



(11)

EP 4 174 413 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:

03.05.2023 Bulletin 2023/18

(21) Application number: **21828947.8**

(22) Date of filing: **21.06.2021**

(51) International Patent Classification (IPC):

F25D 23/00 ^(2006.01) **F25D 11/02** ^(2006.01)
F25D 17/06 ^(2006.01)

(52) Cooperative Patent Classification (CPC):

F25D 11/02; F25D 17/06; F25D 23/00

(86) International application number:

PCT/CN2021/101156

(87) International publication number:

WO 2021/259179 (30.12.2021 Gazette 2021/52)

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

(30) Priority: **24.06.2020 JP 2020108890**

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(54) **REFRIGERATOR**

(57) Provided is a refrigerator with a sterilizing system having a humidity adjustment function, which can controllably perform any one of sterilization, humidification and drying according to a condition. The refrigerator includes a back air duct extending in a vertical direction at a back part of the refrigerator, an upper air duct extending in a front and back direction at an upper part of the refrigerator, and a blower blowing from a lower part of the back air duct to an upper part of the back air duct, wherein the back air duct is provided with a sterilizing unit capable of selectively generating electrolytic water mist containing hypochlorous acid by electrolyzing mist or water; the upper part of the back air duct is in fluid communication with a back part of the upper air duct to form an air path connected to the sterilizing unit; and a switching mechanism arranged downstream of the air path with respect to the blower and the sterilizing unit is utilized by the air path to switch an air outlet between a front air outlet and a rear air outlet.

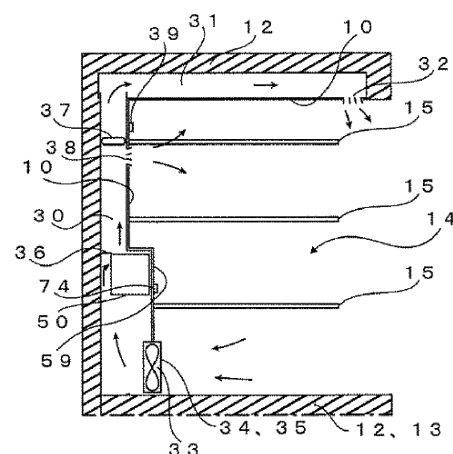


FIG. 3

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Description

TECHNICAL FIELD

[0001] The present invention relates to a refrigerator, and more particularly, to a refrigerator with an air curtain function.

BACKGROUND

[0002] There is a known refrigerator, in which when a door body of the refrigerator is opened, an air curtain is formed by wind which flows from the upper part of a refrigerating chamber to the lower part thereof at the opening of a front surface of the refrigerating chamber. By this formed air curtain, when the door body of the refrigerator is opened, cold air in the refrigerating chamber is released to the outside of the refrigerator to suppress temperature rise in the refrigerating chamber. Among refrigerators with such air curtain function, for example, referring to Reference Document 1 (JP 2008145009), a refrigerator was proposed in which electrolytic mist containing hypochlorous acid was mixed into an air curtain, such that the refrigerator had a sterilizing effect even in an invasion of outside air.

[0003] However, in practice, the refrigerators need not only a sterilizing function when the door is opened but also a function of proper humidification or drying of the refrigerating chamber. For example, the refrigerator described in Reference Document 1 cannot properly cope with various usage conditions as it only has the sterilizing function.

SUMMARY

[0004] An objective of the present invention is to provide a refrigerator with a sterilizing system having a humidity adjustment function, which can controllably perform any one of sterilization, humidification and drying according to a condition.

[0005] The refrigerator provided by the present invention has the following structure, including: a back air duct extending in a vertical direction at a back part of the refrigerator, an upper air duct extending in a front and back direction at an upper part of the refrigerator, and a blower blowing from a lower part of the back air duct to an upper part of the back air duct, wherein the back air duct is provided with a sterilizing unit capable of selectively generating electrolytic water mist containing hypochlorous acid by electrolyzing mist or water; the upper part of the back air duct is in fluid communication with a back part of the upper air duct to form an air path connected to the sterilizing unit; and the air path is provided with a rear air outlet on the back air duct.

[0006] According to this structure, air containing the mist generated by the sterilizing unit can be discharged from the rear air outlet to humidify a refrigerating chamber, or the refrigerating chamber is dried by discharging

air that does not generate mist. Therefore, the temperature in the refrigerating chamber can be easily adjusted with high accuracy. In addition, since not only the mist but also the electrolytic water mist can be generated, water for generating the mist can be sterilized. Thus, cleaning can be kept for a long time even without replacing the water.

[0007] In addition, the structure may also be as follows: the air path is further provided with a front air outlet on the upper air duct, and an air outlet is switched between the front air outlet and the rear air outlet by a switching mechanism arranged downstream of the air path with respect to the blower and the sterilizing unit.

[0008] According to this structure, air flowing in the air path can be discharged from the front air outlet. Therefore, blowing can be performed from the rear air outlet or the front air outlet as required.

[0009] In addition, the structure may also be as follows: when the switching mechanism is in a first state, air containing the electrolytic water mist generated by the sterilizing unit is discharged from the front air outlet; and when the switching mechanism is in a second state, air is discharged from the rear air outlet as neither of the mist and the electrolytic water mist is generated, or air containing the mist generated by the sterilizing unit is discharged from the rear air outlet.

[0010] According to this structure, when sterilization is not performed, blowing to the rear air outlet is performed while or without generating mist to humidify or dry the refrigerating chamber. In addition, during sterilization, sterilizing mist can be generated and discharged from the front air outlet. Therefore, the humidity of the refrigerating chamber can be easily adjusted with high accuracy and sterilization can be realized.

[0011] In addition, the structure may also be as follows: the refrigerator includes a door switch for sensing opening and closing of a door body of the refrigerator, wherein when the door body is opened, the switching mechanism is switched to the first state.

[0012] According to this structure, switching of the switching mechanism, namely, switching among sterilization, humidification and drying can be automatically performed. Therefore, it is possible to switch to sterilization, humidification or drying as required without a user controlling an apparatus to switch these functions.

[0013] In addition, the structure may also be as follows: the air path is configured so that air passing through the air path passes through the sterilizing unit.

[0014] According to this structure, the air passing through the back air duct passes through the sterilizing unit. Thus, an effect of more reliable sterilization, humidification or drying through the air flowing in the air path can be achieved.

