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(54) REFRIGERATING AND FREEZING DEVICE

(57) A refrigerating and freezing device, comprising: a first storage compartment which is divided into at least two storage spaces; a cooling chamber; an air path system which is provided with at least two air supply ports, at least two first air return ports and an on-off control device, each air supply port communicating with the cooling chamber and one storage space, each first air return port communicating with one storage space and the cooling chamber, and the on-off control device controlling airflow from the cooling chamber to flow towards one or more of the at least two air supply outlets so as to control all or part of the airflow to flow towards a corresponding storage space; and a gear generation device which is configured to generate at least two gear instruction groups, each gear instruction group comprising a plurality of gear instructions and correspondingly controlling one storage space, wherein each gear instruction comprises control information that causes the corresponding storage space to be at a target temperature so that the refrigerating and freezing device controls the on-off control device according to each gear instruction so as to control the temperature within the corresponding storage space.

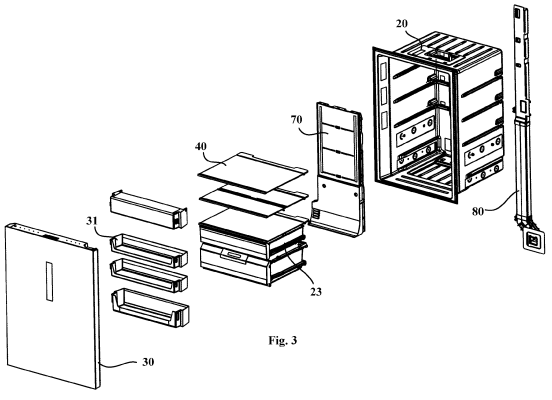

Fig. 3

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the technical field of refrigeration equipment, and more particularly relates to a refrigerating and freezing device.

BACKGROUND OF THE INVENTION

[0002] With the development of society and economy and the improvement of people's living standards, refrigerators have also become indispensable household appliances in people's daily lives. Existing refrigerating compartments of refrigerators adopt unified temperature control, and each layer is at a unified set temperature of 0-5°C, but different foods have different optimal storage temperatures. If a user sets the temperature to a low gear of 0°C, the temperature of the entire refrigerating compartment is about 0°C. If foods with the optimal storage temperature greater than 5°C are stored at this temperature, the food fresh-keeping period will be greatly shortened, and the food deterioration and decay will be accelerated.

BRIEF DESCRIPTION OF THE INVENTION

[0003] In view of the above problems, the present invention is proposed so as to provide a refrigerating and freezing device solving or at least partially solving the above problems. Independent partitions of a refrigerating compartment of a refrigerator can be realized, and each layer of partition can realize independent adjustment of multi-gear temperatures of 2°C, 5°C, 10°C (low, medium, high) and the like, so that users can adjust the temperature of each layer of the refrigerator according to their own requirements and habits. Through balanced control on the temperature and the humidity, optimal storage environment zones for different foods are achieved, and the users are guided to correctly place the foods into the optimal storage space.

[0004] Therefore, the present invention provides a refrigerating and freezing device, including:

a first storage compartment, internally provided with at least one storage rack so that the first storage compartment is separated by the storage rack into at least two storage spaces;

a cooling chamber, configured to accommodate an evaporator of the refrigerating and freezing device;

an air path system, provided with at least two air supply ports, at least two first air return ports and an on-off control device, wherein each of the air supply ports communicates with the cooling chamber and one of the storage spaces, and each of the first air return ports communicates with one of the storage spaces and the cooling chamber; the on-off control device is configured to control airflows from the cooling chamber to flow towards one or more of the at least two air supply ports so as to control all or part of the airflows to flow towards the corresponding storage space; and

a gear generation device, configured to generate at least two gear instruction groups, wherein each of the gear instruction groups includes a plurality of gear instructions, and correspondingly controls one of the storage spaces; each of the gear instructions includes control information enabling the corresponding storage space to be at a target temperature or within a target temperature range so that the refrigerating and freezing device controls the on-off control device according to each of the gear instructions to control a temperature in the corresponding storage space.

[0005] Optionally, the gear generation device includes at least two display control panels disposed on inner side walls of each of the storage spaces; each of the display control panels is configured to receive a signal and generate the gear instructions of one of the gear instruction groups; and each of the display control panels is further configured to display suggestions for types of articles stored in the corresponding storage space; or

the gear generation device includes at least two adjustment buttons and indication icons disposed in a manner of corresponding to each of the gear instructions of each of the adjustment buttons; and each of the indication icons includes at least information suggesting types of articles stored in the corresponding storage space.

[0006] Optionally, the at least two storage spaces are sequentially disposed in a vertical direction; and the air path system includes:

an air supply assembly, disposed at a back portion of the first storage compartment, and provided with the at least two air supply ports, the on-off control device being disposed in the air supply assembly; and

an air return assembly, disposed at one transverse side of the air supply assembly, and provided with the at least two first air return ports.

[0007] Optionally, the on-off control device is a shunt air supply device including a shell, at least two air outlets disposed on a peripheral wall of the shell and an adjusting element rotatably disposed inside the shell; the adjusting element is provided with at least one shielding portion configured to shield the at least two air outlets in a controlled manner so as to adjust respective air outlet areas of the at least two air outlets; and each of the air outlets communicates with one of the storage spaces through the corresponding air supply port.

[0008] Optionally, a drawer space is further separated from the first storage compartment by the at least one storage rack; the drawer space is disposed at a lower side of three of the storage spaces; the air path system

is further provided with a second air return port formed on the air return assembly; and the second air return port communicates with the drawer space and the cooling chamber.

[0009] Optionally, the quantity of the storage spaces is three, and the quantity of the first air return ports is three; and three of the first air return ports and the second air return port are sequentially disposed in a vertical direction.

[0010] Optionally, the at least two air outlets include a first air outlet, and a second air outlet and a third air outlet formed at two sides of the first air outlet; the first air outlet is upward;

the air supply ports communicating with the storage space at the uppermost side are first air supply ports, and there are four, respectively formed at two sides of an upper portion and two sides of a middle portion of the storage space;
the air supply ports communicating with the storage space in the middle are second air supply ports, and there are two, respectively formed at two sides of the upper portion of the storage space;
the air supply ports communicating with the storage space at the lowermost side are a third air supply port, and there is one, formed at one side of the upper portion of the storage space;
the air supply assembly is internally provided with:

a first air supply duct, communicating with the first air outlet by a lower end, and communicating with four of the first air supply ports by an upper end;
a second air supply duct and a spanning air duct, wherein the second air supply duct is disposed at one side of the first air supply duct, communicating with the second air outlet by a lower end, and communicating with one of the second air supply ports and the spanning air duct by an upper end; and the spanning air duct spans across the first air supply duct, and communicates with the other of the second air supply ports; and
a third air supply duct, disposed at the other side of the first air supply duct, communicating with the third air outlet by a lower end, and communicating with the third air supply port by an upper end.

[0011] Optionally, an area ratio between the first air return port at the uppermost side and the first air return port under the first air return port at the uppermost side is 2 to 3;

an area ratio between the first air return port at the lowermost side and the first air return port above the first air return port at the lowermost side is 1/2 to 7/10; and
an area ratio between the first air return port at the lowermost side and the second air return port is 1/10 to 1/5.

[0012] Optionally, the refrigerating and freezing device further includes:

a first door, installed on the first storage compartment and configured to open or close the first storage compartment; and
at least one bottle holder, disposed at a back side of the first door, wherein a lower portion of each of the bottle holders is located at a front side of one of the storage racks, and when the first door is closed, each of the bottle holders is in contact with the storage rack.

