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(71) Applicant: **Qingdao Haier Joint Stock Co., Ltd**
Qingdao, Shandong 266101 (CN)

(72) Inventors:
- **WU, Yong**
  Qingdao
  Shandong 266101 (CN)
- **DANG, Guangming**
  Qingdao
  Shandong 266101 (CN)
- **TANG, Ying**
  Qingdao
  Shandong 266101 (CN)
- **ZENG, Hao**
  Qingdao
  Shandong 266101 (CN)
- **ZHAO, Qinghai**
  Qingdao
  Shandong 266101 (CN)
- **WANG, Weiqing**
  Qingdao
  Shandong 266101 (CN)
- **WANG, Qingfu**
  Qingdao
  Shandong 266101 (CN)

(74) Representative: **Ziebig & Hengelhaupt**
Patentanwälte PartG mbB
Leipziger Straße 49
10117 Berlin (DE)

(54) REFRIGERATOR AND PARTITION CONTROL METHOD AND PARTITION CONTROL DEVICE FOR COMPARTMENTS OF SAME

(57) A refrigerator and a partition control method for compartments of the same are provided. The refrigerator comprises a door (2) for opening or closing compartments, an air sending device (4) for distributing cooling air from the cooling source to different positions in the compartment, and a camera device (3) for shooting the inside of the compartment, a control unit for electrically connecting the air sending device (4) and the camera device (3). The partition control method comprises: S1, acquiring an opening/closing state of the door (2); S2, after receiving the opening/closing information of the door (2), the control unit driving the camera device (3) to obtain the storage state image of the inside of the compartment after the door (2) closes; S3, retrieving the storage state image of the inside of the compartment this time before the door (2) opens, and comparing the same with the state image after the door (2) closes; S4, if items increases in the compartment, enlarging or opening cooling air supply to the corresponding area by means of the air sending device (4), and if items decreases in the compartment, reducing or stopping cooling air supply to the corresponding area.

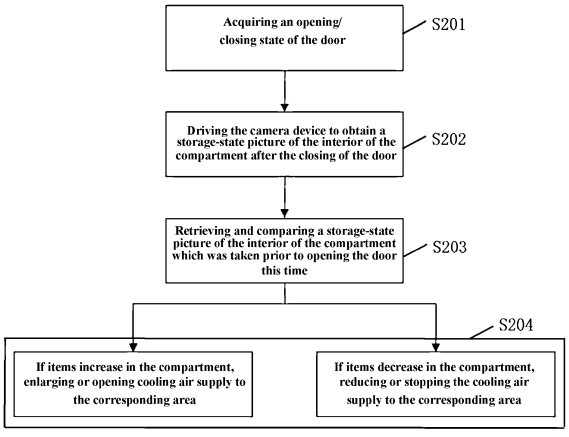

Fig. 2

EP 3 441 700 A1

Description

Technical Field

[0001] The present invention relates to a refrigerator and a partition control method and device for a compartment thereof.

Background of the Invention

[0002] The existing refrigerator typically uses a temperature sensor disposed inside a compartment to sense the temperature around the position where the temperature sensor is disposed, and use this temperature as the basis of refrigeration control.

[0003] However, when this control method is used to control the refrigerator, the compartment of the refrigerator starts refrigeration when the temperature measured by the temperature sensor is higher than a preset value. The compartment is usually divided by shelves into a plurality of relatively independent storage spaces, the temperature in the storage space where items have been just put in may be higher than that in other storage spaces, and the storage space in which the items are placed needs to be refrigerated, while other idle storage spaces do not require refrigeration. However, if the existing control method of the refrigerator is adopted, it is necessary to refrigerate the entire compartment, which causes waste of electric energy, particularly evident in the case of a large volume compartment.

[0004] In addition, during the actual use of the compartment of the refrigerator, the user often accesses the stored items, the items that have been just put in generally have a relatively high temperature, and it takes a certain time for the temperature of the items to be transmitted to the whole compartment by means of heat radiation. Therefore, it is equivalent to the case where the temperature of the items stored in the refrigerator does not change for a long period of time, and the storage effect is lowered.