[0015] In addition, the structure may also be as follows: the refrigerator includes a humidity sensor for measuring humidity in the refrigerator, wherein the sterilizing unit controls the generation of the mist based on a value measured by the humidity sensor.

[0016] According to this structure, the humidity of the refrigerating chamber can be automatically adjusted. Therefore, the humidity of the refrigerating chamber can be easily adjusted with high accuracy.

[0017] According to the present invention, there is provided a refrigerator with the sterilizing system having the humidity adjustment function, which can controllably perform any one of sterilization, humidification and drying according to a condition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a perspective view of an exemplary refrigerator according to the present invention;

FIG. 2 is a front sectional view of a refrigerating chamber of a main body of an exemplary refrigerator according to the present invention;

FIG. 3 is a side sectional view of a refrigerating chamber of a main body of an exemplary refrigerator according to the present invention;

FIG. 4 shows an exploded view of a sterilizing unit of an exemplary refrigerator according to the present invention; and

FIG. 5 shows a side view of a sterilizing unit of an exemplary refrigerator according to the present invention.

DETAILED DESCRIPTION

[0019] FIG. 1 is a front view of a refrigerator 1 according to an embodiment of the present invention. The outline of the refrigerator 1 will be described with reference to FIG. 1. The refrigerator 1 includes a refrigerator main body 2, a door body 3 rotatably arranged at the front of the refrigerator main body 2 in the horizontal direction, and a lower door body 4 rotatably arranged on the lower side of the door body in the horizontal direction. As for the door body 3 and the lower door body 4, the upper and lower parts of each of the door body 3 and the lower door body 4 are coupled with the refrigerator main body by hinges arranged on either of the left and right sides of each of the door body 3 and the lower door body 4, and thus, each of the door body 3 and the lower door body 4 pivots around the axis of its hinges.

[0020] The refrigerator main body 2 includes a liner 10 and a housing 11. A heat insulating material 12 is filled between the liner 10 and the housing 11 to insulate the inside from the outside of the refrigerator main body 2. Also, each of the door body 3 and the lower door body 4 is provided with a liner 10 and a housing 11. A heat insulating material 12 is filled between the liner 10 and the housing 11 to insulate the inside from the outside of the door body 3. The inside of the refrigerator main body 2 is divided into a refrigerating chamber 14 and a freezing chamber by the liner 10 and a partition wall 13. The door body 3 pivots around the axis of its hinges to open the

refrigerating chamber 14, and the lower door body 4 pivots around the axis of its hinges to open the freezing chamber.

[0021] FIG. 2 is a front sectional view of the refrigerating chamber 14 of the refrigerator main body 2. As shown in FIG. 2, the refrigerating chamber 14 is provided with at least one shelf 15 (and other shelves if present) separated in the vertical direction from the bottom surface to the upper surface of the refrigerating chamber 14, and is divided into a plurality of storage regions by the shelf 15. The shelf 15 is fixed by shelf holding parts which are arranged on the left and right sides of the liner 10 constituting the refrigerating chamber 14. The inside of the refrigerating chamber 14 is separated by the shelf 15 but is not separated in terms of fluid communication, and air in the refrigerating chamber can flow to each of the storage regions. In addition, the liner 10 is provided with a door switch (not shown in the figures) that can sense the opening and closing of the door body 3. When the door body 3 is opened, the door switch sends a signal indicating that the door body 3 is in an open state to a control apparatus (not shown in the figures) of the refrigerator, and thus, for example, an inside lamp in the refrigerating chamber 14 is turned on.

[0022] As shown in FIG. 2, the refrigerator main body 2 is provided with cold air circulation ducts 16 which are respectively arranged on the left and right sides of a back part of the refrigerating chamber 14, and which extend in the vertical direction between the liner 10 and the heat insulating material 12. Each cold air circulation duct 16 is provided with an air return outlet 17 penetrating the liner 10 at the lower part of the refrigerating chamber 14, and an air outlet 18 penetrating the liner 10 at the upper part of the refrigerating chamber 14. The air outlets 18 may be arranged at multiple heights based on the positions of the shelves 15.

[0023] As is well known, the refrigerator main body is generally provided with a compressor, a condenser and an expansion valve on the outside of the refrigerator main body (for example, the lower part of the back of the outside of the refrigerator main body), and an evaporator on the inside of the refrigerator main body (for example, the back of the above freezing chamber), which are in fluid communication with one another, such that a filled refrigerant can circulate, and cold air can be generated in the evaporator by repeatedly compressing and evaporating the refrigerant.

[0024] In addition, the refrigerator main body 2 is provided with a circulating blower between the liner 10 and the heat insulating material 12 or between the liner 10 and the housing 11. The circulating blower blows the cold air generated by the evaporator to the cold air circulation ducts 16 from the bottom up. The blown air flows into the refrigerating chamber 14 from each of the above air outlets 18, flows out from the air return outlet 17 to the cold air circulation ducts 16, and circulates between the refrigerating chamber 14 and the cold air circulation ducts 16. Therefore, the refrigerating chamber 14 can be

cooled after the air with the cold air is blown into the refrigerating chamber 14. The refrigerator main body 2 is provided with the control apparatus so as to control such a cooling system.

[0025] FIG. 3 is a side sectional view of the refrigerating chamber 14 and parts around the refrigerating chamber 14 of the refrigerator main body 2. The outline of a sterilizing system having a humidity adjustment function will be described with reference to FIG. 3. As shown in FIG. 3, a back air duct 30 is arranged between a back liner 10 of the refrigerator main body 2 and the heat insulating material 12. Similarly, an upper air duct 31 is arranged between an upper liner 10 and the heat insulating material 12. The upper part of the back air duct 30 is in fluid communication with the back part of the upper air duct 31, such that an air path independent of the above air duct for circulation of the cold air is formed.

[0026] As shown in FIG. 3, the back air duct 30 extends in the vertical direction between the left and right cold air circulation ducts. In addition, the upper air duct 31 extends in the front and back direction at the upper part of the refrigerating chamber 14. Preferably, the width of the upper air duct 31 increases in the left-right direction as it approaches the front of the refrigerator main body 2, and the upper air duct 31 at least has the width equivalent to the distance from the left side to the right side of the refrigerating chamber 14 around a front air outlet 32 to be described later.

