinge Z.

(20) As shown in FIG. 1, the refrigerator R is provided with a photographing device 10 installed inside the refrigerator on each of the right and left doors D and a door D provided at the upper portion of each of the right and left doors D, and provided with a driving device 20 for automatically opening and closing the door.

(21) First, the photographing device 10 will be described.

(22) As shown in FIG. 2, the photographing device 10 has a casing 11 and a camera body (not shown) housed in the casing 11. Here, a storage pocket P is provided in the door D is provided.

(23) The refrigerator R of the present disclosure is provided with a plurality of the photographing devices 10 installed at different positions on the upper and lower sides and each of the photographing devices 10 is provided with a plurality of the storage pockets P. Further, the number of photographing devices 10 may be changed as appropriate.

(24) As shown in FIG. 2, the casing **11** is a box-shaped casing provided on the side of the hinge Z of the storage pocket P, and has a surface **111** on the opposite side of the storage pocket P provided with a photographing window **12**. The photographing window **12** is a window having transparency. A heater (a condensation preventing heater in the claims) is provided in the casing **11** so as to prevent the transparent window from being frosted. A heat insulating material is provided in the casing **11** so as to prevent the heat from the anti-fog heater from being transmitted to the storage pocket P.

(25) The camera body is disposed in the casing **11** so as to take an image of the exterior of the casing **11** through the photographing window **12**. Specifically, the camera body captures a moving image using a wide-angle lens.

(26) Here, an angle of view of the camera body described above will be described with reference to FIG. 3.

(27) The relationship between an angle of view $\theta\theta$ of the camera body and a distance d between the camera body and a predetermined object surface to be photographed in the refrigerator or inside of the door D of the refrigerator is expressed by the following equation.

$$d=(L/2)/\tan(\theta\theta/2)$$

(28) Here, L is the width of the inside of the refrigerator, the height of the inside of the refrigerator, the width of the door D, or the height of the door D.

(29) Moreover, the object surface to be photographed set in the refrigerator is a surface including a front end of a plurality of shelves provided in the refrigerator and the object surface to be photographed set in the door D is a surface including a front end of a plurality of storage pockets provided in the door D, however, it may be set at a desired position as long as the object surface to be photographed is between the front surface of the refrigerator and the back surface or inside the refrigerator of the door D.

(30) The distance d between the object surface to be photographed and the camera body set in the refrigerator or the door D changes depending on the degree of opening of the door D, herein, the distance d between the object surface to be photographed and the camera body set in the refrigerator or the door D is defined as the distance to the shortest state. Further, the distance d may be defined, for example, in a state in which the camera body is faced to each object surface to be photographed.

(31) It is preferable that the angle of view of the camera body is set to be equal to or larger than the largest angle among the following angles $\theta\theta1\sim\theta\theta4$ calculated based on the above-described expression in order to make it possible to capture images stored in the refrigerator without fail.

$$d1=(L1/2)/\tan(\theta\theta1/2)$$

$$d1=(L2/2)/\tan(\theta\theta2/2)$$

$$d2=(L3/2)/\tan(\theta\theta3/2)$$

$$d2=(L4/2)/\tan(\theta\theta4/2)$$

(32) Here, $d1$ is a distance between the object surface to be photographed set in the refrigerator and the camera body, $d2$ is a distance between the object surface to be photographed set in the door D and the camera body, $L1$ is a width of the inside of the refrigerator, $L2$ is a height of the inside of the refrigerator, $L3$ is a width of the door, and $L4$ is a height of the door.

(33) In the present disclosure, since the plurality of photographing devices are provided in each door, the angle of view of the camera body is set so that at least a part of the respective object surfaces to be photographed with respect to each camera body overlaps with each other so that these respective object surfaces to be photographed include both inside the refrigerator or inside the refrigerator.

(34) Next, the driving device **20** will be described.