Summary of the Invention

[0005] It is an object of the present invention to provide a partition control method for a compartment of a refrigerator, a partition control device for a compartment of a refrigerator, and a corresponding refrigerator to overcome at least one of the problems existing in the prior art.

[0006] In one aspect, the present invention provides a partition control method for a compartment of a refrigerator, wherein the refrigerator comprises a door for opening or closing the compartment, an air supply device for distributing cooling air from a cold source to different positions in the compartment, a camera device for photographing the interior of the compartment, and a control unit for electrically connecting the air supply device and the camera device; and the partition control method comprises: S1, acquiring an opening/closing state of the door; S2, after receiving opening/closing information about the door, the control unit driving the camera device to obtain a storage-state picture of the interior of the compartment after the closing of the door; S3, retrieving a storage-state picture of the interior of the compartment which was taken prior to opening the door this time, and comparing it with the storage-state picture which was taken after said closing of the door; and S4, if items increase in the compartment, enlarging or opening cooling air supply to the corresponding area by means of the air supply device, and if items decrease in the compartment, reducing or stopping the cooling air supply to the corresponding area.

[0007] Optionally, when the air supply device is in a running state, determining whether the average temperature of interior environment of the compartment is less than a preset cooling stop temperature threshold in the compartment; and if so, the air supply device is stopped.

[0008] Optionally, the compartment is internally provided with a lighting device for illuminating the interior of the compartment, and after the closing information about the door is acquired in step S2, the lighting device is turned on first, then the camera device is driven to operate, and the lighting device is turned off after the storage-state picture is obtained.

[0009] Optionally, the air supply device is provided with a plurality of dampers in the compartment, and the compartment is formed with a plurality of storage partitions corresponding to the dampers; and step S3 mentioned above is specifically as follows: comparing the two storage-state pictures adjacent in time, and obtaining a changed storage partition in the two storage-state pictures, wherein if the storage is across multiple storage partitions, the large storage partition occupied by the storage is determined to be the changed storage partition.

[0010] Optionally, step S4 mentioned above is specifically as follows: if the storage in the changed storage partition increases, enlarging or opening the cooling air supply to the storage partition by the air supply device; and if the storage in the changed storage partition decreases, reducing or stopping the cooling air supply to the storage partition.

[0011] Optionally, the refrigerator is provided with a storage device for storing the storage-state pictures, which are stored in the storage device once obtained and are sequentially arranged in chronological order, and the storage-state picture which is unnecessary and first stored in the storage device is deleted before a new storage-state picture is obtained.

[0012] In another aspect, the present invention provides a partition control device for a compartment of a refrigerator, wherein a plurality of camera devices are provided in the compartment, the refrigerator is further provided with an air supply device, and the air supply device is configured to distribute cooling air from a cold source to different positions of the compartment; and the partition control device comprises: a door control module for acquiring opening/closing information about a door; an image comparison module for comparing storage-

state pictures photographed by the camera devices; and a running module for driving the air supply device to run and stop.

[0013] Optionally, the partition control device further comprises: a temperature comparison module for comparing the average temperature in the compartment with a preset cooling stop temperature threshold.

[0014] In yet another aspect, the present invention provides a refrigerator configured to perform partition control of a compartment of the refrigerator by any partition control method according to the present invention.

[0015] In still another aspect, the present invention provides a refrigerator comprising any partition control device according to the present invention for partition control of a compartment of the refrigerator.

[0016] In various technical solutions of the present invention, by monitoring the opening and closing of the door, and photographing the interior of the compartment to compare changes occurring in the compartment before and after, and when there is an increase in storage in the corresponding area of the compartment, the air supply device provides cooling air to the area, which can quickly cool the area, thereby achieving the effect of the partition cooling control.

[0017] According to the detailed description of particular embodiments of the present invention below in conjunction with the accompanying drawings, the above and other objects, advantages and features of the present invention will become more apparent to a person skilled in the art.

Brief Description of the Drawings

[0018] Some of particular embodiments of the present invention will be described below in detail in an exemplary but not limiting way with reference to the accompanying drawings. The same reference signs indicate the same or similar components or parts in the accompanying drawings. It is understood by a person skilled in the art that the accompanying drawings are not necessarily drawn to scale. In the accompanying drawings:

Fig. 1 is a structural schematic diagram of a refrigerator of the present invention;

Fig. 2 is a flow chart of a partition control method for a compartment of the refrigerator;

Fig. 3 is a schematic diagram of a partition control device for the compartment of the refrigerator.