[0027] The refrigerating chamber 14 is provided with a blower 33 which is arranged in the inner lower part of the refrigerating chamber 14 through the liner 10 and which blows air from the inside of the refrigerating chamber 14 to the back air duct. In addition, the blower 33 is parted from the refrigerating chamber by a cover 34 and the like arranged at the refrigerating chamber side. A suction port 35 for sucking air from the refrigerating chamber 14 to the back air duct 30 is formed in the cover 34. The air sucked from the suction port 35 and blown by the blower 33 flows from bottom up in the back air duct 30, and thus, flows into the upper air duct 31. The air flows from the rear to the front in the upper air duct 31.

[0028] The front air outlet 32 penetrating the liner 10 is arranged on the front of the upper air duct 31. Preferably, the front air outlet 32 has the width equivalent to the distance from the left side to the right side of the refrigerating chamber 14. The air blown from the blower 33 is discharged through the front air outlet 32 downward from the front end of the upper part of the refrigerating chamber 14. When the door body 3 is opened, the air forms an air curtain for hindering the inflow of outside air at the opening of the front surface of the refrigerating chamber 14. The air discharged as the air curtain can at least partially flow to the air return outlet or the suction port 35 to circulate between the refrigerating chamber and each air duct. In addition, when the door body 3 is closed, the same air as the air curtain can be discharged from the front air outlet 32 to circulate in the refrigerating chamber.

[0029] In this way, the air blown from the blower 33 can be discharged from the front air outlet 32 through the back air duct 30 and the upper air duct 31 as an air path. In this embodiment, the blower 33 penetrates through the liner 10, but it is not limited thereto. For example, the blower 33 may be arranged inside the refrigerating chamber 14 while an opening of the liner 10 is formed, or may be arranged inside the back air duct 30 while the suction port 35 is formed in the liner 10.

[0030] In addition, the back air duct 30 is provided with a sterilizing unit 50 on the downstream side of the blower 33. Further, a partition wall 36 is arranged inside the back air duct 30, is connected to the sterilizing unit 50, and is configured to block a passage of the back air duct 30 together with the sterilizing unit 50. Therefore, although the details will be described later, the sterilizing unit 50 is provided with a vent penetrating from the downstream side to the upstream side of the partition wall 36 of the back air duct 30. Thus, in the back air duct 30 according to this embodiment, the air blown from the blower necessarily passes through the sterilizing unit 50.

[0031] Although the details will be described later, the sterilizing unit 50 can accommodate water (for example, tap water), such that the water is atomized to spray mist. Furthermore, hypochlorous acid can be generated by electrolyzing the water. Therefore, the sterilizing unit 50 can atomize the electrolytic water containing hypochlorous acid to spray the mist.

[0032] The air generated by the blower 33 and passing through the sterilizing unit 50 contains the electrolytic water mist, such that the air curtain can contain the electrolytic water mist containing hypochlorous acid. Therefore, when the door body 3 is opened, the inflow of the outside air can be suppressed as much as possible, and an excellent sterilizing effect on the inflowing outside air can be achieved, such that the sanitary state in the refrigerating chamber can be kept clean. In addition, when the door body 3 is opened for storing food and the like in the refrigerating chamber 14, the food and the like cross the air curtain, such that the electrolytic water mist can be in contact with the food and the like to sterilize them.

[0033] The refrigerator delays the progress of spoilage or inhibits the proliferation of bacteria by keeping the refrigerating chamber at a low temperature, thereby realizing the long-term reservation of the food and the like. Therefore, by sterilizing the food and the like stored in the refrigerating chamber, the amount of bacteria attached to the stored food and the like from the beginning can be reduced, and further, long-term reservation can be achieved.

[0034] As shown in FIG. 3, in the air path of the refrigerator 1 in this embodiment, a switching mechanism 37 for switching the air path is arranged in the middle thereof, and located on the downstream side of the sterilizing unit 50. The switching mechanism 37 is, for example, a damper. The switching mechanism 37 has a first state in which the damper is opened to allow air to pass through, and a second state in which the damper is closed to restrict

the flow of the air. When the switching mechanism 37 is in the first state, the air passing through the back air duct 30 can flow to the upper air duct 31.

[0035] The back air duct 30 is provided with a rear air outlet 38 which penetrates the liner 10 and which can discharge air flowing in the air duct to the inside of the refrigerating chamber 14. The rear air outlet 38 is formed in the upper part of the back air duct 30 on the refrigerating chamber side, and is located near the switching mechanism 37 and on the upstream side of the air path. Therefore, by switching the switching mechanism 37 to the second state, an air path guiding to the front air outlet 32 is closed, and an air flow generated by the blower 33 is discharged from the rear air inlet 38 upstream of the air path of the switching mechanism 37.

[0036] In other words, by switching the switching mechanism 37 to the first state or the second state, the air path guiding to the front air outlet 32 can be opened to switch an outlet of the air path to the front air outlet 32, or the air path can be closed to switch the outlet of the air path to the rear air outlet 38. In this embodiment, the switching mechanism 37 and the rear air outlet 38 are arranged on the back air duct 30, but they are not limited thereto. For example, they may be arranged in such a way that the air blows front downward from the upper surface of the refrigerating chamber to the bottom of the upper air duct 31 on the rear side of the refrigerating chamber. In addition, in this embodiment, the switching mechanism 37 is the damper, but it may be any mechanism such as a shutter or a pivotable plate. For example, when the switching mechanism 37 is switched to the first state to open the air path, the rear air outlet 38 and the like can be covered by the pivotable plate, and thus, the switching mechanism 37 blocks the rear air outlet 38.

[0037] In FIG. 3, arrows near the blower 33, the front air outlet 32 and the rear air outlet 38 respectively schematically indicate air flows sucked into or discharged from the air ducts. In addition, the arrows in each air duct schematically indicate air flowing in the air duct.

[0038] In this way, by providing the rear air outlet 38, the air blown from the blower 33 can be discharged to the inside of the refrigerating chamber when there is no need to discharge the electrolytic water mist to the front air outlet 32. Although the sterilizing unit 50 can generate the electrolytic water mist as described above, it may generate mist of the water accommodated in the sterilizing unit 50 without electrolysis. Thus, the air blown by the blower 33 contains the mist, and when it is discharged from the rear air outlet 38, the refrigerating chamber can be humidified. In addition, in the case of blowing without mist, pure air is discharged from the rear air outlet 38, such that the refrigerating chamber can be dried. Therefore, the sterilizing system according to this embodiment can adjust the humidity of the refrigerating chamber by humidifying or drying.