[0013] Optionally, an air return duct is disposed in the air return assembly, and each of the first air return ports respectively communicates with the air return duct;

a sealing structure is disposed between each of the storage racks and a compartment wall of the first storage compartment; and
at least two temperature sensors are further disposed in the air supply assembly, so as to respectively detect a temperature in each of the storage spaces.

[0014] In the refrigerating and freezing device of the present invention, because of the air path system and the gear generation device, the independent partitions of the refrigerating compartment of the refrigerator can be realized, and each layer of partition can realize independent adjustment of multi-gear temperatures of 2°C, 5°C, 10°C (low, medium, high) and the like, so that users can adjust the temperature of each layer of the refrigerator according to their own requirements and habits. Through balanced control on the temperature and the humidity, optimal storage environment zones for different foods are achieved, and the users are guided to correctly place the foods into the optimal storage space.

[0015] Further, through an innovative miniature air duct technology in the refrigerating and freezing device of the present invention, the independent temperature control and fast refrigeration of each layer of the refrigerating compartment can be realized; the temperature fluctuation of each layer is reduced; and fresh keeping and energy saving are realized. Additionally, independent adjustability of the temperature of each layer of 3 gears and the like can also be realized, so that the foods are stored at an optimal temperature interval, which greatly prolongs the fresh-keeping period of the foods, makes it more convenient for the users to use, and saves more energy at the same time.

[0016] According to the following detailed descriptions of specific embodiments of the present invention in conjunction with the drawings, those skilled in the art will

more clearly understand the above and other objectives, advantages and features of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Some specific embodiments of the present invention are described in detail below with reference to the drawings by way of example and not limitation. The same reference numerals in the drawings indicate the same or similar components or parts. Those skilled in the art should understand that these drawings are not necessarily drawn in scale. In the drawings:

Figure 1 is a schematic structure diagram of a refrigerating and freezing device according to an embodiment of the present invention.

Figure 2 is a schematic local structure diagram of the refrigerating and freezing device shown in Figure 1.

Figure 3 is a schematic exploded view of a local structure of the refrigerating and freezing device shown in Figure 1.

Figure 4 is a schematic local structure diagram of the refrigerating and freezing device shown in Figure 1.

Figure 5 is a schematic internal structure diagram of the refrigerating and freezing device shown in Figure 1.

Figure 6 is a schematic structure diagram of an air supply assembly in the refrigerating and freezing device shown in Figure 1.

Figure 7 is a schematic structure diagram of the air supply assembly shown in Figure 6 from another perspective.

Figure 8 is a schematic structure diagram of an air return assembly of the refrigerating and freezing device shown in Figure 1.

DETAILED DESCRIPTION

[0018] Figure 1 is a schematic structure diagram of a refrigerating and freezing device according to an embodiment of the present invention. As shown in Figure 1, and referring to Figure 2 to Figure 8, arrows in the figures can show flowing directions of airflows. The embodiment of the present invention provides a refrigerating and freezing device. The refrigerating and freezing device includes a cabinet 20, and storage compartments are defined in the cabinet 20. The refrigerating and freezing device is further provided with doors configured to open and close the storage compartments.

[0019] The storage compartments can include a first storage compartment, a second storage compartment and a third storage compartment. The first storage compartment can be a refrigerating compartment. The second storage compartment can be a freezing compartment. The third storage compartment can be a variable-temperature compartment. Correspondingly, the doors can include a first door 30, a second door and a third door, so as to respectively open or close the first storage compartment, the second storage compartment and the third storage compartment. Further, a temperature in the freezing compartment is generally in a range of -22°C to -14°C. A temperature in the variable-temperature compartment can be freely adjusted to -18°C to 8°C.

[0020] A refrigerating system is configured to provide cooling capacity to the storage compartments. In some embodiments, the refrigerating system can be a refrigerating circulation system consisting of a compressor, a condenser, a throttling device, an evaporator 27, etc. The evaporator 27 is configured to directly or indirectly provide cooling capacity to the storage compartments. Since the refrigerating system of the refrigerating and freezing device per se is well known to those skilled in the art, the descriptions thereof are omitted herein. Additionally, a cooling chamber can be disposed in the cabinet 20, and can be specifically disposed at a back side of the third storage compartment. The cooling chamber is configured to accommodate the evaporator 27. The quantity of the cooling chambers and the evaporators 27 can be one or more. When one evaporator 27 is used, the cooling capacity is provided to all of the storage compartments. When a plurality of evaporators 27 are used, each of the evaporators 27 can provide cooling capacity to one storage compartment.

[0021] In some embodiments of the present invention, as shown in Figure 2, at least one storage rack 40 is disposed in the first storage compartment, so that the first storage compartment is separated into at least two storage spaces 21 by the storage rack 40. The refrigerating and freezing device further includes an air path system and a gear generation device 50. The air path system is provided with at least two air supply ports, at least two first air return ports 81 and an on-off control device. Each air supply port communicates with the cooling chamber and one storage space 21. Each first air return port 81 communicates with one storage space 21 and the cooling chamber. The on-off control device 60 is configured to control airflows from the cooling chamber to flow towards one or more of the at least two air supply ports so as to control all or part of the airflows to flow towards the corresponding storage space 21. Specifically, the on-off control device 60 can enable the airflows from the cooling chamber to only flow towards one storage space 21, and can also enable the airflows to flow towards two or more storage spaces 21 at the same time, i.e., can be used to adjust the air supply of respective storage spaces 21.

[0022] The gear generation device 50 is configured to generate at least two gear instruction groups. Each gear instruction group includes a plurality of gear instructions, and correspondingly controls one storage space 21. Each gear instruction includes control information enabling the corresponding storage space 21 to be at a target temperature or within a target temperature range, so that the refrigerating and freezing device controls the on-off control device 60 according to each gear instruction to

control the temperature in the corresponding storage space 21.

[0023] For example, in some embodiments, the gear generation device 50 includes at least two display control panels disposed on inner side walls of each storage space 21; each display control panel is configured to receive a signal and generate gear instructions of one of the gear instruction groups, and each display control panel is further configured to display suggestions for types of articles stored in the corresponding storage space 21. Each display control panel can be disposed adjacent to the corresponding storage space 21. Further, each display control panel can perform information input in modes of sliding, clicking, etc. In some alternative embodiments of the present invention, the gear generation device 50 can be a general touch display screen of the refrigerating and freezing device.

[0024] In some other embodiments, the gear generation device 50 includes at least two adjustment buttons, and indication icons disposed in a manner of corresponding to each gear instruction of each adjustment button. Each indication icon includes at least information suggesting types of articles stored in the corresponding storage space. Each adjustment button can be a mechanical press key structure such as a knob. The indication icons can be icons disposed near the adjustment buttons and disposed at an inner side of the cabinet of the refrigerator, and can be disposed in modes of carving, silk screen printing, hollow structures, etc. For example, the indication icons can be signs of representative articles of suggesting types of articles stored in the corresponding storage space. Further, each indication icon includes at least a target temperature or a target temperature range in the corresponding storage space. The gear generation device 50 can further include at least two indication lamps. Each gear instruction of each adjustment button is associated with one indication lamp, so that the corresponding indication lamp is turned on when the adjustment button indicates the corresponding gear instruction, and further the corresponding indication icon is displayed in a highlight manner, i.e., is illuminated so as to be convenient for users to observe. Alternatively, the indication icons can also be displayed by a display screen, and combination of the mechanical press keys and the display by the display screen can be realized. Further, the indication icons can also be characters directly, i.e., the display screen can display all information associated with the corresponding gear instruction.