Detailed Description of the Invention

[0019] The present invention is described in detail below in conjunction with the embodiments shown in the accompanying drawings. However, these embodiments are not intended to limit the present invention, and the structures or functional changes made by those skilled in the art in accordance with the embodiments are included within the scope of the present invention.

[0020] In one aspect, some embodiments of the present invention provide a partition control method for a compartment of a refrigerator. As shown in Fig. 1, the refrigerator comprises a housing 1 and a door 2 for opening or closing the housing 1, and the compartment is provided in the housing 1. The refrigerator further comprises an air supply device 4 for providing cooling air to the compartment, a camera device 3 for photographing storage-state pictures inside the compartment, a control unit for electrically connecting the air supply device 4 and the camera device 3, a storage device (not illustrated) for storing the storage-state pictures, a temperature sensing device (not illustrated) for sensing the temperature inside the compartment, and a lighting device for illuminating the interior of the compartment. In some embodiments of the present invention, the compartment can be divided by shelves into several storage spaces 11.

[0021] In some embodiments of the present invention, as shown in Fig. 1, the camera device 3 is mounted on the door 2, and a plurality of camera devices are provided corresponding to the storage spaces 11 to respectively photograph the situation of each storage space 11. Since there is a partition plate, each of the camera devices 3 can only photograph the situation of the storage space 11 corresponding thereto.

[0022] The air supply device 4 may comprise dampers 41, the dampers 41 corresponding to the storage spaces 11, and several dampers 41 are provided and evenly distributed in each storage space. In some embodiments of the present invention, three dampers 41 are provided and evenly distributed. Several storage partitions are formed in the storage spaces 11 corresponding to the dampers 41, i.e. one damper 41 corresponding to one storage partition.

[0023] The temperature sensor may be provided in the compartment to detect the temperature in each of the storage spaces 11. In some embodiments of the present invention, a plurality of temperature sensors are provided and distributed in each of the storage spaces 11.

[0024] In another aspect, some embodiments of the present invention provide a partition control device for a compartment of a refrigerator. As shown in Fig. 3, the partition control device can comprise: a door control module 310 for acquiring opening/closing information about a door; an image comparison module 320 for comparing storage-state pictures photographed by the camera devices 3; a running module 330 for driving the air supply device 4 to run and stop; and a temperature comparison module 340 for comparing the average temperature in the compartment and/or the temperature in the various storage spaces 11 with a preset cooling stop temperature threshold. The temperature in the storage spaces 11 is obtained by the temperature sensor, and the average temperature in the compartment is calculated by the temperatures in the storage spaces 11 mentioned above.

[0025] As shown in Fig. 2, a partition control method for a compartment of a refrigerator according to some embodiments of the present invention comprises steps

S201-S204.

[0026] In step S201, an opening/closing state of the door is acquired by the door control module.

[0027] In step S202, after receiving opening/closing information about the door, the control unit drives the camera device 3 to obtain a storage-state picture of the interior of the compartment after the closing of the door 2.

[0028] Of course, as the door 2 is closed, the lighting device in the compartment is also in a closed state to save on power, the lighting device needs to be turned on before the camera device 3 photographs a storage-state picture, and after the camera device 3 photographs the storage-state picture, the lighting device is then turned off.

[0029] In step S203, a storage-state picture of the interior of the compartment which was taken prior to opening the door 2 this time is retrieved, and it is compared with the storage-state picture which was taken after said closing of the door 2. The storage-state pictures are stored in the storage device once obtained and are sequentially arranged in chronological order, and the storage-state picture which is unnecessary and first stored in the storage device is deleted before a new storage-state picture is obtained. In some embodiments of the present invention, the storage device only needs to store two storage-state pictures, so the first storage-state picture needs to be deleted before a new third storage-state picture is obtained. Therefore, when the comparison operation is performed, it is necessary to retrieve the storage-state picture of the storage last photographed from the storage device.