(35) The driving device **20** outputs the power for opening and closing the door D and transmits this power to the door D, specifically as shown in FIGS. 4 and 5, and the driving device **20** has a motor M for receiving the drive signal from an information processing device **30** and rotating forward or

reverse and a power transmission device **40** for transmitting the power of the motor M to the door D through the hinge axis Z. FIG. **4** is a plan view of the driving device **20** from above, and FIG. **5** is a plan view of the driving device **20** from below. Here, the motor M and the power transmission device **40** are accommodated in a casing C as shown in FIG. **1** so as to prevent the appearance from deteriorating.

(36) The power transmission device **40** is disposed between the motor M and the hinge axis Z and has a plurality of gears that rotate in conjunction with the motor M as shown in FIG. **4**.

(37) More specifically, as shown in FIGS. **4** to **6**, the power transmission device **40** includes a motor-side gear **41** that rotates in conjunction with the motor M, a center gear **43** connected to the motor-side gear **41** and a pair of idler gears **44** meshing with the center gear **43**. Hereinafter, the pair of the idler gears **44** is defined as one idler gear **44a** and other flow gear **44b**.

(38) As shown in FIGS. **6** to **7b**, the power transmission device **40** of the present embodiment has a swing device **50** for moving the pair of the idler gears **44** along a plane perpendicular to the rotation axis of the center gear **43** with the center gear **43** as the center by the rotation of the center gear **43**.

(39) The swing device **50** includes a mounting member **51** which rotates about the rotational axis of the center gear **43** and on which the idler gears **44a** and **44b** are mounted, and a rotation load member **52** for applying a load to the rotation of each of the idler gears **44**.

(40) The mounting member **51** is provided with a plate member **511** on which both the center gear **43** and the pair of the idler gears **44** are installed and a pair of mounting shafts of the pair of the idler gears **512** standing from the plate member **511** for mounting the idler gears **44** and a mounting shafts of the center gear **513** for mounting the center gear **43**.

(41) The rotation load member **52** generates a torque that applies a load to the rotation of the idler gears **44** and pivots the pair of the idler gears **44** about the rotational axis of the center gear **43**, and is an elastic member such as a spring that passes through the mounting shaft of the pair of the idler gears **512** and applies an upward force along the rotating shaft to the idler gears **44**.

(42) In the present embodiment, as shown in FIG. **6**, the rotation load member **52** is passed through the mounting shaft of the pair of the idler gears **512**, the idler gears **44** is passed from above, and a pressure member **53** pressing the idler gears **44** downward is passed from above, so that the upward force is applied to the idler gears **44**.

(43) The swing device **50** is configured so that the pair of the idler gears **44** are arranged between a forward power transmission position such that one of the idler gears **44a** is engaged with the door gear **42** (FIG. **7a**) and a reverse power transmission position such that the other of the idler gears **44b** is engaged with the door gear **42** (FIG. **7b**).

(44) With the above-described configuration, as shown in FIG. **7a**, when the center gear **43** rotates in the forward direction being interlocking with the rotation of the motor M (here, in the counterclockwise direction as viewed from above), the pair of the idler gears **44** rotate in the counterclockwise direction about the rotation axis of the center gear **43** so that one of the idler gears **44a** engages with the door gear **42**. As a result, the driving device **20** of the present embodiment becomes an automatic opening mode in which the door D is automatically opened by the power of the motor M.

(45) On the other hand, as shown in FIG. **7b**, when the center gear **43** rotates in the reverse direction being interlocked with the rotation of the motor M (here, clockwise from above) the pair of the idler gears **44** rotate in the clockwise direction about the rotation axis of the center gear **43** so that the other of the idler gears **44b** engages with the door gear **42**. As a result, the driving device **20** of the present embodiment becomes an automatic closing mode in which the door D is automatically closed by the power of the motor M.

(46) In the refrigerator R of the present embodiment, the above-described driving device **20** is configured to photograph the inside of the refrigerator with the door D opened.