[0025] In the embodiment, because of the air path system and the gear generation device 50, the independent partitions of the refrigerating compartment of the refrigerator can be realized, and each layer of partition can realize independent adjustment of multi-gear temperatures of 2°C, 5°C, 10°C (low, medium, high) and the like, so that users can adjust the temperature of each layer of the refrigerator according to their own requirements and habits. Through balanced control on the temperature and the humidity, optimal storage environment zones for different foods are achieved, and the users are guided to correctly place the foods into the optimal storage space. Before the present application, temperatures of each layer of the refrigerator are identical, but different foods have different optimal storage temperatures and humidity, so that the user dares not put some low temperature instant food and tropical fruits into a refrigeration refrigerator. If the temperature is too low, the food cannot be immediately eaten, so that the user can only place the food outside of the refrigeration refrigerator. Furthermore, the tropical fruits need to be stored at a temperature interval of 8°C-10°C for the optimal storage time, and the user dares not place them into the refrigerator either. The foods placed into the refrigerator are not at the optimal temperature interval, so that the foods decay fast, and the waste is serious. According to the embodiment of the present invention, the temperature of each refrigerating layer of the refrigerator can be freely adjusted according to the requirements of the user, so that the foods are stored in an optimal storage space, and the user is guided to correctly place the foods in the optimal storage space. Each storage space 21 is provided with its own independent air outlet and independent air return, and each storage space 21 can realize the multi-gear change and free switching of the temperature.

[0026] Further, when the quantity of the gear instructions of each gear instruction group is relatively large, every change of one degree centigrade of the target temperature in the storage space can be used as a new gear. This can be called stepless gear adjustment. For example, there may be 11 gears between 0°C and 10°C, so that the temperature of each storage space 21 can be freely adjusted between 0°C and 10°C. Of course, there may also be only three gears set between 0°C and 10°C, i.e. a 0°C ice temperature zone, a 4°C gold zone and a 10°C tropical fruit zone.

[0027] In some embodiments of the present invention, as shown in Figure 5 to Figure 7, the on-off control device 60 is preferably a shunt air supply device, which may include a shell, at least two air outlets disposed on a peripheral wall of the shell and an adjusting element rotatably disposed inside the shell. The adjusting element is provided with at least one shielding portion configured to shield the at least two air outlets in a controlled manner so as to adjust respective air outlet areas of the at least two air outlets; and each air outlet communicates with one storage space 21 through the corresponding air supply port. In some specific embodiments, for example in a shunt air supply device in CN104879994A, CN106196840A and the like, the adjusting element can be driven to rotate by a motor and a gear transmission mechanism. For example, when the quantity of the storage spaces 21 and the quantity of the air outlets are respectively three, 7 or 8 kinds of air supply modes can be realized, such as fully opened, fully closed, one air outlet opened (3 kinds) and two air outlets opened (3 kinds).

[0028] In some embodiments of the present invention, as shown in Figure 2 to Figure 5, the at least two storage

spaces 21 are sequentially disposed in a vertical direction. The air path system includes an air supply assembly 70 and an air return assembly 80. The air supply assembly 70 is disposed at a back portion of the first storage compartment, and is provided with at least two air supply ports. The on-off control device 60 is disposed in the air supply assembly 70. The air return assembly 80 is disposed at one transverse side of the air supply assembly 70, and is provided with at least two first air return ports 81.

[0029] Further, a drawer space 22 is separated from the first storage compartment by the at least one storage rack 40. The drawer space 22 is disposed at a lower side of the three storage spaces 21. The air path system is further provided with a second air return port 82 formed on the air return assembly 80. The second air return port 82 communicates with the drawer space 22 and the cooling chamber.

[0030] Each storage rack 40 is preferably a storage plate, a separation plate and the like, and a sealing structure is disposed between each storage rack and a compartment wall of the first storage compartment. At least one bottle holder 31 is further disposed at a back side of the first door 30. Additionally, a lower portion of each bottle holder 31 is located at a front side of one storage rack 40. When the first door 30 is closed, each bottle holder 31 is in contact with the storage rack 40. Preferably, airflows can be allowed to downwards flow to the drawer space 22 through a position between the storage space 21 at the lowermost side and the bottle holder 31 at the front side thereof. The drawer space 22 can be further separated into a plurality of sub drawer spaces 22 by separation plates, so as to accommodate a plurality of drawers 23.

[0031] In some preferred embodiments of the present invention, the quantity of the storage spaces 21 is three, and the quantity of the first air return ports 81 is three. The three first air return ports 81 and the second air return port 82 are sequentially disposed in an up and down direction. Each first air return port 81 is formed in one side of a lower portion of the corresponding storage space 21. The second air return port 82 is formed in one side of a lower portion of the drawer space 22. The at least two air outlets include a first air outlet, and a second air outlet and a third air outlet formed at two sides of the first air outlet. The first air outlet is upward.

[0032] The air supply ports communicating with the storage space 21 at the uppermost side are first air supply ports, and there are four, respectively formed at two sides of an upper portion and two sides of a middle portion of the storage space 21. The air supply ports communicating with the storage space 21 in the middle are second air supply ports, and there are two, respectively formed at two sides of the upper portion of the storage space 21. The air supply port communicating with the storage space 21 at the lowermost side is a third air supply port, and there is one, formed at one side of the upper portion of the storage space 21.

[0033] Further, as shown in Figure 6 and Figure 7, the air supply assembly 70 is internally provided with a first air supply duct 71, a second air supply duct 72, a spanning air duct 73 and a third air supply duct 74. The first air supply duct 71 communicates with the first air outlet by a lower end, and communicates with the four first air supply ports by an upper end. The second air supply duct 72 is disposed at one side of the first air supply duct 71, communicating with the second air outlet by a lower end, and communicating with one second air supply port and the spanning air duct 73 by an upper end. The spanning air duct 73 spans across the first air supply duct 71, and communicates with the other second air supply port. The third air supply duct 74 is disposed at the other side of the first air supply duct 71, communicating with the third air outlet by a lower end, and communicating with the third air supply port by an upper end. Preferably, the third air supply duct 74 and the third air supply port are both located at one side of the first air supply duct 71 far away from the air return assembly 80. As shown in Figure 8, an air return duct is disposed in the air return assembly 80, and each first air return port 81 respectively communicates with the air return duct. The air return duct is provided with a general air return port 83 communicating with the cooling chamber. An air inlet is also formed in the air supply assembly 70, and can communicate with the cooling chamber through an air inlet pipeline. Additionally, a fan 28 for promoting the flowing of airflow can also be disposed at an outlet of the cooling chamber.

[0034] An area ratio between the first air return port 81 at the uppermost side and the first air return port 81 under the first air return port at the uppermost side is 2 to 3. An area ratio between the first air return port 81 at the lowermost side and the first air return port 81 above the first air return port at the lowermost side is 1/2 to 7/10. An area ratio between the first air return port 81 at the lowermost side and the second air return port 82 is 1/10 to 1/5. For convenient control, at least two temperature sensors 51 are further disposed in the air supply assembly 70, so as to respectively detect a temperature in each storage space 21, which enables the refrigerating and freezing device to perform control according to the temperature detected by the temperature sensors 51. Each temperature sensor 51 can sense the temperature change in the corresponding storage space 21.