[0030] In step S204, if items increase in the compartment, cooling air supply to the corresponding area is enlarged or opened by means of the air supply device; and if items decrease in the compartment, the cooling air supply to the corresponding area is reduced or stopped.

[0031] In these embodiments, since the shelves divide the compartment into several storage spaces 11, the camera device 3 can only photograph the storage-state picture of the storage space 11 corresponding thereto. Moreover, since the damper 41 is in one-to-one correspondence with the corresponding storage partition, the image comparison module can compare to find out the storage partitions in which the storage changes, wherein if the storage is across multiple storage partitions, the large storage partition occupied by the storage is determined to be the changed storage partition.

[0032] Therefore, if the storage in the changed storage partition increases, enlarging or opening the cooling air supply to the storage partition by the air supply device 4; and if the storage in the storage partition decreases, reducing or stopping the cooling air supply to the storage partition by the air supply device 4.

[0033] Moreover, since in these embodiments, the cooling air supply is controlled by the damper 41, if the storage in the storage partition increases, the damper is opened, or the damper is enlarged to allow more cooling air to enter; and conversely, if the storage within the storage partition decreases or is finished, the damper is reduced so that less cooling air enters, or the damper is closed directly.

[0034] The two storage-state pictures are retrieved from the storage device, and the storage-state pictures photographed by the camera device 3 are compared by the image comparison module, and the storage space 11 in which the second storage-state picture changes compared to the first storage-state picture is obtained. In such an embodiment, since each storage space 11 is divided into a plurality of storage partitions, the image comparison module can compare to find out the storage partition that changes in the two storage-state pictures, wherein if items increase and the items are placed across multiple adjacent partitions, the large storage partition occupied by the items is determined to be the changed storage partition.

[0035] In addition, in some embodiments of the present invention, the partition control method may also comprise: when the air supply device is in a running state, determining whether the average temperature of interior environment of the refrigerating chamber and/or the temperature of each of the storage compartments is less than a preset cooling stop temperature threshold in the refrigerating chamber; and if so, the air supply device is stopped.

[0036] Therefore, through the above steps, the storage space 11 in which the items increase or decrease can be accurately compared by the camera device 3, and the cooling air can be supplied or closed accordingly. In addition, if a plurality of dampers 41 are provided, each part of each storage space 11 can be precisely controlled. When an item is placed, the refrigeration partition can open or enlarge the damper 41 and rapidly cool, and other refrigeration partitions without items are not cooled, thereby effectively saving on energy.

[0037] In yet another aspect, some embodiments of the present invention provide a refrigerator (as shown in Fig. 1) configured to perform partition control of a compartment of the refrigerator by any partition control method according to the present invention.

[0038] In still another aspect, the present invention provides a refrigerator (as shown in Fig. 1) comprising any partition control device according to the present invention for partition control of a compartment of the refrigerator.

[0039] It should be understood that, although the description is given according to the embodiments, each embodiment does not merely comprise one independent technical solution, and this narrative manner of the description is merely for clarity. A person skilled in the art should take the description as a whole, and technical solutions in the embodiments can also be appropriately combined to form other implementations that can be understood by a person skilled in the art.

[0040] Up to this, a person skilled in the art should recognize that although a plurality of exemplary embodiments of the present invention have been shown and described in detail herein, numerous other variations or

modifications meeting the principle of the present invention can be directly determined or derived according to the contents disclosed in the present invention. Therefore, the scope of the present invention should be construed and considered as covering all of such other variations or modifications.

Claims

1. A partition control method for a compartment of a refrigerator, wherein the refrigerator comprises a door for opening or closing the compartment, an air supply device for distributing cooling air from a cold source to different positions in the compartment, a camera device for photographing the interior of the compartment, and a control unit for electrically connecting the air supply device and the camera device; and the partition control method comprises:

   S1, acquiring an opening/closing state of the door;
   S2, after receiving opening/closing information about the door, the control unit driving the camera device to obtain a storage-state picture of the interior of the compartment after a closing of the door;
   S3, retrieving a storage-state picture of the interior of the compartment which was taken prior to opening the door this time, and comparing it with the storage-state picture which was taken after said closing of the door; and
   S4, if items increase in the compartment, enlarging or opening cooling air supply to the corresponding area by means of the air supply device, and if items decrease in the compartment, reducing or stopping the cooling air supply to the corresponding area.

