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(54) REFRIGERATOR AND PARTITION CONTROL METHOD

KÜHLSCHRANK UND TRENNWANDSTEUERUNGSVERFAHREN

RÉFRIGÉRATEUR ET PROCÉDÉ DE COMMANDE DE DISTRIBUTION

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(56) References cited:
EP-A1- 2 878 904 **CN-A- 103 604 273**
CN-A- 104 677 048 **CN-A- 104 713 309**
CN-A- 104 990 357 **CN-A- 105 091 500**
CN-A- 105 222 518 **CN-A- 105 513 052**
CN-A- 105 783 376 **CN-U- 202 562 170**
DE-U1-212014 000 095 **JP-A- 2014 209 048**
JP-A- 2015 163 839 **JP-A- 2015 169 412**
US-A1- 2003 131 541 **US-A1- 2016 123 659**

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Description

Technical Field

[0001] The present invention relates to a partition control method for a refrigerator and to a refrigerator configured to perform partition control of the refrigerator by the partition control method.

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 energys, 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. US2003131541A1 relates to an apparatus for controlling cool air in a focused manner to cool a section which is weakly cooled or stores new loads. DE212014000095U1 relates to a refrigerator and a refrigerator system, with which food can be photographed in a storage compartment in order to enable the checking of a storage status with the aid of a display device or the like.

Summary of the Invention

[0005] It is an object of the present invention to provide a partition control method for 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 refrigerator according to claim 1.

[0007] Optionally, step S3 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 storage partition in which the largest change happens is determined to be the changed storage partition.

[0008] 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.

[0009] In yet another aspect, the present invention provides a refrigerator according to claim 4.

[0010] 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.

[0011] 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

[0012] 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

[0013] 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 scope of the present invention is defined by the appended claims.

[0014] The present invention provides a partition control method for 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.

[0015] 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.

[0016] The air supply device 4 comprises Z 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.

[0017] 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.

[0018] An unclaimed example includes Z 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.

[0019] 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.

[0020] In step S201, an opening/closing state of the door is acquired by the door control module.

[0021] 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.

[0022] 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.

[0023] 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.

[0024] 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.

[0025] 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.

[0026] 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.

[0027] Moreover, since 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.

[0028] 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 increased items are placed across multiple adjacent partitions, the storage partition in which most of the increased items are located is determined to be the changed storage partition According to

[0029] the present invention, the partition control method also comprises:

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.

[0030] 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.

[0031] In yet another aspect, the present invention provides a refrigerator (as shown in Fig. 1) configured to perform partition control of the refrigerator by any partition control method according to the present invention.

[0032] 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. The scope of the present invention is defined by the appended claims.

Claims

1. A partition control method for a refrigerator, wherein the refrigerator comprises a door (2) for opening or closing a compartment of the refrigerator, an air supply device (4) for distributing cooling air from a cold source to different positions in the compartment, a camera device (3) for photographing the interior of

the compartment, and a control unit for electrically connecting the air supply device (4) and the camera device (3), wherein the air supply device (4) is provided with a plurality of dampers (41) in the compartment, and the compartment is formed with a plurality of storage partitions corresponding to the dampers (41); and the partition control method comprises:

S1, acquiring an opening/closing state of the door (2);

S2, after receiving opening/closing information about the door (2), the control unit driving the camera device (3) to obtain a storage-state picture of the interior of the compartment after a closing of the door (2);

S3, retrieving a storage-state picture of the interior of the compartment which was taken prior to opening the door (2) this time, and comparing it with the storage-state picture which was taken after said closing of the door (2);

characterized in that the partition control method further comprises:

S4, if items increase in a storage partition of the compartment, enlarging or opening cooling air supply to the storage partition by means of the damper (41) corresponding to the storage partition, and if items decrease in a storage partition of the compartment, reducing or stopping the cooling air supply to the storage partition by means of the damper (41) corresponding to the storage partition, wherein

when the air supply device (4) 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 (4) is stopped, 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 (2) is acquired in step S2, the lighting device is turned on first, then the camera device (3) is driven to operate, and the lighting device is turned off after the storage-state picture is obtained.