(47) More specifically, the refrigerator R of the present embodiment receives a command from the outside to control the driving device **20** and the photographing device **10**, and also provided with

the information processing device **30** for processing the information photographed by the photographing device **10**.

(48) The information processing device **30** is physically equipped with a CPU, a memory, an A/D converter, and the like built-in the door D or the case H, as shown in FIG. **8**. CPU or the peripheral device cooperates with the CPU or the peripheral device according to the program stored in the predetermined area of the memory so that the information processing device **30** functions as a photographing command receiver **31**, a driving device controller **32**, a photographing device controller **33**, a photographing data processor **34**, a photographing data saver **35**, and a photographing data transmission **36**.

(49) Hereinafter, the operation of the refrigerator R of the present embodiment will be described in the description of each of the configurations **31**, **32**, **33**, **34**, **35**, and **36** of the information processing device **30**.

(50) First, the photographing command receiver **31** receives a photographing command by a user using an image display device such as an input device such as a touch panel provided in the refrigerator R or a portable device such as a mobile phone. The image display device may include a TV, a computer, a tablet PC, and the like. Hereinafter, a portable device will be described as an example.

(51) When the photographing command receiver **31** receives the photographing command, the driving device controller **32** outputs a driving signal to control the driving device **20** to the automatic opening mode, and, as shown in FIGS. **9a** to **9d**, the driving device **20** first opens one of the left and right doors D to a predetermined angle.

(52) Hereinafter, for convenience of explanation, one of the doors D is referred to as the left door D as viewed from the front.

(53) Next, the driving device **20** opens the other door D of the right and left doors D, that is, the right door D to a predetermined angle.

(54) At this time, the photographing device controller **33** outputs a photographing start signal to the photographing device **10** installed on the door D on the right side to photograph a continuous still picture or to shoot a video from the state in which the right door D is closed to when the right door D is opened with the predetermined angle. Thus, the photographing device **10** installed on the right door D may photograph at least the storage pockets P of the doors D on the right and left sides in the refrigerator.

(55) Subsequently, the driving device **20** closes the left door D as shown in FIGS. **10a** to **10d**. At this time, the photographing device controller **33** outputs a photographing start signal to the photographing device **10** installed at the door D on the left side to photograph a continuous still picture or to shoot a video from the state in which the left door D is opened with the predetermined angle to when the left door D is closed. Thus, the photographing device **10** installed on the left door D may photograph at least the storage pockets P of the doors D and the left sides in the refrigerator.

(56) The photographing device controller **33** of this embodiment outputs the photographing start signal to all of the photographing devices **10** installed in each of the doors D when photographing the inside of the refrigerator, and outputs the photographing start signal to the photographing device **10** located at the uppermost position of the door D on the opposite side of the storage pocket P when photographing the storage pocket P.

(57) In the present embodiment, as shown in FIG. **11**, the photographing device **10** positioned at the upper end has at least a vertical viewing angle capable of photographing the upper half of the refrigerator, and the photographing device **10** located at the lower end has at least a vertical viewing angle capable of photographing the lower half of the refrigerator. If the photographing device **10** has a vertical viewing angle in which the entire upper and lower portions of the refrigerator, for example, it is possible to photograph the inside of the refrigerator using one of the photographing devices **10** located at the center of the upper and lower portions.

(58) The photographing device **10** of the present embodiment has a horizontal viewing angle in

which at least the whole length of the storage pocket P in the left and right direction.

(59) When the driving device **20** and the photographing device **10** cooperate to take photographs of the inside of the refrigerator and the storage pocket P, the photographing data processor **34** reads the photographing data from the photographing device **10**, and acquires image data or moving image data.

(60) The photographing data processor **34** may acquire the photographing data after the above-described process of photographing, or may sequentially acquire the photographing data during the above-described process of photographing.

(61) The photographing data processor **34** selects an acquired optimal continuous still picture or an acquired optimal video (hereinafter referred to as an optimal photograph).