2. The partition control method according to claim 1, wherein
   when the air supply device is in a running state, determining whether the average temperature of interior environment of the compartment is less than a preset cooling stop temperature threshold in the compartment; and
   if so, the air supply device is stopped.

3. The partition control method according to claim 1, wherein
   the compartment is internally provided with a lighting device for illuminating the interior of the compartment, and after the closing information about the door is acquired in step S2, the lighting device is turned on first, then the camera device is driven to operate, and the lighting device is turned off after the storage-state picture is obtained.

4. The partition control method according to claim 1, wherein
   the air supply device is provided with a plurality of dampers in the compartment, and the compartment is formed with a plurality of storage partitions corresponding to the dampers; and
   step S3 as mentioned comprises: comparing the two storage-state pictures adjacent in time, and obtaining a changed storage partition in the two storage-state pictures, wherein if the storage is across multiple storage partitions, the large storage partition occupied by the storage is determined to be the changed storage partition.

5. The partition control method according to claim 4, wherein step S4 as mentioned comprises:
   if the storage in the changed storage partition increases, enlarging or opening the cooling air supply to the storage partition by the air supply device; and
   if the storage in the changed storage partition decreases, reducing or stopping the cooling air supply to the storage partition.

6. The partition control method according to claim 1, wherein
   the refrigerator is provided with a storage device for storing the storage-state pictures, which are stored in the storage device once obtained and are sequentially arranged in chronological order, and the storage-state picture which is unnecessary and first stored in the storage device is deleted before a new storage-state picture is obtained.

7. A partition control device for a compartment of a refrigerator, wherein a plurality of camera devices are provided in the compartment, the refrigerator is further provided with an air supply device, and the air supply device is configured to distribute cooling air from a cold source to different positions of the compartment; and the partition control device comprises:

   a door control module for acquiring opening/closing information about a door;
   an image comparison module for comparing storage-state pictures photographed by the camera devices; and
   a running module for driving the air supply device to run and stop.

8. The partition control device according to claim 7, wherein the partition control device further comprises:
   a temperature comparison module for comparing the average temperature in the compartment with a preset cooling stop temperature threshold.

9. A refrigerator configured to perform partition control of a compartment of the refrigerator by the partition

control method according to claim 1.

10. A refrigerator comprising the partition control device of claim 7 for partition control of a compartment of the refrigerator.