2. The partition control method according to claim 1, wherein

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 storage partition in which the largest change happens is determined to be the changed storage partition.

3. 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.
4. A refrigerator configured to perform partition control of the refrigerator by the partition control method according to claim 1.

Patentansprüche

1. Bereichssteuerungsverfahren für einen Kühlschrank, wobei der Kühlschrank eine Tür (2) zum Öffnen oder Schließen eines Faches des Kühlschranks, eine Luftzufuhrvorrichtung (4) zur Verteilung von Kühlluft von einer Kältequelle zu verschiedenen Stellen in dem Fach, eine Kameravorrichtung (3) zum Fotografieren des Innenraumes des Faches und eine Steuerungseinheit zur elektrischen Verbindung der Luftzufuhrvorrichtung (4) und der Kameravorrichtung (3) umfasst, wobei die Luftzufuhrvorrichtung (4) mit einer Mehrzahl von Dämpfern (41) in dem Fach versehen ist und das Fach mit einer Mehrzahl von Aufbewahrungsbereichen ausgebildet ist, die den Dämpfern (41) entsprechen; und das Bereichssteuerungsverfahren Folgendes umfasst:

S1, Erfassen eines Öffnungs-/Schließungszustandes der Tür (2);
 S2, nach Erhalten von Öffnungs-/Schließungsinformationen über die Tür (2), Ansteuern der Kameravorrichtung (3) durch die Steuerungseinheit, um ein Aufbewahrungszustandsfoto des Innenraumes des Faches nach einem Schließen der Tür (2) zu erfassen;
 S3, Abrufen eines Aufbewahrungszustandsfotos des Innenraumes des Faches, das vor dem diesmaligen Öffnen der Tür (2) aufgenommen wurde, und Vergleichen dieses Fotos mit dem Aufbewahrungszustandsfoto, das nach dem Schließen der Tür (2) aufgenommen wurde;
dadurch gekennzeichnet, dass das Bereichssteuerungsverfahren ferner Folgendes umfasst:

S4, wenn sich Gegenstände in einem Aufbewahrungsbereich des Faches vermehren, Vergrößern oder Öffnen der Kühlluftzufuhr zu dem Aufbewahrungsbereich durch den Dämpfer (41), der dem Aufbewahrungsbereich entspricht, und wenn sich Gegenstände in einem Aufbewahrungsbereich des Faches verringern, Reduzieren

oder Stoppen der Kühlluftzufuhr zu dem Aufbewahrungsbereich durch den Dämpfer (41), der dem Aufbewahrungsbereich entspricht, wobei wenn die Luftzufuhrvorrichtung (4) sich in einem Betriebszustand befindet, Bestimmen ob die Durchschnittstemperatur der Innenraumumgebung des Faches niedriger ist als ein voreingestellter Kühlstopptemperaturgrenzwert in dem Fach; und falls ja, die Luftzufuhrvorrichtung (4) gestoppt wird, wobei das Fach innen mit einer Beleuchtungsvorrichtung zur Ausleuchtung des Innenraumes des Faches versehen ist und, nachdem die Schließungsinformationen über die Tür (2) in Schritt S2 erfasst werden, zuerst die Beleuchtungsvorrichtung angeschaltet wird, dann die Kameravorrichtung (3) in Betrieb versetzt wird und die Beleuchtungsvorrichtung abgeschaltet wird, nachdem das Aufbewahrungszustandsfoto erfasst wird.