[0039] Such humidity adjustment can be automatically performed, for example, by controlling whether to generate mist in the sterilizing unit 50 or the amount of the

generated mist depending on whether the value of the humidity sensor arranged in the refrigerating chamber as shown in FIG. 3 is close to a predetermined humidity value. In addition, a manual control switch that enables a user to instruct humidification or drying at any time may also be provided.

[0040] The rear air outlet 38 is formed in the upper part inside the refrigerating chamber 14. Thus, for example, a space partitioned by the top shelf 15 can be designed as a space (hereinafter, referred to as a humidity adjustment space) strongly influenced by the air from the rear air outlet 38. Preferably, in the humidity adjustment space, the shelf (for example, configured as a mesh plate 15) is configured to allow fluid to pass through. When the humidity sensor 39 is arranged in the humidity adjustment space, a space for controlling humidity with higher accuracy can be formed.

[0041] FIG. 4 is a schematic exploded view of the sterilizing unit 50. As shown in FIG. 4, the sterilizing unit 50 is provided with a supplied-water storage tank part 51, an air filtration part 52, a unit part 53, a control substrate 54 and a bottom plate 55. As described above, the sterilizing unit 50 is configured to face the liner 10 in the back air duct 30. In addition, a surface (e.g., a side surface) facing the back air duct 30 at the upstream of the partition wall 36 is provided with a first vent 56 (e.g., composed of a mesh or the like) through which air can pass, and a surface (e.g., the upper face) facing the back air duct 30 at the downstream of the partition wall 36 is provided with a second vent 57 through which air can pass. Therefore, in the back air duct 30 in this embodiment, the air blown from the blower necessarily passes through the sterilizing unit 50.

[0042] The supplied-water storage tank part 51 is provided with a storage tank 58. The storage tank 58 is a container that can accommodate water (for example, tap water) from the outside. The supplied-water storage tank part 51 and the air filtration part 52 are detachably coupled to the unit part 53. The supplied-water storage tank part 51 and the air filtration part 52 to be described later are integrally formed, such that the user can take out the supplied-water storage tank part 51 and the like from the refrigerator main body 2 to supply water to the storage tank 58. For example, a detachable cover 59 is arranged in the liner 10, and a part of the liner 10 and a part of the back air duct 30 in a region where the sterilizing unit 50 is located can be removed from the inner side of the refrigerating chamber 14 for access to the supplied-water storage tank part 51.

[0043] At least a part of the air filtration part 52 is configured to face the inside of the back air duct 30 in the sterilizing unit 50. In addition, as described above, the back air duct 30 is provided with the partition wall 36 therein, such that all the air blown from the blower 33 flows into the air filtration part 52. The air filtration part 52 has a first mesh part 60, a second mesh part 61 and a third mesh part 62; and an element mounting part 63 between the first mesh part 60 and the second mesh part

61 is provided with a filtering element or a filter 65. In this embodiment, the first vent 56 also serves as the first mesh part 60. That is, the air flowing in from the first vent 56 flows into the first mesh part 60. In addition, the second vent 57 also serves as the third mesh part 62. The air filtration part 52 is provided with a cover 64 which is closed after the element 65 is provided.

[0044] The element mounting part 63 is configured to allow the air flowing into the first mesh part 60 to flow to the second mesh part 61. Thus, air flowing from a place below the sterilizing unit 50 flows from the first mesh part 60 to the second mesh part 61 through the element 65; and the air passing through the element 65 is filtered. The air passing through the second mesh part 61 flows upward again into the back air duct 30 through the second vent 57. As described above, since the air filtration part 52 can be detached from the sterilizing unit 50, the element 65 can be easily replaced as required.

[0045] The unit part 53 is provided with a water storage part 66 for storing some of water supplied by the supplied-water storage tank part 51. As shown in FIG. 4, a storage tank drainage part 67 of the storage tank 58 is connected to a unit water intake part 68 arranged in the water storage part 66, and water is supplied by the storage tank 58 to the water storage part 66. The water storage part 66 can store water to a specific height. As for the height of the water, it is preferable that the height of the stored water is configured to enable at least electrodes to be described later to be completely immersed in the water. The unit part 53 can be provided with a mist generation part 69; mist is generated by the mist generation part 69; and the air flowing to the second vent 57 contains the mist. For example, the mist generation part 69 may be configured to generate ultrasonic vibration and apply ultrasonic vibration to surrounding water, thereby atomizing the water. In addition, the unit part 53 is provided with two electrodes 70 and 71 which are immersed in the water in the water storage part 66 and which can electrolyze water to generate hypochlorous acid.

[0046] The unit water intake part 68 is mainly surrounded by a wall with a predetermined height. The water supplied by the storage tank bypasses the wall constituting the unit water intake part 68 to flow in the direction where the electrodes 70 and 71 exist.

[0047] As shown in FIG. 4, the unit part 53 is provided with a filtration part receiving part 72 for accommodating the air filtration part 52. The filtration part receiving part 72 is configured to accommodate the air filtration part 52 when the storage tank 58 is mounted in the water storage part 66 of the unit part 53.

[0048] At least a part of the filtration part receiving part 72 is configured to be in fluid communication with the water storage part 66, and water is also accumulated in the filtration part receiving part 72. When the air filtration part 52 is accommodated in the filtration part receiving part 72, the element 65 accommodated in the air filtration part 52 is immersed in the water in the filtration part receiving part 72. In the element 65, the part thereof not

immersed in water is also moist due to the capillary phenomenon. Therefore, water can spread throughout the whole element 65 without special power or the like.

[0049] The unit part 53 is provided with a water level sensor 73. The water level sensor 73 detects the water level of the water in the water storage part 66. A water supply lamp 74 in the refrigerating chamber is turned on when the water level is lower than a predetermined water level. Thus, the user can notice that the water accumulated in the storage tank 58 is insufficient even if he/she can't directly visually recognize the storage tank 58, such that water can be supplied as required. The water level sensor 73 is connected to a control unit 75 to be described later. For example, when the water level is less than half the height of the electrodes above the water, the water supply lamp can be turned on through the control unit 75. In addition, the control unit 75 may be configured in such a way that electrolysis is not performed in a case of that water level. Therefore, it is possible to exclude the possibility of electrolysis in the case of insufficient remaining water.