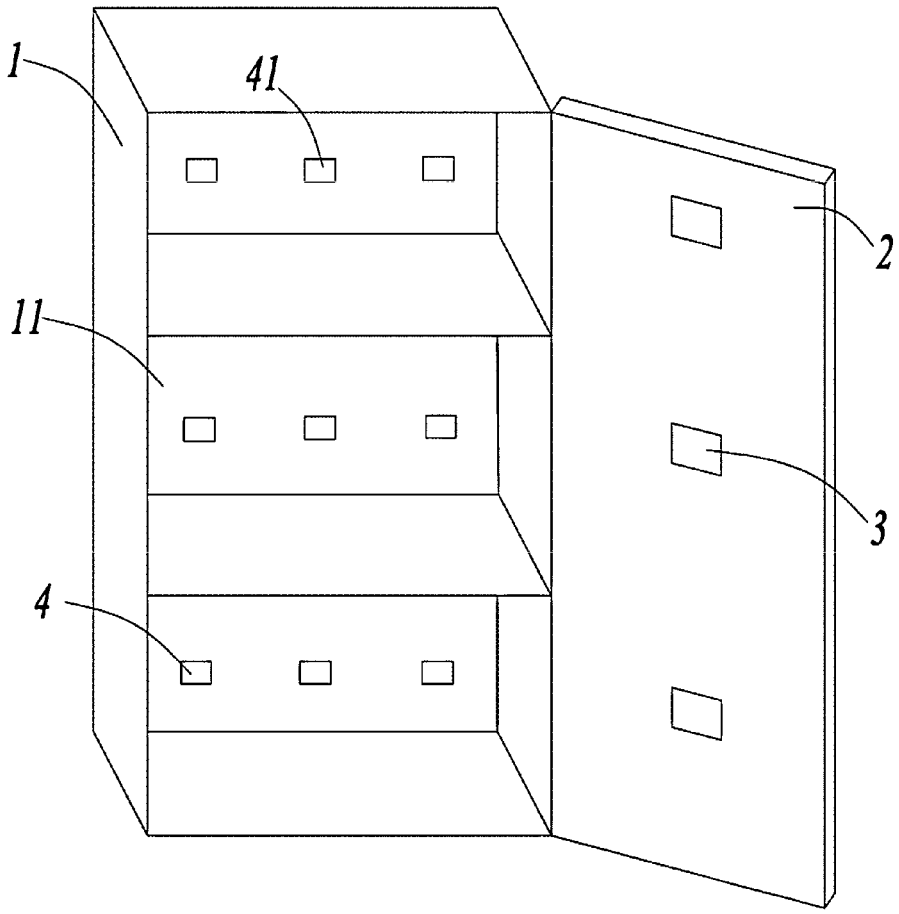

Fig. 1

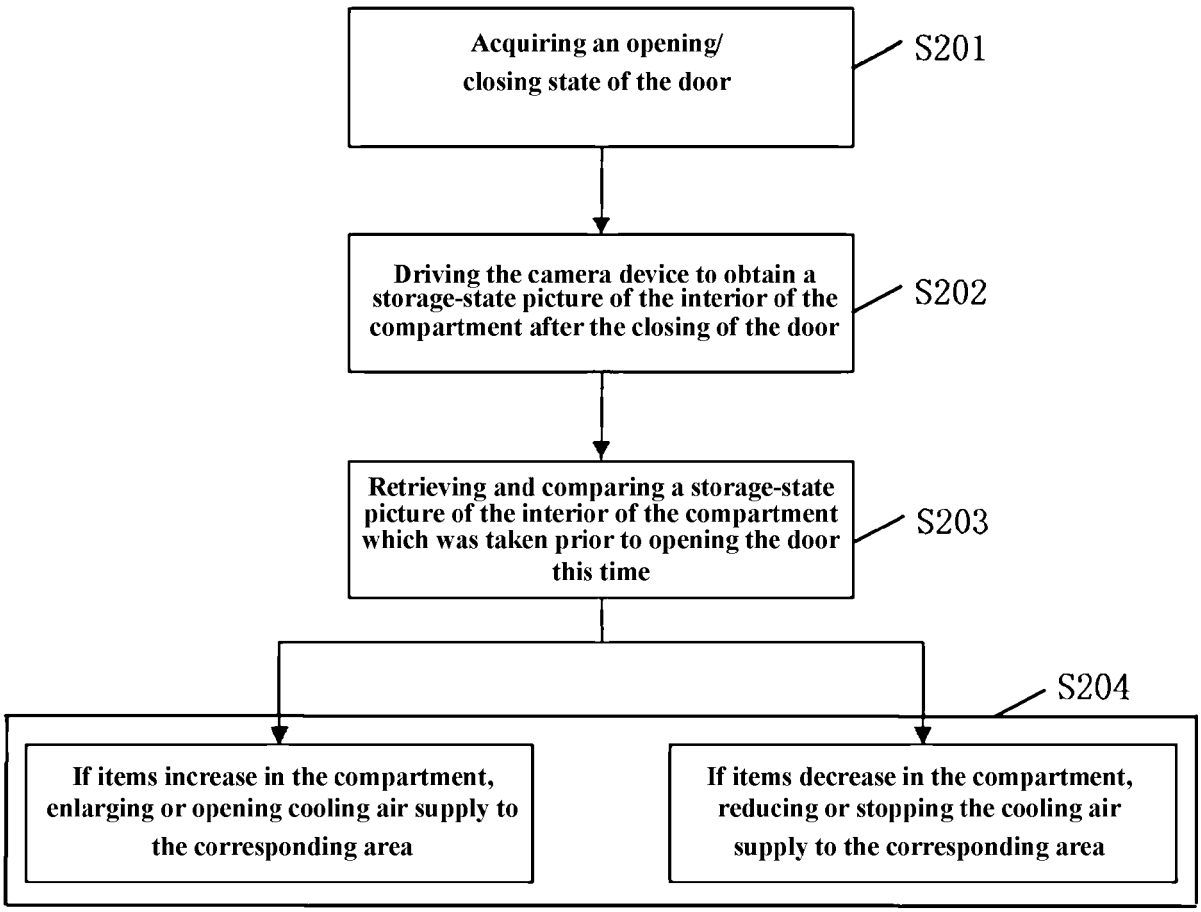
Acquiring an opening/ closing state of the door
S201
Driving the camera device to obtain a storage-state picture of the interior of the compartment after the closing of the door
S202
Retrieving and comparing a storage-state picture of the interior of the compartment which was taken prior to opening the door this time
S203
S204
If items increase in the compartment, enlarging or opening cooling air supply to the corresponding area
If items decrease in the compartment, reducing or stopping the cooling air supply to the corresponding area