2. Bereichssteuerungsverfahren nach Anspruch 1, wobei Schritt S3, wie erwähnt, Folgendes umfasst: Vergleichen der zwei zeitlich benachbarten Aufbewahrungszustandsfotos und Erfassen eines veränderten Aufbewahrungsbereiches in den zwei Aufbewahrungszustandsfotos, wobei, wenn die Aufbewahrung über mehrere Aufbewahrungsbereiche hinweg erfolgt, der Aufbewahrungsbereich, in dem die größte Veränderung stattfindet, als der veränderte Aufbewahrungsbereich bestimmt wird.
3. Bereichssteuerungsverfahren nach Anspruch 1, wobei der Kühlschrank mit einer Speichervorrichtung zum Speichern der Aufbewahrungszustandsfotos versehen ist, die nach dem Erfassen in der Speichervorrichtung gespeichert und in chronologischer Reihenfolge nacheinander angeordnet werden, und das Aufbewahrungszustandsfoto, das unnötig ist und zuerst in der Speichervorrichtung gespeichert wurde, gelöscht wird, bevor ein neues Aufbewahrungszustandsfoto erfasst wird.
4. Kühlschrank, der dazu ausgestaltet ist, eine Bereichssteuerung des Kühlschranks durch das Bereichssteuerungsverfahren nach Anspruch 1 durchzuführen.

Revendications

1. Procédé de commande de distribution d'un réfrigérateur, où le réfrigérateur comprend une porte (2)

pour ouvrir ou fermer un compartiment du réfrigérateur, un dispositif d'alimentation en air (4) pour distribuer de l'air de refroidissement provenant d'une source froide à différentes positions dans le compartiment, un dispositif de caméra (3) pour photographier l'intérieur du compartiment, et une unité de commande pour connecter électriquement le dispositif d'alimentation en air (4) et le dispositif de caméra (3), où le dispositif d'alimentation en air (4) est pourvu d'une pluralité de clapets (41) dans le compartiment, et le compartiment est formé d'une pluralité de distributions de stockage correspondant aux clapets (41) ; et le procédé de commande de distribution comprend :

S1, la détection d'un état d'ouverture/fermeture de la porte (2) ;

S2, après réception d'une information d'ouverture/fermeture de la porte (2), l'unité de commande pilote le dispositif de caméra (3) pour obtenir une image d'état de stockage de l'intérieur du compartiment après fermeture de la porte (2) ;

S3, la récupération d'une image d'état de stockage de l'intérieur du compartiment ayant été prise avant l'ouverture de la porte (2) cette fois, et sa comparaison avec l'image d'état de stockage ayant été prise après ladite fermeture de la porte (2) ;

caractérisé en ce que le procédé de commande de distribution comprend en outre :

S4, si le nombre d'éléments augmente dans une distribution de stockage du compartiment, l'augmentation ou l'ouverture de l'alimentation en air de refroidissement vers la distribution de stockage au moyen du clapet (41) correspondant à la distribution de stockage, et si le nombre d'éléments diminue dans une distribution de stockage du compartiment, la réduction ou l'arrêt de l'alimentation en air de refroidissement vers la distribution de stockage au moyen du clapet (41) correspondant à la distribution de stockage, où

lorsque le dispositif d'alimentation en air (4) est dans un état de mimétisme, déterminer si la température moyenne de l'environnement intérieur du compartiment est inférieure à un seuil de température d'arrêt de refroidissement prédéfini dans le compartiment ; et

si oui, le dispositif d'alimentation en air (4) est arrêté, où

le compartiment est pourvu à l'intérieur d'un dispositif d'éclairage pour éclairer l'intérieur du compartiment, et après que les informations de fermeture de la porte (2) ont été

recueillies à l'étape S2, le dispositif d'éclairage est d'abord allumé, puis le dispositif de caméra (3) est mis en marche, et le dispositif d'éclairage est éteint après que l'image de l'état de stockage a été obtenue.