[0050] The control substrate 54 is provided with a control part 75 for controlling each of the atomization, the electrolysis, and the turning on of the lamp. For example, when the door switch on the door body 3 detects that the door body 3 is in the open state, the control unit 75 controls the electrodes 70 and 71 to perform electrolysis; the switching mechanism 37 is switched to the first state; and air (the air curtain) containing electrolytic water mist is discharged from the front air outlet 32. When the door switch detects that the door body 3 is in the closed state, the switching mechanism 37 is switched to the second state. In this case, if the value of the humidity sensor 39 is less than a predetermined threshold, the mist generation part 69 is controlled to work to humidify the inside of the refrigerating chamber 14.

[0051] The bottom plate 55 is coupled to either or both of the back air duct 30 and the liner 10 of the refrigerating chamber 14 to hold the sterilizing unit 50 in the back air duct 30. The bottom plate 55 at least has the rigidity capable of bearing the supplied-water storage tank part 51 filled with water, the air filtration part 52, the unit part 53 and the control substrate 54.

[0052] FIG. 5 is a side view of the sterilizing unit 50 assembled with components such as the supplied-water storage tank part 51 shown in FIG. 4. The orientation of the sterilizing unit 50 in FIG. 5 corresponds to that of the sterilizing unit 50 in FIG. 3. The dotted line W illustrates the water level. At the water level W shown in FIG. 5, the electrodes 70 and 71 are immersed in water, such that electrolysis can be performed by the control unit 75 as required. The arrow A shows a path of air flowing from the lower part of the back air duct 30 to the upper part thereof after passing through the sterilizing unit 50. As shown in FIG. 5, air enters the sterilizing unit 50 from the first vent 56, passes through element 65, and flows back to the back air duct 30 from the second vent 57.

[0053] In this way, in the refrigerator with the sterilizing

system according to this embodiment, when the door body 3 is opened, electrolysis is performed in the sterilizing unit 50 to generate mist, the switching mechanism 37 is switched to the first state (that is, the damper is opened), and the air (air curtain) containing the electrolytic mist is discharged from the front air outlet 32, such that the food and the like stored in the refrigerating chamber can be sterilized. In addition, when the door body 3 is closed, the sterilizing unit 50 generates mist without electrolysis, and the switching mechanism 37 is closed to discharge air containing the mist from the rear air outlet, such that the refrigerating chamber can be humidified. Furthermore, the door body 3 is closed, no mist is generated in the sterilizing unit 50, the switching mechanism 37 is switched to the second state (that is, the damper is closed), and the air is discharged from the rear air outlet, such that the refrigerating chamber can be dried.

[0054] In this way, since the humidity of the refrigerating chamber can be adjusted by the water accommodated in the sterilizing unit 50, the humidity can be adjusted more easily with high accuracy. In addition, the water is electrolyzed by the sterilizing unit 50 to generate hypochlorous acid. Thus, bacteria in the water itself can be sterilized to prevent the bacteria from significantly multiplying even in the accommodated water, and accordingly, the water for humidification can be kept clean for a long time. Consequently, the frequency of replacing the water accommodated in the sterilizing unit 50 can be reduced.

[0055] In addition, hypochlorous acid has a deodorizing effect. For example, after the door body 3 is closed, the air containing electrolytic water mist is blown to the refrigerating chamber 14 within a predetermined period, such that the inside of the refrigerating chamber 14 can also be deodorized. Therefore, a deodorization function is provided without additional components.

[0056] The present invention is not limited to the illustrated embodiments, and various improvements and design changes can be made within the scope of the present invention.

Industrial availability

[0057] As described above, according to the present invention, there is provided the refrigerator with the sterilizing system having the humidity adjustment function, which can controllably perform any one of sterilization, humidification and drying according to a condition.

Claims

1. A refrigerator, comprising: a back air duct extending in a vertical direction at a back part of the refrigerator, an upper air duct extending in a front and back direction at an upper part of the refrigerator, and a blower blowing from a lower part of the back air duct to an upper part of the back air duct, wherein

the back air duct is provided with a sterilizing unit capable of selectively generating electrolytic water mist containing hypochlorous acid by electrolyzing mist or water;

the upper part of the back air duct is in fluid communication with a back part of the upper air duct to form an air path connected to the sterilizing unit; and

the air path is provided with a rear air outlet on the back air duct.

2. The refrigerator according to claim 1, wherein the air path is further provided with a front air outlet on the upper air duct, and an air outlet is switched between the front air outlet and the rear air outlet by a switching mechanism arranged downstream of the air path with respect to the blower and the sterilizing unit.

3. The refrigerator according to claim 2, wherein when the switching mechanism is in a first state, air containing the electrolytic water mist generated by the sterilizing unit is discharged from the front air outlet; and when the switching mechanism is in a second state, air is discharged from the rear air outlet as neither of the mist and the electrolytic water mist is generated, or air containing the mist generated by the sterilizing unit is discharged from the rear air outlet.

4. The refrigerator according to claim 2, further comprising: a door switch for sensing opening and closing of a door body of the refrigerator, wherein when the door body is opened, the switching mechanism is switched to the first state.

5. The refrigerator according to claim 1, wherein the air path is configured so that air passing through the air path passes through the sterilizing unit.

6. The refrigerator according to claim 1, further comprising: a humidity sensor for measuring humidity in the refrigerator, wherein the sterilizing unit controls the generation of the mist based on a value measured by the humidity sensor.

7. The refrigerator according to claim 2, wherein the switching mechanism comprises a pivotable plate, and when the switching mechanism is switched to the first state to open the air path, the plate pivots to cover the rear air outlet.

8. The refrigerator according to claim 1, wherein the sterilizing unit is provided with a supplied-water storage tank part having a storage tank; an liner of the refrigerator is provided with a freely detachable cov-

er; and a part of the liner and a part of the back air duct in a region where the sterilizing unit is located are removable for access to the supplied-water storage tank part.

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9. The refrigerator according to claim 8, wherein the sterilizing unit is provided with an air filtration part and a unit part; the supplied-water storage tank part and the air filtration part are detachably coupled to the unit part; the unit part is provided with a filtration part receiving part for accommodating the air filtration part, and a water storage part for storing some of water supplied by the supplied-water storage tank part; at least a part of the filtration part receiving part is in fluid communication with the water storage part; water is accumulated in the filtration part receiving part; the air filtration part is accommodated in the filtration part receiving part; and a filtering element accommodated in the air filtration part is immersed in the water in the filtration part receiving part.