Fig. 2

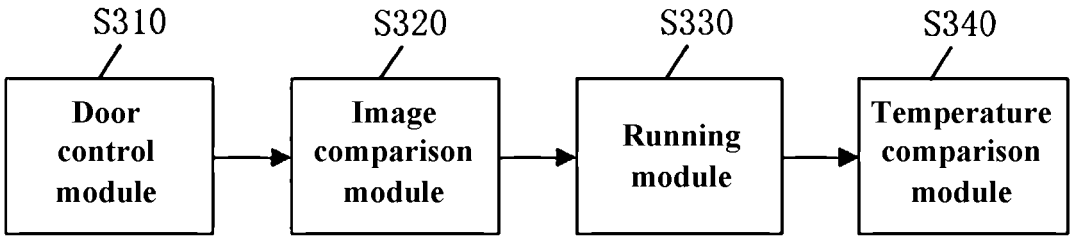
S310
Door control module
S320
Image comparison module
S330
Running module
S340
Temperature comparison module

Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/113926

A. CLASSIFICATION OF SUBJECT MATTER

F25D 11/02(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25D; F25B; F24F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPODOC, CNABS, CNKI, CNTXT: air conditioner, camera shooting, air supply, temperature, air door; REFRIGERATOR, ZONE, CAMMER, COMPARISION, DAMPER, DISTRIBUTE, TEMP

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105783376 A (QINGDAO HAIER CO., LTD.), 20 July 2016 (20.07.2016), the whole document	1-10
Y	CN 104990357 A (QINGDAO HAIER CO., LTD.), 21 October 2015 (21.10.2015), description, pages7-10, and figures 7-10	1-10
Y	CN 105513052 A (SICHUAN CHANGHONG ELECTRIC CO., LTD.), 20 April 2016 (20.04.2016), description, page 6, and figures 1-2	1-10
A	CN 103604273 A (SICHUAN CHANGHONG ELECTRIC CO., LTD.), 26 February 2014 (26.02.2014), the whole document	1-10
A	CN 104713309 A (V-ZUG AG), 17 June 2015 (17.06.2015), the whole document	1-10
A	CN 202562170 U (HEFEI MIDEA-ROYALSTAR REFRIGERATOR CO., LTD. et al.), 28 November 2012 (28.11.2012), the whole document	1-10
A	CN 105091500 A (WU, Keyi), 25 November 2015 (25.11.2015), the whole document	1-10

☒ Further documents are listed in the continuation of Box C. ☒See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22March 2017 (22.03.2017)	**06April 2017 (06.04.2017)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **ZHANG, Xudong** Telephone No.:(86-10) **62084963**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/113926

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 104677048 A (HEFEI MEILING COMPANY LIMITED), 03 June 2015 (03.06.2015), the whole document	1-10

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/113926

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 105783376 A	20 July 2016	None	
CN 104990357 A	21 October 2015	WO 2016206216 A1	29 December 2016
CN 105513052 A	20 April 2016	None	
CN 103604273 A	26 February 2014	CN 103604273 B	20 January 2016
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		AU 2014271328 A1	25 June 2015
		EP 2881686 A1	10 June 2015
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		EP 2998671 A1	23 March 2016
		WO 2015056856 A1	23 April 2015
CN 104677048 A	03 June 2015	None	

Form PCT/ISA/210 (patent family annex) (July 2009)