[0035] In the embodiments of the present invention, as shown in Figure 4 and Figure 5, cold air from the cooling chamber is transmitted into the air supply assembly 70. An air volume distributor, i.e., a shunt air supply device is installed in the air supply assembly 70, and the distributor realizes independent air supply or combined arbitrary air supply to each layer of air path. The air reaches each layer, returns through independent air return ports of each layer, and then converges to the inside of the air return duct assembly to return to the cooling chamber together. A sealed state is formed between the storage rack 40 and an inner liner of the cabinet 20, so as to prevent the influence of cold air sinking on the tempera-

ture fluctuation and control of a next layer. The display control panels are provided with 2°C, 5°C and 10°C selection buttons (or low, medium and high) for gear selection. At the same time, information of types of articles for storage can be displayed to remind a user of recommended zones of different articles. When a first layer of storage space 21 (the storage space 21 at the uppermost side) needs air supply, the air is out from the first air supply port, and reaches the bottle holders 31 and the first door 30 through the storage rack 40. Due to the arrangement of the first air return port 81, the air will be returned to realize air return through the air return port of the first layer to complete a refrigerating cycle. When the temperature of the temperature sensor 51 corresponding to each layer of storage space 21 reaches a set temperature, the corresponding air outlet on the shunt air supply device is closed to stop air supply. The temperatures between the storage rack 40 and the bottle holders 31 are identical. The air path circulations of a second layer of storage space 21 (the storage space 21 in the middle) and the first layer of storage space 21 are identical. A part of the air of a third layer of storage space 21 (the storage space 21 at the lowermost side) reaches the bottle holders 31 and the first door 30 through the storage rack 40, and the other part of the air will go down towards the drawer zone to convey cooling capacity. The cooling capacity ratio of each layer is controlled through controlling the size of the air return port, and the balance of the set temperature is reached. If the temperature sensor 51 detects that the temperature of a storage space 21 is high, and the air supply is needed, the distributor supplies the air to the required layer. One independent air return port is disposed in each storage space 21 and the drawer spaces 22; the size of each air return port is subjected to strict calculation and simulated analysis; factors such as heat conduction and refrigerating capability are considered, and an area ratio of four air return ports including the three first air return ports 81 from top to bottom and the second air return port 82 is preferably 6:2.5:1.5:10.

[0036] The refrigerating and freezing device according to the embodiment of the present invention can realize the multilayer partition temperature control of the refrigerating compartment. Each layer can realize three-gear variable temperature. The users can freely select a temperature interval according to their own requirements. The size proportion of the air return ports is strictly calculated to reach the temperature balance. Due to the set structure mode of the air return ports, the variable-temperature adjustable and humidity adjustable air path circulation mode of the refrigerating and freezing device is realized through cooperation of the air return ports, the storage rack 40 and the bottle holder 31. Each display control panel can be disposed in a position on the side wall of each storage space 21 and near the first door 30, so that the operation is convenient. The users can freely adjust the temperature according to their own habits, which is convenient for the users to use. Additionally, the user can be guided to correctly place the foods for storage, and the waste is reduced. The foods which cannot be placed into the refrigerator for storage can be placed into the refrigerator to prolong the storage period now. The foods can be stored in an optimal temperature and humidity environment, and the fresh-keeping effect is greatly improved. The air is only supplied when the zone in each layer needs the air supply, so that too low storage temperature of the foods is prevented, and the energy is saved.

[0037] Hereto, those skilled in the art should realize that although multiple exemplary embodiments of the present invention have been shown and described in detail herein, without departing from the spirit and scope of the present invention, many other variations or modifications that conform to the principles of the present invention can still be directly determined or deduced from the contents disclosed in the present invention. Therefore, the scope of the present invention should be understood and deemed to cover all such other variations or modifications.

Claims

1. A refrigerating and freezing device, comprising:

a first storage compartment, internally provided with at least one storage rack so that the first storage compartment is separated by the storage rack into at least two storage spaces;

a cooling chamber, configured to accommodate an evaporator of the refrigerating and freezing device;

an air path system, provided with at least two air supply ports, at least two first air return ports and an on-off control device, wherein each of the air supply ports communicates with the cooling chamber and one of the storage spaces, and each of the first air return ports communicates with one of the storage spaces and the cooling chamber; the on-off control device is configured to control airflows from the cooling chamber to flow towards one or more of the at least two air supply ports so as to control all or part of the airflows to flow towards the corresponding storage space; and

a gear generation device, configured to generate at least two gear instruction groups, wherein each of the gear instruction groups comprises a plurality of gear instructions, and correspondingly controls one of the storage spaces; each of the gear instructions comprises control information enabling the corresponding storage space to be at a target temperature or within a target temperature range so that the refrigerating and freezing device controls the on-off control device according to each of the gear instructions to control a temperature in the correspond-

ing storage space.

2. The refrigerating and freezing device according to claim 1, wherein the gear generation device comprises at least two display control panels disposed on inner side walls of each of the storage spaces; each of the display control panels is configured to receive a signal and generate the gear instructions of one of the gear instruction groups; and each of the display control panels is further configured to display suggestions for types of articles stored in the corresponding storage space; or
the gear generation device comprises at least two adjustment buttons and indication icons disposed in a manner of corresponding to each of the gear instructions of each of the adjustment buttons; and each of the indication icons comprises at least information suggesting types of articles stored in the corresponding storage space.

3. The refrigerating and freezing device according to claim 1, wherein
the at least two storage spaces are sequentially disposed in a vertical direction; and the air path system comprises:

an air supply assembly, disposed at a back portion of the first storage compartment, and provided with the at least two air supply ports, the on-off control device being disposed in the air supply assembly; and
an air return assembly, disposed at one transverse side of the air supply assembly, and provided with the at least two first air return ports.

4. The refrigerating and freezing device according to claim 3, wherein the on-off control device is a shunt air supply device comprising a shell, at least two air outlets disposed on a peripheral wall of the shell and an adjusting element rotatably disposed inside the shell; the adjusting element is provided with at least one shielding portion configured to shield the at least two air outlets in a controlled manner so as to adjust respective air outlet areas of the at least two air outlets; and each of the air outlets communicates with one of the storage spaces through the corresponding air supply port.

5. The refrigerating and freezing device according to claim 4, wherein
a drawer space is further separated from the first storage compartment by the at least one storage rack; the drawer space is disposed at a lower side of three of the storage spaces; the air path system is further provided with a second air return port formed on the air return assembly; and the second air return port communicates with the drawer space and the cooling chamber.

6. The refrigerating and freezing device according to claim 5, wherein
the quantity of the storage spaces is three, and the quantity of the first air return ports is three; each of the first air return ports is formed in one side of a lower portion of the corresponding storage space; and the second air return port is formed in one side of a lower portion of the drawer space.

7. The refrigerating and freezing device according to claim 6, wherein

the at least two air outlets comprise a first air outlet, and a second air outlet and a third air outlet formed at two sides of the first air outlet; the first air outlet is upward;
the air supply ports communicating with the storage space at the uppermost side are first air supply ports, and there are four, respectively formed at two sides of an upper portion and two sides of a middle portion of the storage space;
the air supply ports communicating with the storage space in the middle are second air supply ports, and there are two, respectively formed at two sides of the upper portion of the storage space;
the air supply ports communicating with the storage space at the lowermost side are a third air supply port, and there is one, formed at one side of the upper portion of the storage space;
the air supply assembly is internally provided with:

a first air supply duct, communicating with the first air outlet by a lower end, and communicating with four of the first air supply ports by an upper end;
a second air supply duct and a spanning air duct, wherein the second air supply duct is disposed at one side of the first air supply duct, communicating with the second air outlet by a lower end, and communicating with one of the second air supply ports and the spanning air duct by an upper end; and
the spanning air duct spans across the first air supply duct, and communicates with the other of the second air supply ports; and
a third air supply duct, disposed at the other side of the first air supply duct, communicating with the third air outlet by a lower end, and communicating with the third air supply port at an upper end.