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10. The refrigerator according to claim 9, wherein the unit part is provided with a water level sensor and two electrodes immersed in the water in the water storage part; the water level sensor is configured to detect a water level of the water in the water storage part; and when the water level is less than half a height of the electrodes above the water, a water supply lamp in a refrigerating chamber of the refrigerator is turned on, and the electrodes are restricted from electrolysis.

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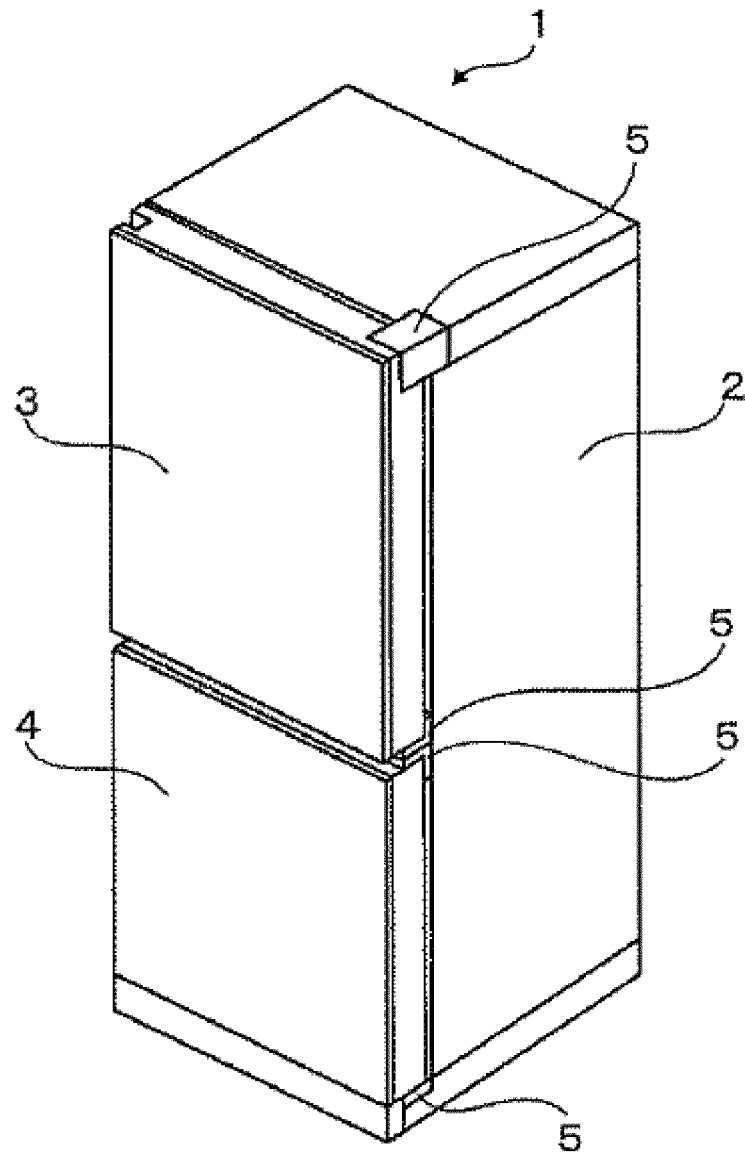