(62) More specifically, for example, in the refrigerator or on the inside of the refrigerator in the door D, an area index (not shown) indicating a photographing target area to be photographed by the photographing device **10** is provided in advance, and the photographing data processor **34** selects the optimal photograph from the acquired continuous still picture or acquired video based on the area index.

(63) The area index is provided at a predetermined position of the case H or the door D in accordance with the viewing angle of the photographing device **10**, and is a plurality of markers provided at corner portions on the inner side of the refrigerator, and the like.

(64) As a result, the photographing data processor **34** of the present embodiment easily (with a small throughput) selects an image including all of the area index or an image having the least deformation of each area index as the optimum photograph from the acquired continuous still image data or moving image data. The optimum photograph selection method may be changed as appropriate.

(65) The photographing data processor **34** appropriately corrects the optimal photograph according to a correction algorithm previously stored in the memory. For example, in this embodiment, as shown in FIG. **12**, the optimal photograph is configured to correcting or trimming from wide angle lens distortion correction, trapezoid correction, or trimming. For the optimal photograph in the refrigerator, for example, the object surface of the wide-angle lens distortion correction or the trapezoidal correction is set on the surface including the front end of the plurality of shelves provided in the refrigerator, and for the optimal photograph of the storage pocket P, the object surface of the wide-angle lens distortion correction or the trapezoidal correction is set to the surfaces including the front surfaces of the respective storage pockets P, so that the image of the stored object after correction may be corrected so as to similar to the outline from the user's point of view as much as possible. In addition, the surface to be corrected may appropriately change.

(66) The photographing data processor **34** is configured to combine a plurality of optimal photographs.

(67) As shown in FIG. **12**, the photographing data processor **34** of the present embodiment composes the optimal photograph of the left side in the refrigerator and the optimal photograph of the storage pockets P of the right door D taken by the photographing device **10** on the left door D, and the optimal photograph on the right side in the refrigerator and the optimal photograph of the storage pockets P of the left door D taken by the photographing device **10** on the right door D.

(68) As a result, a photograph in which the left and right doors D are opened is generated as a composite photograph.

(69) The photographing data saver **35** is set in a predetermined area of the memory and stores the optimal photograph obtained by the photographing data processor **34**. Further, in order to reduce the capacity of the memory, it doesn't matter that the optimal photograph stored in the photographing data saver **35** may be configured to be overwritten.

(70) As shown in FIG. **13**, the photographing data transmission **36** transmits the above-described optimal photograph or the composite photograph of the plurality of optimal photographs to the portable device such as a user's portable telephone.

(71) The photographing data transmission **36** of this embodiment is configured to transmit the optimal photograph or the composite photograph of the plurality of optimal photographs when the optimal photograph or the composite photograph of the plurality of optimal photographs is generated, however for example, the photographing data transmission **36** of this embodiment is configured to transmit the latest optimal photograph or the composite photograph of the plurality of optimal photographs stored in advance in the photographing data saver **35** when receiving a command from the user. Further, the latest optimal photograph or the composite photograph of the plurality of optimal photographs may be an image obtained when the door D is opened latest.

(72) In the refrigerator R according to this embodiment configured as described above, since the photographing device **10** photographs the inside of the refrigerator while the door D is automatically opened by the driving device **20**, a distance between the photographing device **10** and the refrigerator may be kept longer than the that of when the door D is closed. As a result, the photographing range is widened, so that even if the stored object is placed in front of the refrigerator, the stored object is within the entire photographing range, and other objects may be taken. As a result, the stored objects in the refrigerator may be clearly photographed, and the stored state in the refrigerator may be confirmed even in a remote place.

(73) Since the storage pocket P of the door D is photographed by the driving device **20** with the door D automatically opened, even if the user is far from the refrigerator R, the storage pocket P may be photographed.

(74) As a configuration for photographing the storage pocket even if the user is far away from the refrigerator, it is conceivable to adopt a configuration in which the photographing device is provided inside the refrigerator and the storage pocket is photographed by the photographing device in a state in which the door D is closed.