8. The refrigerating and freezing device according to claim 6, wherein

an area ratio between the first air return port at the uppermost side and the first air return port

under the first air return port at the uppermost side is 2 to 3;
an area ratio between the first air return port at the lowermost side and the first air return port above the first air return port at the lowermost side is 1/2 to 7/10; and
an area ratio between the first air return port at the lowermost side and the second air return port is 1/10 to 1/5.

9. The refrigerating and freezing device according to claim 5, further comprising:

a first door, installed on the first storage compartment and configured to open or close the first storage compartment; and
at least one bottle holder, disposed at a back side of the first door, wherein a lower portion of each of the bottle holders is located at a front side of one of the storage racks, and when the first door is closed, each of the bottle holders is in contact with the storage rack.

10. The refrigerating and freezing device according to claim 3, wherein

an air return duct is disposed in the air return assembly, and each of the first air return ports respectively communicates with the air return duct;
a sealing structure is disposed between each of the storage racks and a compartment wall of the first storage compartment; and
at least two temperature sensors are further disposed in the air supply assembly, so as to respectively detect a temperature in each of the storage spaces.

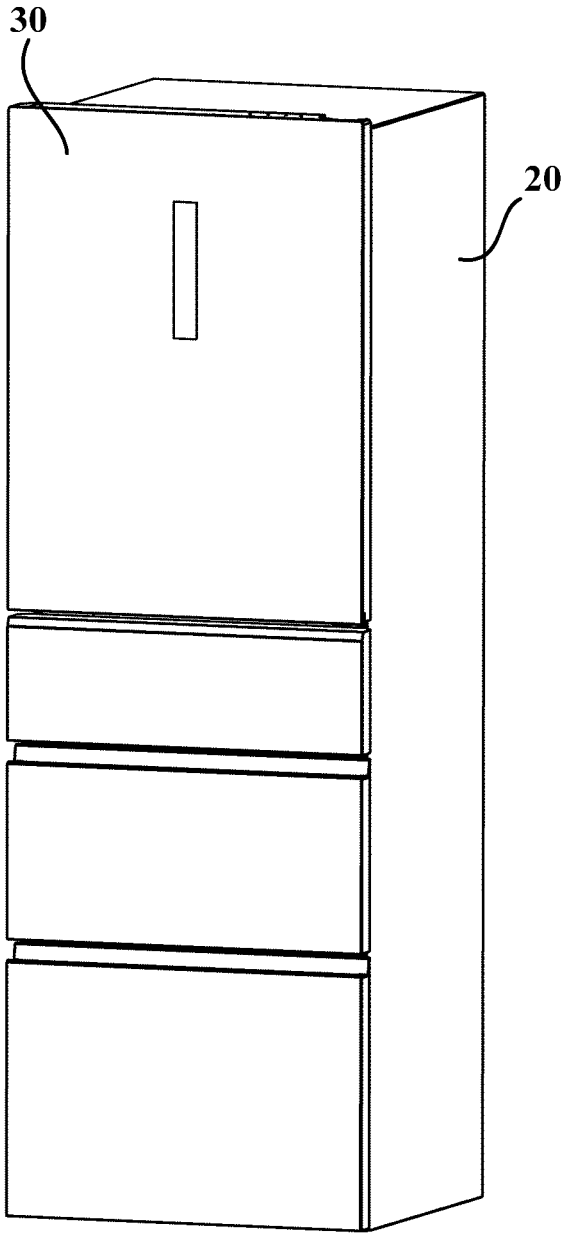

Fig. 1

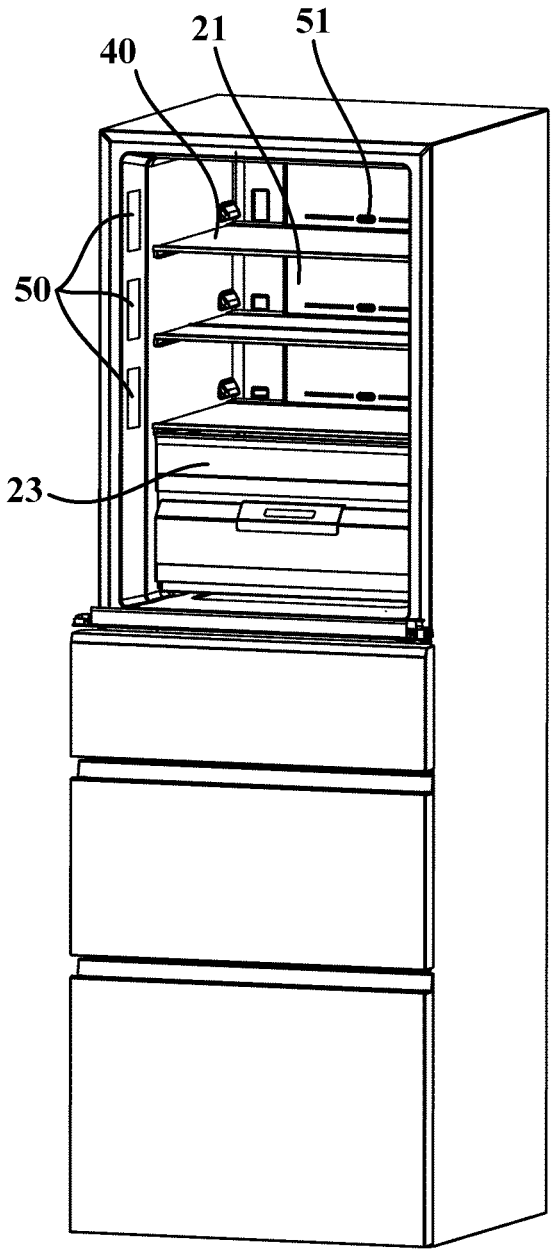

Fig. 2

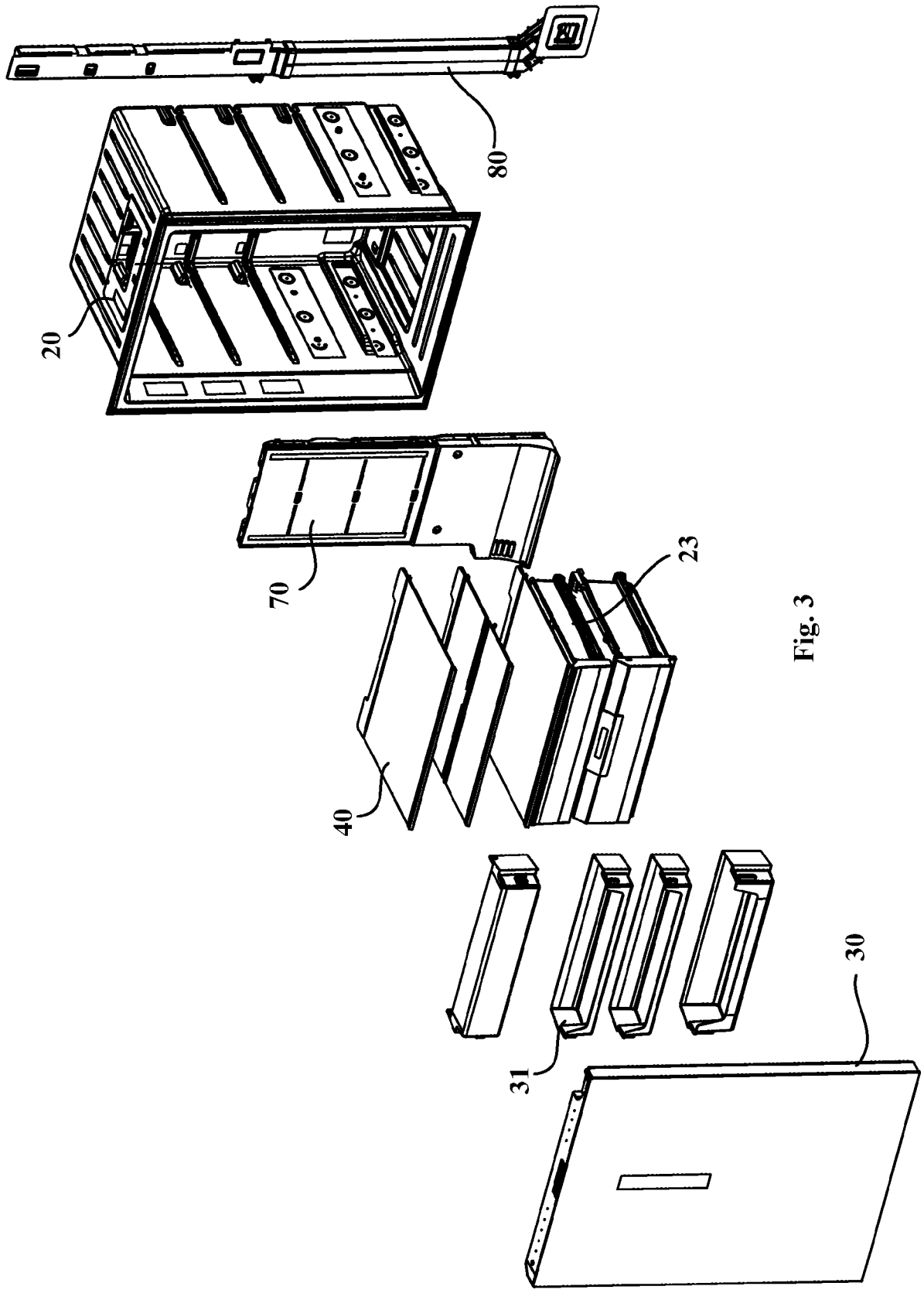

Fig. 3

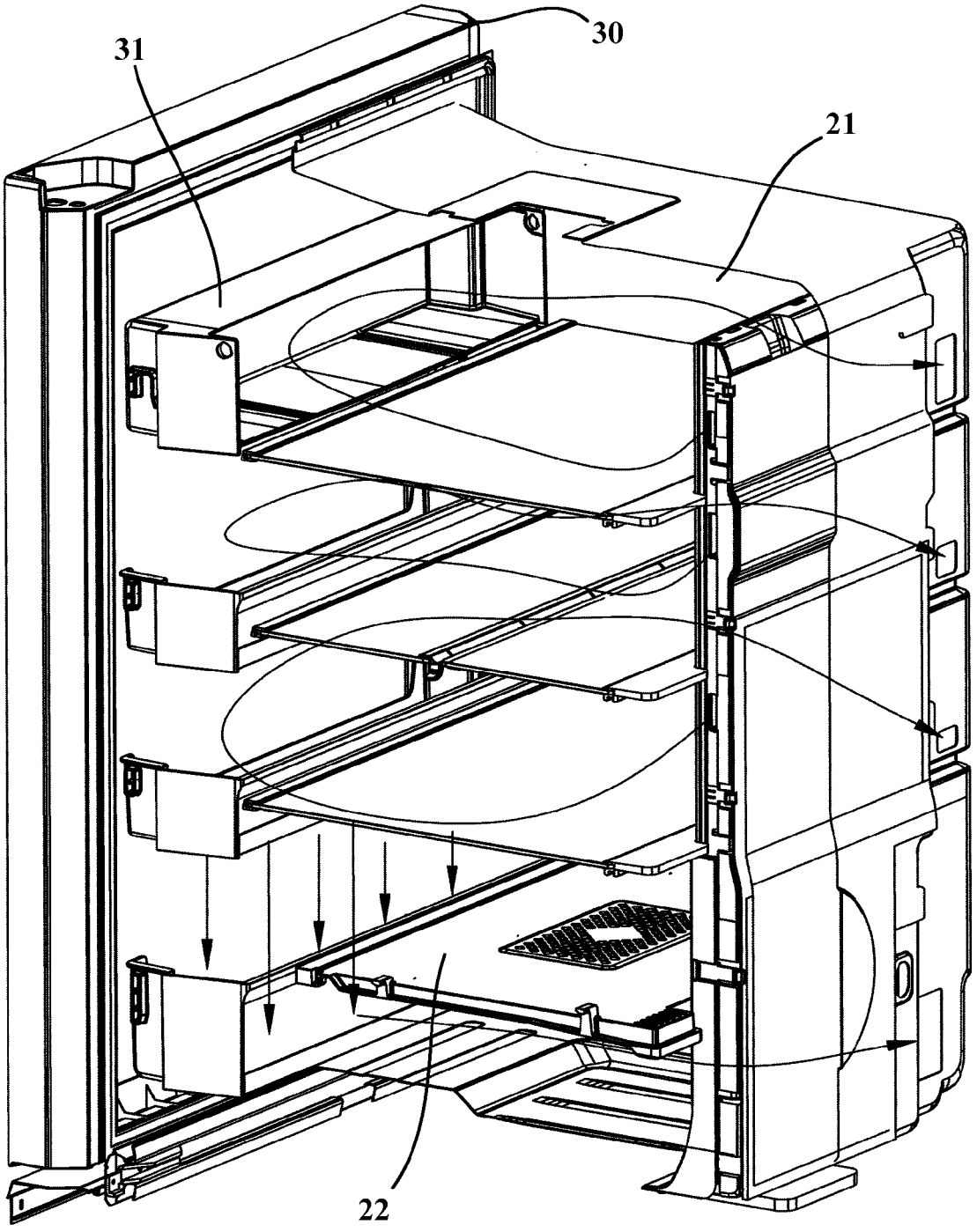

Fig. 4

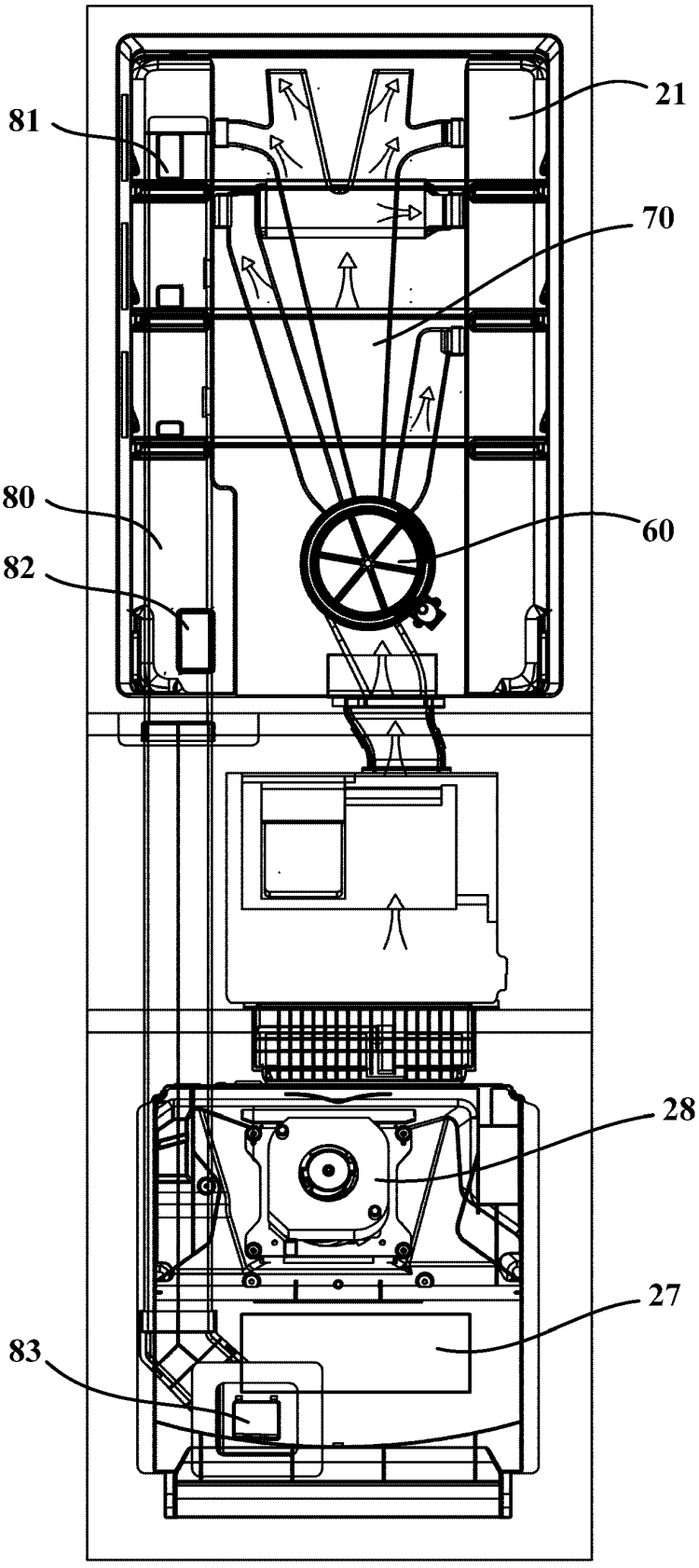

Fig. 5

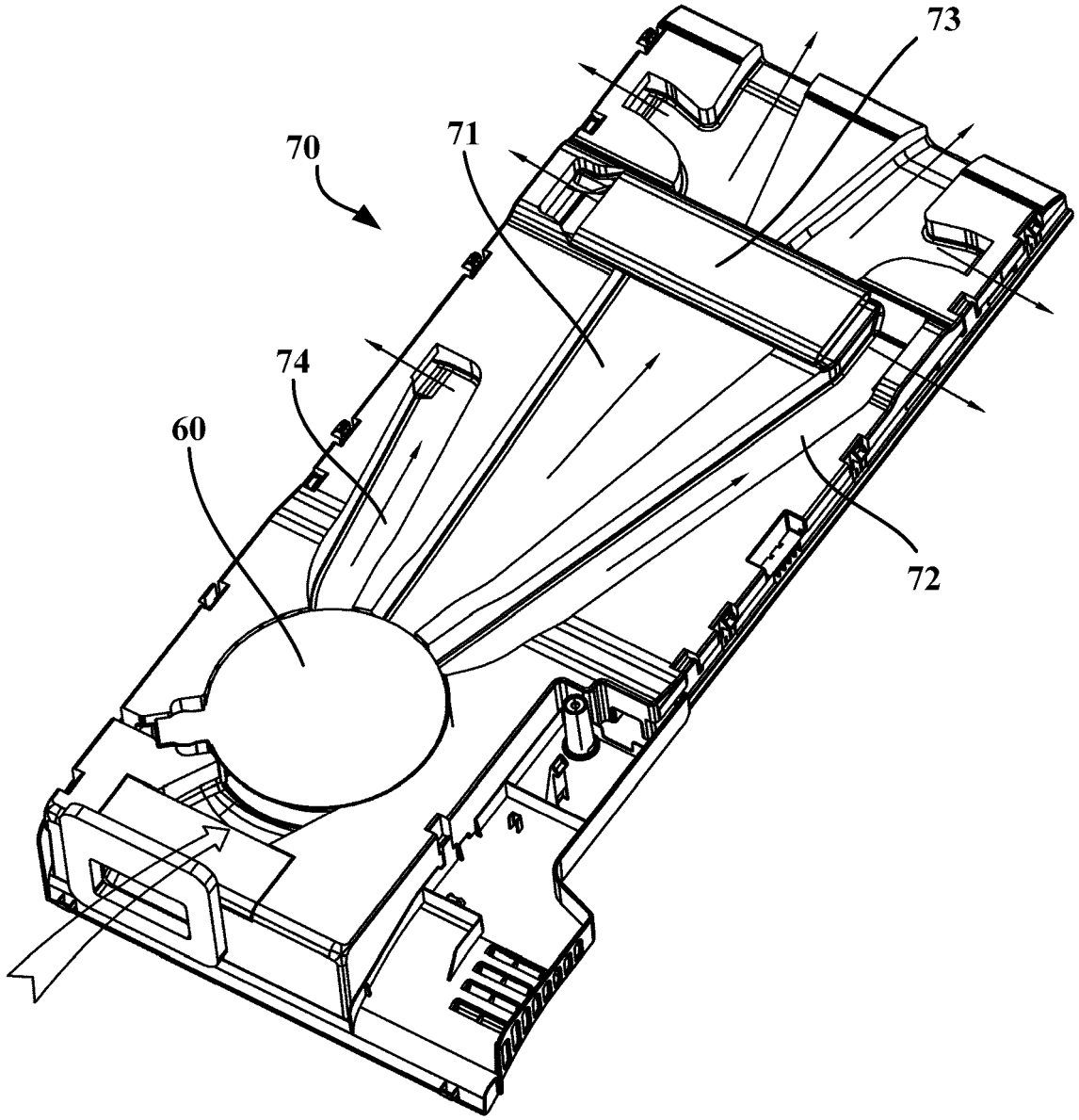

Fig. 6

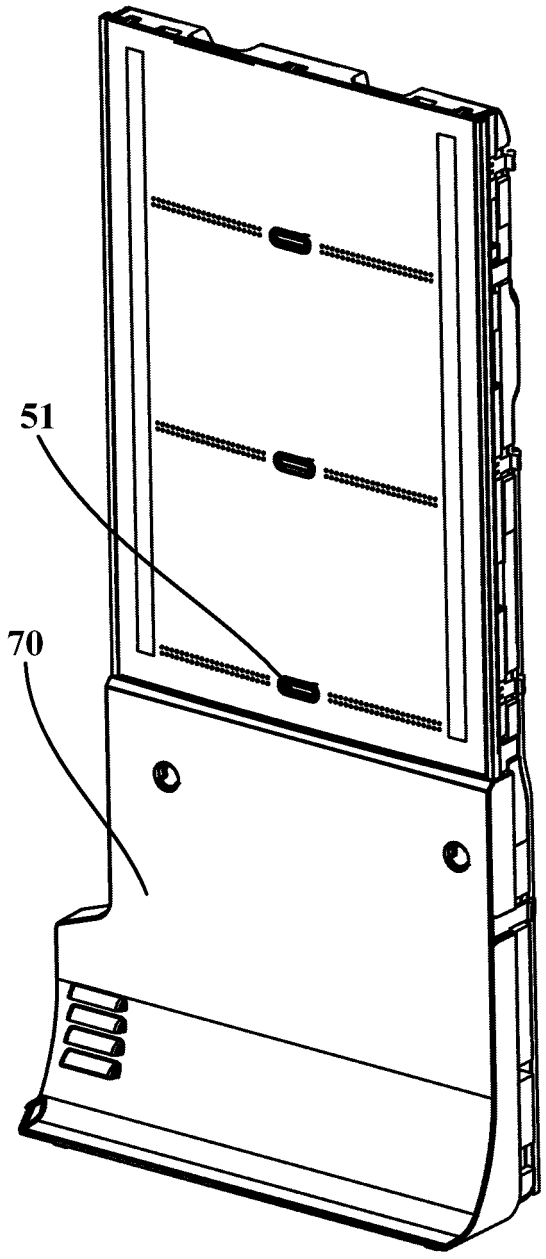

Fig. 7

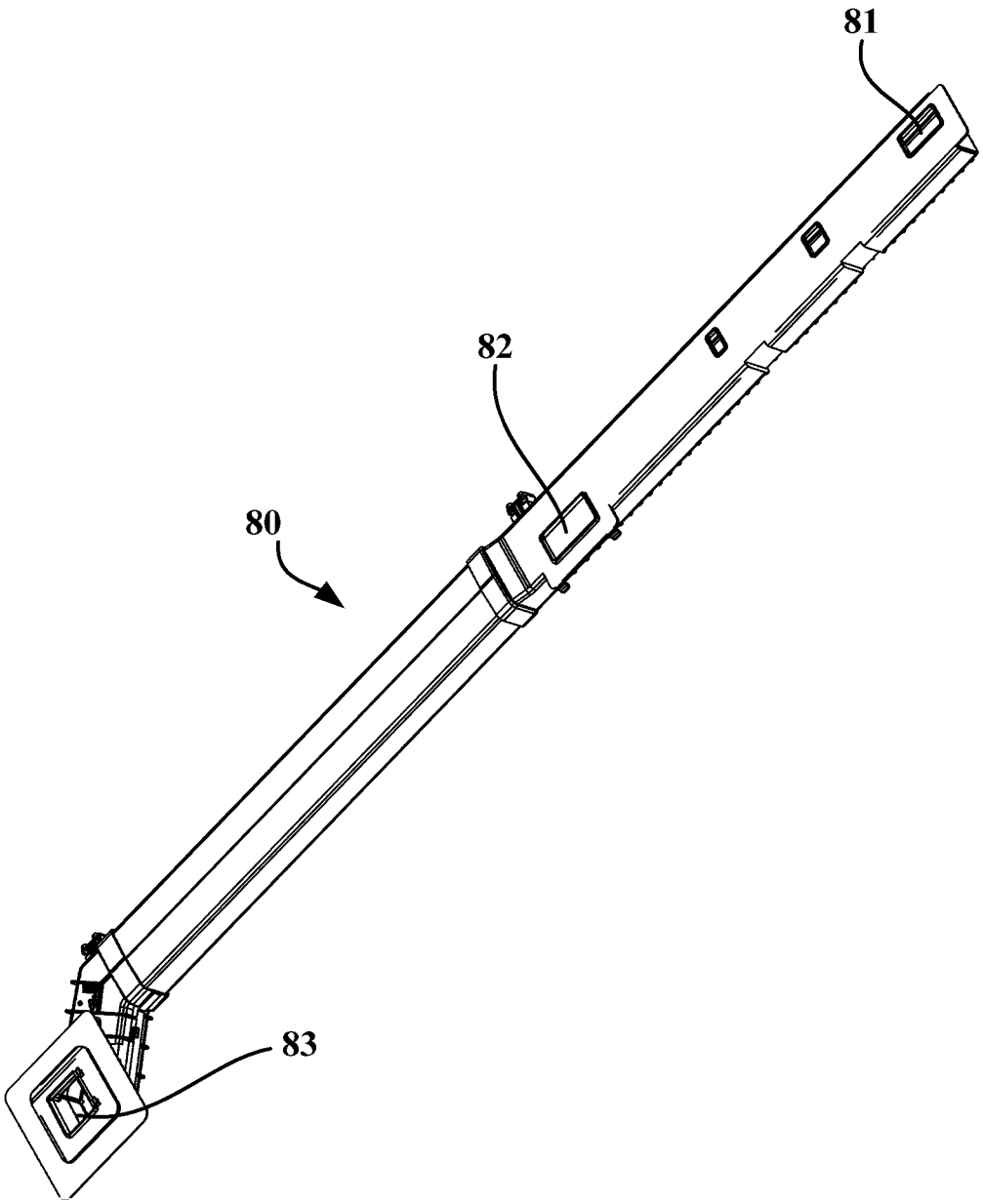

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/079992

A. CLASSIFICATION OF SUBJECT MATTER

F25D 11/02(2006.01)i; F25D 17/04(2006.01)i; F25D 29/00(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)