2. Procédé de commande de distribution selon la revendication 1, où l'étape S3 telle que mentionnée comprend : la comparaison des deux images d'état de stockage adjacentes dans le temps, et l'obtention d'une distribution de stockage modifiée dans les deux images d'état de stockage, où si le stockage s'effectue sur plusieurs distributions de stockage, la distribution de stockage où le changement le plus important se produit est déterminée comme étant la distribution de stockage modifiée.
3. Procédé de commande de distribution selon la revendication 1, où le réfrigérateur est muni d'un dispositif de stockage pour stocker les images d'état de stockage, qui sont stockées dans le dispositif de stockage une fois obtenues et sont agencées séquentiellement dans l'ordre chronologique, et l'image d'état de stockage qui est inutile et stockée en premier dans le dispositif de stockage est supprimée avant qu'une nouvelle image d'état de stockage soit obtenue.
4. Réfrigérateur configuré pour effectuer une commande de distribution du réfrigérateur par le procédé de commande de distribution selon la revendication 1.

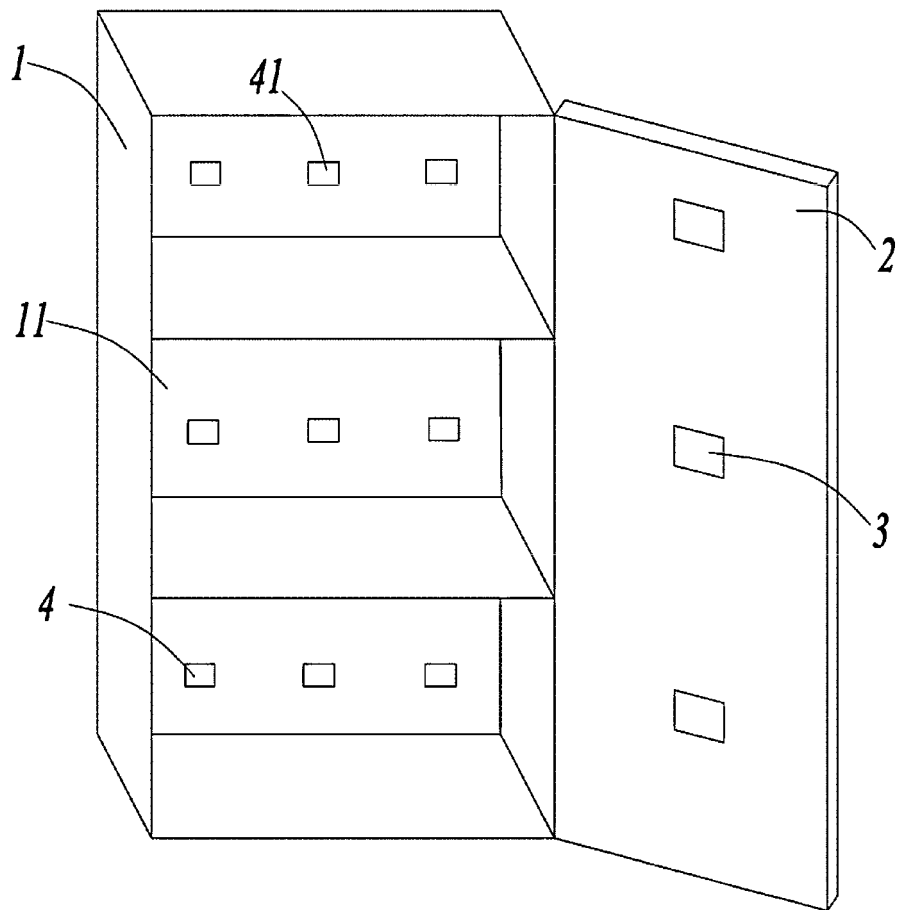


Fig. 1

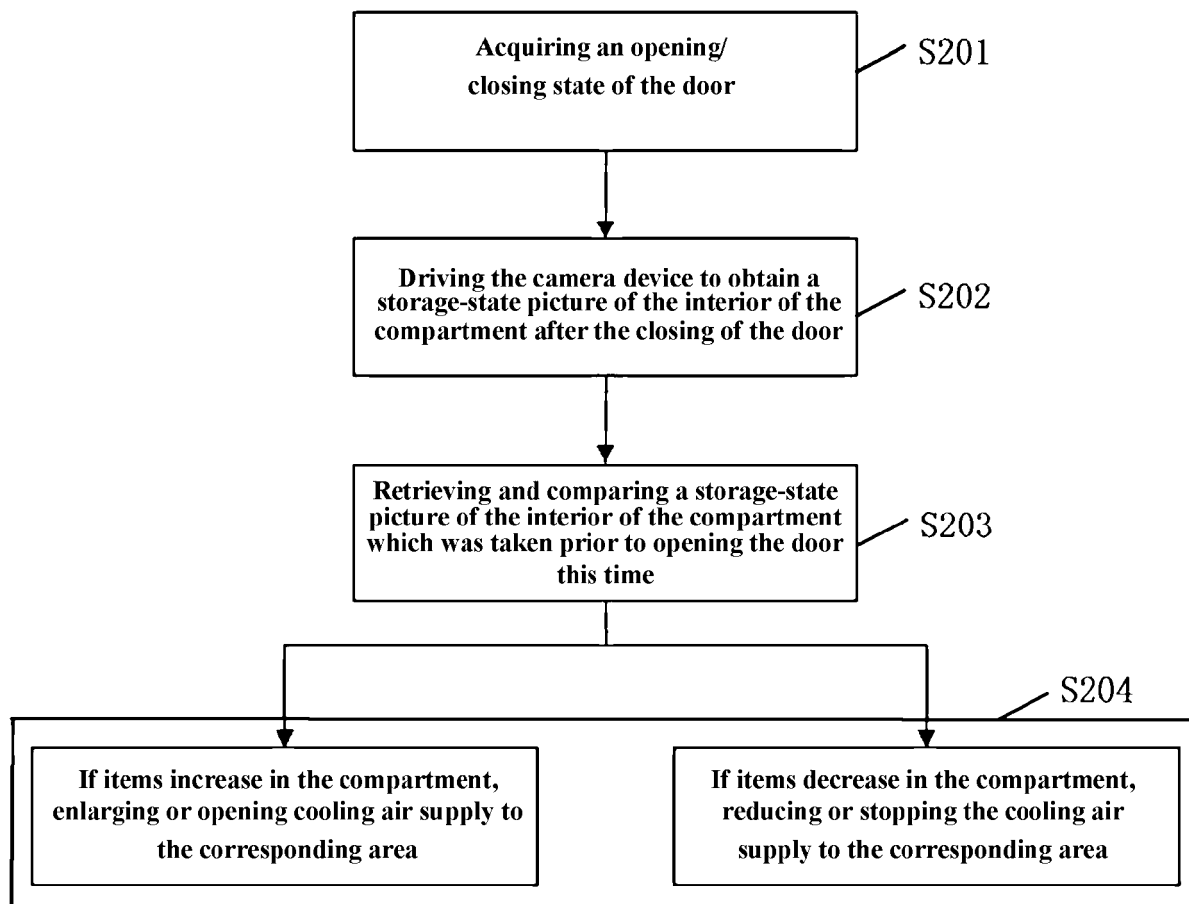


Fig. 2

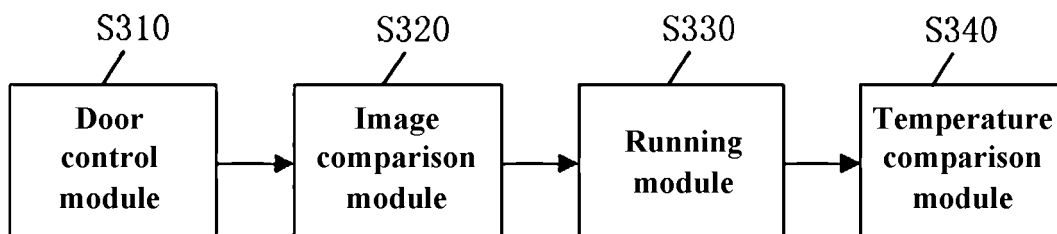


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2003131541 A1 [0004]
- DE 212014000095 U1 [0004]