(75) However, in the above-described configuration, when the distance between the photographing device and the storage pocket is relatively close, a large number of photographing devices are required to photograph all of the plurality of storage pockets installed at the upper and lower sides.

(76) On the other hand, in the refrigerator R according to the present embodiment, since the storage pocket P of each of the doors D is photographed with the left and right doors D opened by the driving device **20**, the plurality of storage pockets P may be photographed by the photographing device **10** which is smaller than the above-described configuration.

(77) In addition, the information processing device **30** selects the optimal photograph from the continuous still picture or the video, and transmits the corrected or composed optimal photograph to the outside, so that user may easily check the storage state of the refrigerator R even in the place where the user goes out.

(78) The user confirms an optimal photograph through the portable device or the like, and the user may additionally desire an image photographed at a different angle. At this time, the user may send a signal to the information processing device **30** through a portable device or the like to receive the photographed image at an angle different from the optimal photograph.

(79) In detail, the user may send a photographing command signal from another angle to the information processing device **30** through the portable device. The photographing command receiver **31** of the information processing device **30** receives the additional photographing command sent by the user and may drive the driving device **20** through the driving device controller **32**.

(80) In order to obtain the optimal photograph, the driving device **20** opens the door D at the predetermined angle, and the driving device controller **32** may rotate the door D at an angle larger or smaller than the predetermined angle for photographing at a different angle.

(81) Thereafter, the photographing device controller **33** drives the photographing device **10** so that the photographing device **10** may photograph the inside of the refrigerator or the storage pocket P of the door D at the predetermined angle.

(82) The image photographed at an angle outside the predetermined angle may be transmitted to

the portable device or the like of the user again through the same process as described above, and the user may confirm the optimal photograph outside the portable device or the like.

(83) In addition, the information processing device **30** allows the user to specify the angle desired by the user, rather than a predetermined angle, to allow the driving device **20** to open the door D at an angle desired by the user, and the photographing device **10** may be provided so as to photograph the storage pocket P in the refrigerator or the door D at the opening angle of the door D desired by the user.

(84) That is, the user may input the opening angle of the door D desired by the user to the portable device or the like, and the input signal may be received by the photographing command receiver **31** of the information processing device **30**.

(85) Thereafter, the driving device controller **32** may drive the driving device **20** to open the door D by the angle designated by the user and the photographing device controller **33** may control the opening and closing of the door D, and the photographing device **10** may be driven to obtain the photograph at the angle designated by the user.

(86) The photographed image at the angle designated by the user may be transmitted to the portable device or the like of the user again through the same process as described above and the user may confirm the photograph that is not the optimal photograph through the portable terminal or the like.

Second Embodiment

(87) Hereinafter, a second embodiment of the refrigerator according to the present invention will be described with reference to the drawings.

(88) As shown in FIG. **14**, a refrigerator R according to the present embodiment includes a refrigerator main body H (hereinafter, also referred to as a case H) having a front face opened and at least one door D provided at the opening of the case H, and each of the doors D is rotatably supported on a hinge axis of a hinge Z that is so-called one-door refrigerator.

(89) As shown in FIG. **14**, the refrigerator R is provided with a photographing device **10** installed inside the refrigerator of the door D and a driving device **20** installed at the top of the door D for automatically opening and closing the door D. The photographing device **10** and the driving device **20** are the same as those in the first embodiment, and a description thereof will be omitted.

(90) The refrigerator R of the present embodiment further includes a second photographing device **60** installed in the refrigerator and the driving device **20** opens the door D so that the second photographing device **60** is configured to photograph a storage pocket P of the door D.

(91) The second photographing device **60** is provided on the side (handle side) opposite to the hinge Z of the door D in the refrigerator. The specific configuration is the same as that of the photographing device **10** described above.

(92) Hereinafter, the operation of the refrigerator R of the present embodiment will be described with reference to FIGS. **15a** to **15d**.