FIG. 1

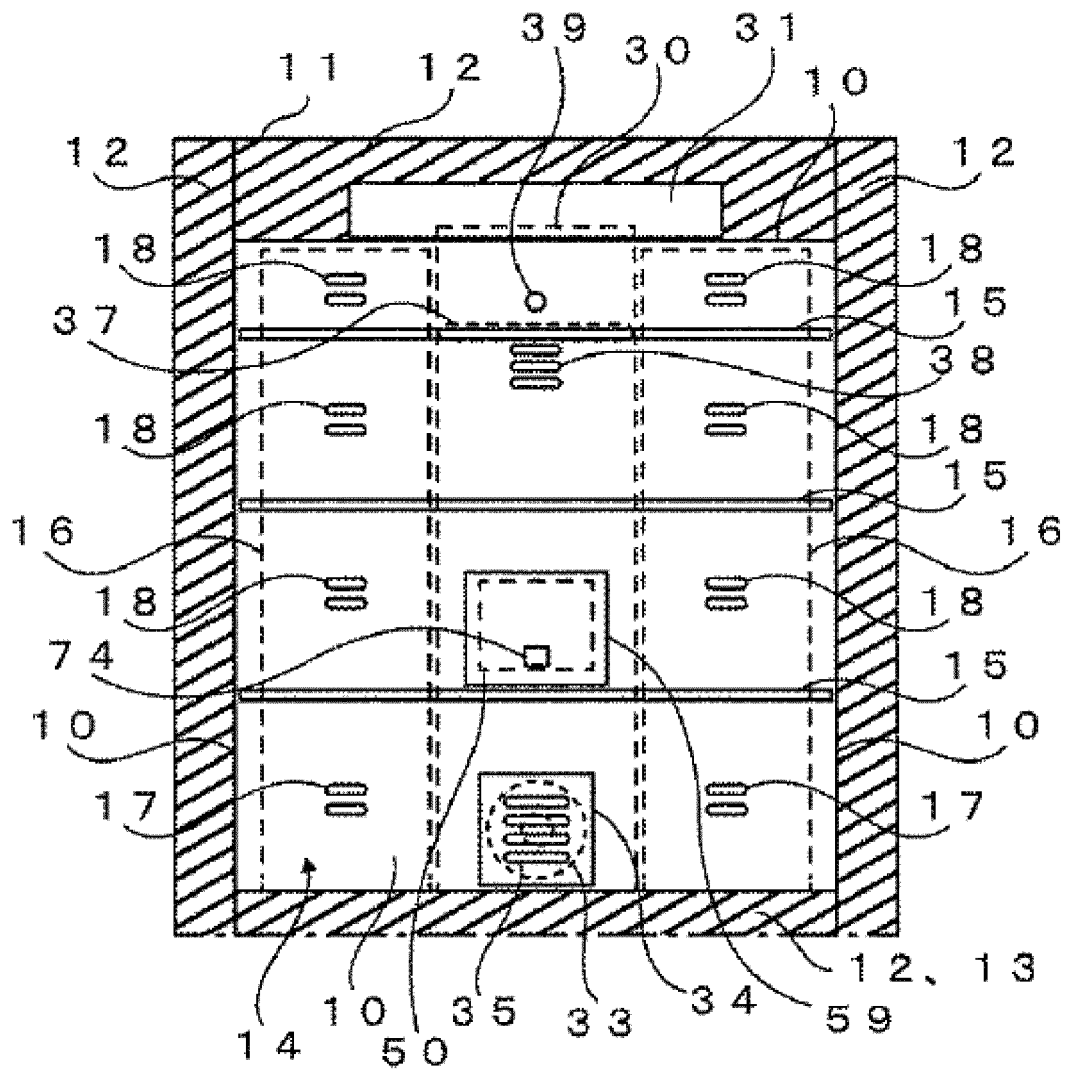


FIG. 2

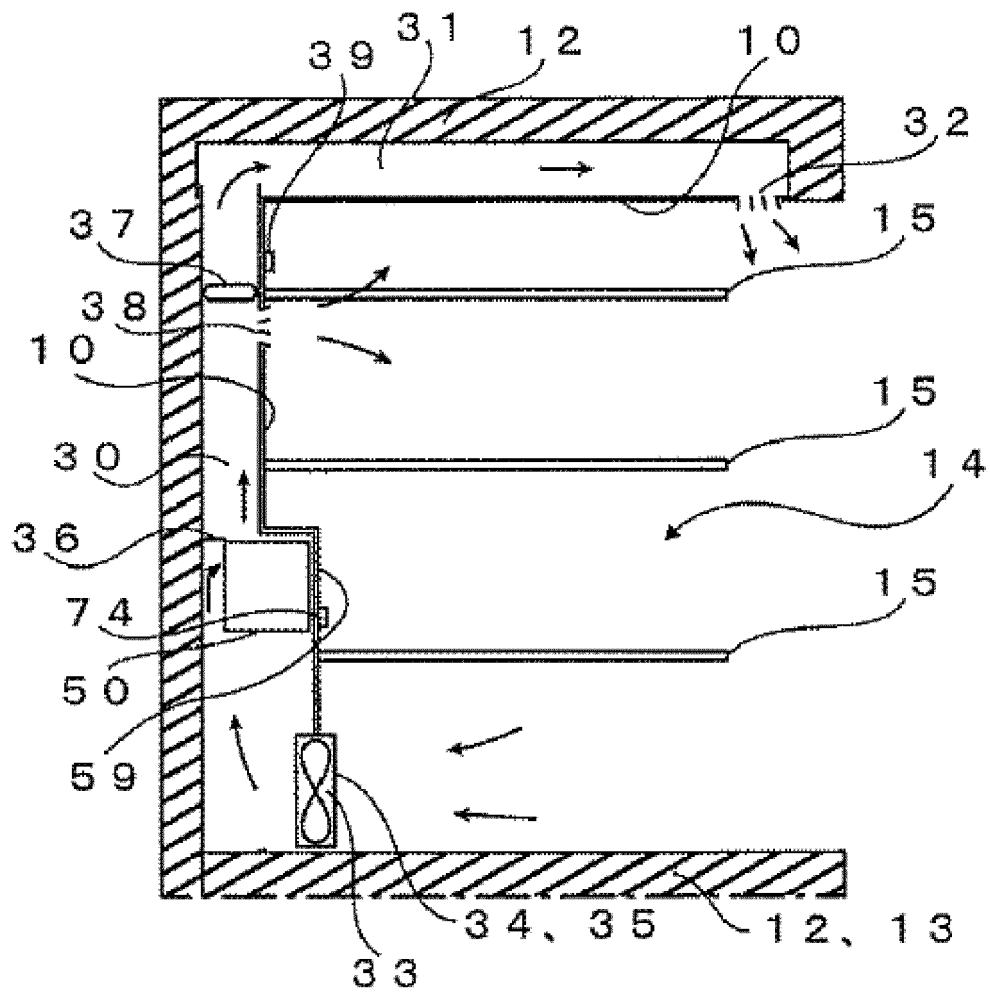


FIG. 3

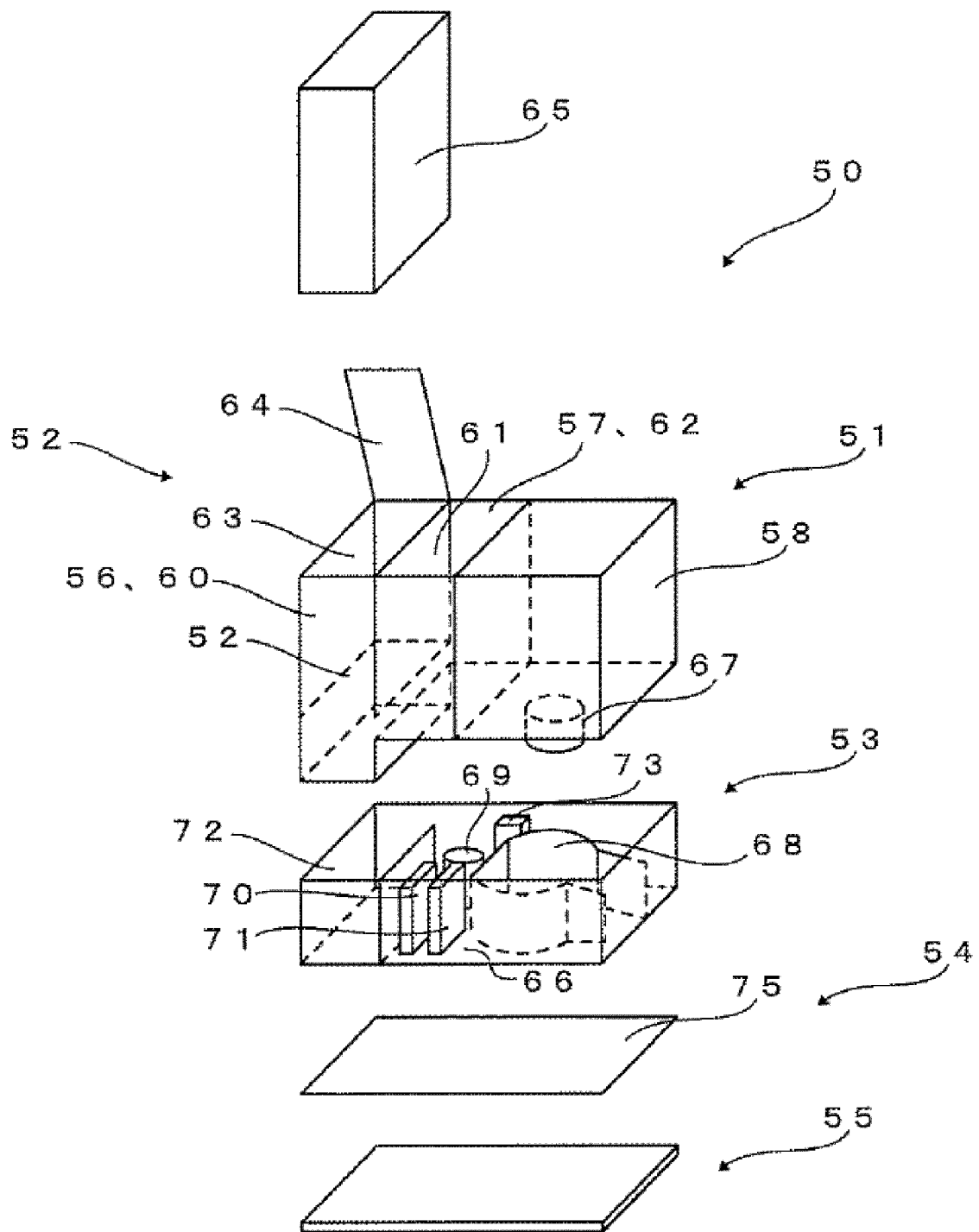


FIG. 4

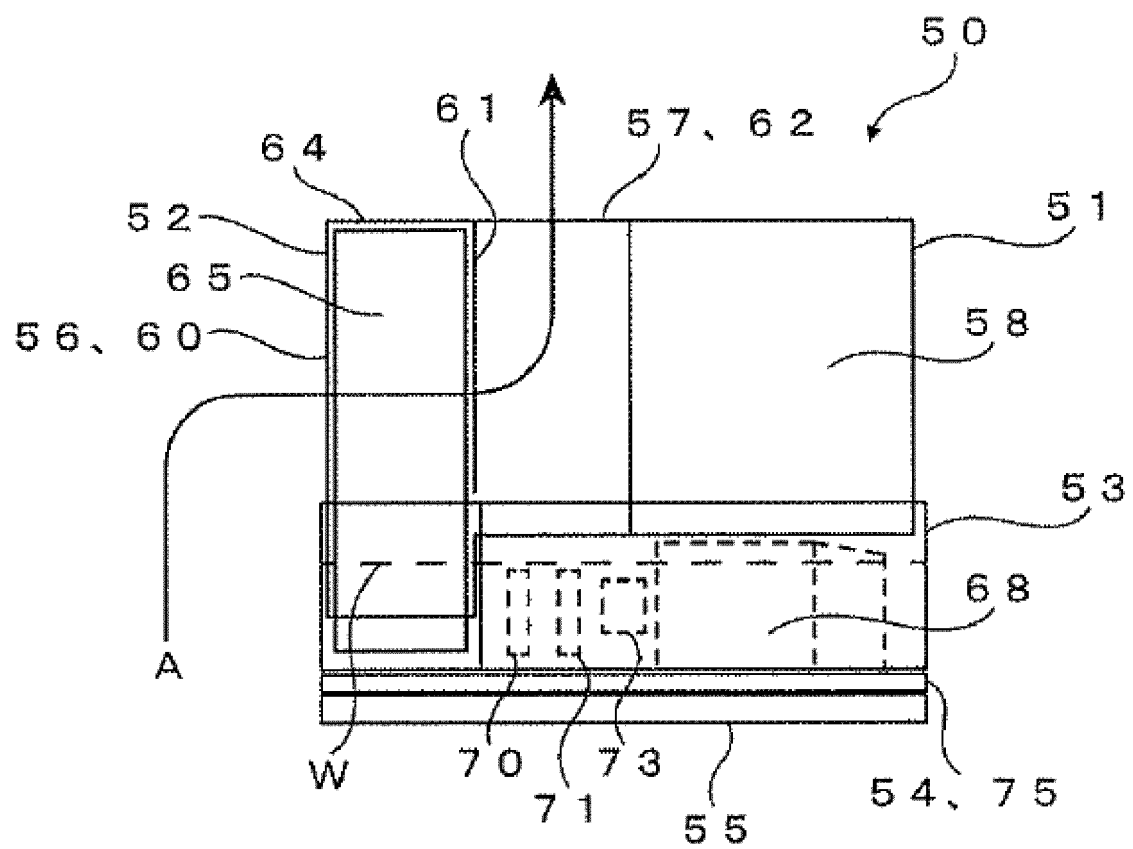


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2021/101156

A. CLASSIFICATION OF SUBJECT MATTER		
F25D 23/00(2006.01)i; F25D 11/02(2006.01)i; F25D 17/06(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		
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)		
SIPOABS, CNABS, CNTXT.PATENTICS: 海尔, 冰箱, 风帘, 风幕, 空气幕, 除菌, 防菌, 抑菌, 次氯酸, 水, 电解, 风门, 切换, 背, 顶, refrigerat+, frigerat+, air w curtain+, steriliz+, disinfect+, water, electro+, hypochlorous+		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2008145009 A (SANYO ELECTRIC CO., LTD.) 26 June 2008 (2008-06-26) description, paragraphs 13-56, figures 1-17	1-10
A	CN 111174512 A (LV, Gang) 19 May 2020 (2020-05-19) entire document	1-10
A	CN 205460012 U (GUANGZHOU INSTITUTE OF ADVANCED TECHNOLOGY, CHINESE ACADEMY OF SCIENCES) 17 August 2016 (2016-08-17) entire document	1-10
A	CN 207247666 U (QINGDAO HAIER REFRIGERATOR CO., LTD. et al.) 17 April 2018 (2018-04-17) entire document	1-10
A	CN 108426407 A (WANG, Huaguang) 21 August 2018 (2018-08-21) entire document	1-10
A	CN 104336167 A (SUZHOU SAMSUNG ELECTRONICS CO., LTD. et al.) 11 February 2015 (2015-02-11) entire document	1-10
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
03 September 2021		18 September 2021
Name and mailing address of the ISA/CN		Authorized officer
China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China		
Facsimile No. (86-10)62019451		Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2021/101156

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2008145009 A	26 June 2008	None	
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REFERENCES CITED IN THE DESCRIPTION

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