F25D11, F25D17, F25D29

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)

CNTXT, CNABS, CNKI, VEN: 隔板, 搁板, 搁架, 隔架, 搁物架, 隔物架, 分隔板, 置物板, 档位, 温度, shelf, shelves, gear, temp, temperature

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 110186242 A (QINDAO HAIER REFRIGERATOR CO., LTD. et al.) 30 August 2019 (2019-08-30) description, paragraphs [0046]-[0070], and figures 1-17	1-6, 8-10
E	CN 210374251 U (QINDAO HAIER REFRIGERATOR CO., LTD. et al.) 21 April 2020 (2020-04-21) description, paragraphs [0003]-[0070], and figures 1-17	1-6, 8-10
E	CN 210220354 U (QINDAO HAIER REFRIGERATOR CO., LTD. et al.) 31 March 2020 (2020-03-31) description, paragraphs [0003]-[0064], and figures 1-8	1-10
E	CN 210220353 U (QINDAO HAIER REFRIGERATOR CO., LTD. et al.) 31 March 2020 (2020-03-31) description, paragraphs [0003]-[0077], and figures 1-10	1-3, 5-10
Y	CN 104990333 A (QINGDAO HAIER CO., LTD.) 21 October 2015 (2015-10-21) description, paragraphs [0023]-[0044], and figures 1-5h	1-6, 9, 10
Y	CN 105737475 A (QINGDAO HAIER CO., LTD.) 06 July 2016 (2016-07-06) description, paragraphs [0026]-[0030]	1-6, 9, 10

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 May 2020	**11 June 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/079992

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	CN 105972904 A (SAMSUNG ELECTRONICS CO., LTD.) 28 September 2016 (2016-09-28) entire document	1-10
A	JP 2014040967 A (HITACHI APPLIANCES, INC.) 06 March 2014 (2014-03-06) entire document	1-10
A	EP 2423624 A2 (VESTEL BEYAZ ESYA SANAYI VE TICARET A.S.) 29 February 2012 (2012-02-29) entire document	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/079992

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				CN	103629880	B	04 November 2015
				JP	5909427	B2	26 April 2016
EP	2423624	A2	29 February 2012	TR	201007211	A2	21 December 2010
				EP	2423624	A3	11 December 2013

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REFERENCES CITED IN THE DESCRIPTION

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