(93) First, the second photographing device **60** photographs the storage pocket P while the driving device **20** opens the door D in a closed state to a first predetermined angle.

(94) Next, the photographing device **10** photographs the inside of the refrigerator while the driving device **20** further opens the door D at the first predetermined angle and moves it to a second predetermined angle.

(95) Then, the driving device **20** closes the door D.

(96) According to the refrigerator R of this embodiment configured as described above, the photographing device **10** photographs the inside of the refrigerator in a state in which the door D is automatically opened by the driving device **20** as in the first embodiment, and the second photographing device **60** is installed in the refrigerator, so that the storage pocket P may be photographed by the second photographing device **60** even the refrigerator R is one-door refrigerator.

(97) Also, the present invention is not limited to the above-described embodiments.

(98) The photographing device **10** is provided in the storage pocket P in each of the above

embodiments, as shown in FIG. 16, and the photographing device **10** may be provided on the side of the hinge Z in a throat section D1 in which the storage pocket P is mounted.

(99) Although the photographing device **10** of the above-described embodiment is configured to photograph a moving image, it may be configured to continuously photograph a plurality of images.

(100) Also in the first embodiment, when the inside of the refrigerator and the storage pocket P are photographed by the photographing device **10**, one of the doors D is opened and then the other door D is opened, however, the inside of the refrigerator and the storage pocket P may be photographed by the photographing device **10** installed in each of the doors D while simultaneously opening the doors D.

(101) Further, in a refrigerator having a relatively small height called a French door type, it is judged from a viewing angle ($\theta\theta$) of the camera and a distance d between the camera body and the object surface body calculated on the basis of the relational expression described in the first embodiment, so that the number of photographing apparatuses installed on the door may be one.

(102) In addition, some or all of configurations **31**, **32**, **33**, **34**, **35**, and **36** of the information processing device **30** of the first embodiment may be provided in a system, for example a server, located outside the refrigerator, and a management system for the refrigerator may be established by using the system and the refrigerator R.

(103) In addition, some or all of the configurations **31**, **32**, **33**, **34**, **35**, and **36** of the information processing device **30** of the first embodiment may be provided in a portable device, and the management system for the refrigerator may be established by using the portable device and the refrigerator R.

(104) Moreover, some or all of the configurations **31**, **32**, **33**, **34**, **35**, and **36** of the information processing device **30** of the first embodiment may be provided in the portable device and the system, and the management system for the refrigerator may be established by using the system, the portable device, and the refrigerator R.

(105) The information processing device includes, for example, a display portion for displaying a photograph on a display mounted on the refrigerator or a user's portable telephone, and the display portion is configured to display a link or the like to be connected to delivery services automatically.

(106) With such a configuration, the user may confirm a deficient object while viewing the photograph, smoothly purchase the deficient object, and assist the user in managing the inventory.

(107) The information processing device may be configured so as to recognize a stored object by using the image recognition process from the photographed image.

(108) Further, when the information processing device recognizes that it is stored and, for example, if the number of items previously selected is less than the required number, the information processing device automatically orders the required object from the delivery services or the like through a communication line such as a telephone line or the Internet.

(109) Further, an ordering company, for example the delivery services, may be selected from a plurality of ordering companies previously authorized by the user, or may be limited to one ordering company designated by the user.

(110) In the case where the deficient object is automatically ordered, the information processing device may automatically select the ordering company of the lowest ordering order or the shortest delivery date out of the plurality of ordering companies, or may select the ordering company based on the priority set in advance by the user.

(111) When the deficient object is recognized, the information processing device notifies the user of the deficient object by e-mail, message, voice, video, etc. through the display mounted on the refrigerator or the cellular phone, and it is also possible to automatically order the deficient object.

(112) The above-described various functions are not limited to the configuration in which the information processing device mounted in the refrigerator is used, and some or all of the functions may be connected to a remote server connected to the information processing device via a

communication network such as the Internet, or it may be provided on the cell phone.
(113) It is needless to say that the present invention is not limited to the above embodiments, and that various modifications are possible without departing from the spirit of the present invention.

Claims

1. A refrigerator comprising: a body including a chamber; a first camera configured to capture a first image of the chamber; a second camera configured to capture a second image of the chamber; at least one processor configured to: control the first camera and the second camera to capture the first image and the second image, respectively, combine the first image and the second image, automatically recognize a deficient object and a stored object by using an image recognition process from the combined image, obtain stored object information by using the image recognition process from the combined image, based on the obtained stored object information, obtain deficient object information, and send, via a communication network, the deficient object information to an external device.
2. The refrigerator of claim 1, wherein the deficient object information comprises a link for a store for placing an order of the deficient object.
3. The refrigerator of claim 1, wherein the at least one processor is further configured to send, via the communication network, the combined image to the external device.
4. The refrigerator of claim 1, wherein the at least one processor is configured to send the deficient object information to the external device via a message.
5. The refrigerator of claim 4, wherein the message comprises at least one audio or image.
6. The refrigerator of claim 1, wherein the at least one processor is configured to send the deficient object information to the external device via an e-mail.
7. The refrigerator of claim 1, wherein the first camera is disposed inside the chamber and the second camera is disposed on a door.
8. The refrigerator of claim 1, wherein the at least one processor is further configured to correct a captured image according to wide angle lens distortion correction or trapezoid correction.
9. A method of controlling a refrigerator including a body including a chamber, and a door configured to open and close the chamber, the method comprising: controlling a first camera of the refrigerator to capture a first image of the chamber; controlling a second camera of the refrigerator to capture a second image of the chamber; combining the first image and the second image; automatically recognizing a deficient object and a stored object by using an image recognition process from the combined image; obtaining stored object information by using the image recognition process from the combined image; based on the obtained stored object information, obtaining deficient object information; and sending, through a communication network, the deficient object information to an external device.
10. The method of claim 9, further comprising sending the combined image to the external device.
11. The method of claim 9, wherein the sending the deficient object information to the external device comprises: sending a message including the deficient object information to the external device.
12. The method of claim 9, wherein the sending the deficient object information to the external device comprises: sending an e-mail including the deficient object information to the external device.
13. The refrigerator of claim 1, further comprising: a door configured to open and close the chamber; and a driving device configured to rotate the door about a hinge to open and close the chamber, wherein the at least one processor is further configured to: control the driving device to output power to open the door, and while the door is open by the driving device, control the first camera and the second camera to capture the first image and the second image, respectively.
14. The method of claim 9, further comprising: controlling a driving device of the refrigerator to

output power to open a door of the chamber, wherein the capturing the first image and the second image comprises while the door is open by the driving device, capturing the first image and the second image by the first camera and the second camera, respectively.

15. The refrigerator of claim 13, wherein the at least one processor is further configured to: based on completely opening the door, control the first camera and the second camera to capture the first image and the second image, respectively.

16. The refrigerator of claim 13, wherein the at least one processor is further configured to: based on the door being opened to a predetermined angle, control the first camera and the second camera to capture the first image and the second image, respectively.

17. The refrigerator of claim 13, further comprising: a communication interface is configured to receive a photographing command from the external device, wherein the at least one processor is further configured to: in response to receiving the photographing command through the communication interface, control the driving device to open the door.

18. The method of claim 14, wherein the capturing the first image and the second image comprises: based on completely opening the door, capturing the first image and the second image by the first camera and the second camera, respectively.

19. The method of claim 14, wherein the capturing the first image and the second image comprises: based on the door being opened to a predetermined angle, capturing the first image and the second image by the first camera and the second camera, respectively.

20. The method of claim 14, wherein the controlling the driving device to output the power to open the door of the chamber comprises: receiving a photographing command from the external device, and in response to receiving the photographing command through the communication network, controlling the driving device to open the door.
