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- **CHENG, Xueli**
Qingdao
Shandong 266101 (CN)
- **LI, Dengqiang**
Qingdao
Shandong 266101 (CN)
- **TAO, Haibo**
Qingdao
Shandong 266101 (CN)

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

(74) Vertreter: **Lavoix**
Bayerstrasse 83
80335 München (DE)

(72) Erfinder:
• **FEI, Bin**
Qingdao
Shandong 266101 (CN)

(54) **KÜHLSCHRANK UND MEHRPFADIGE LUFTZUFÜHRVORRICHTUNG FÜR KÜHLSCHRANK**

(57) The present invention relates to a refrigerator and a branching air supply device thereof. The branching air supply device comprises: a housing provided with an air inlet and a plurality of air outlets; a regulating component configured to completely shield, partially shield or completely expose each air outlet in a controllable manner to adjust respective air discharging areas of the plurality of air outlets; an air feeding device arranged in the housing and configured to prompt the air flow to flow into the housing from the air inlet and to flow out of the housing via one or more air outlets of the plurality of the air outlets; and an air distributing device arranged in the housing and configured to guide air flowing out of the air feeding device and to enable the air flowing out of the air feeding device to flow to each air outlet with a predetermined ratio. The refrigerator and the branching air supply device thereof provided by the invention can accurately realize an air supply ratio of a plurality of storage compartments or different places of one storage compartment, and the air supply amount of the branching air supply device is increased.

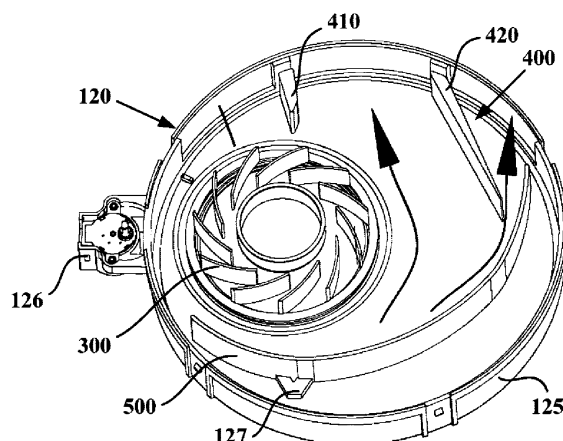


Fig. 3

Beschreibung

TECHNICAL FIELD

[0001] The present invention is related to the field of refrigerators, and more particularly, to a refrigerator and a branching air supply device thereof.

BACKGROUND

[0002] In general, an air-cooled refrigerator can produce refrigeration air via a built-in evaporator, and then the refrigeration air flows via an air passage circularly to all storage compartments of the refrigerator to achieve refrigeration. With respect to the air-cooled refrigerator, the preservation of food largely depends on whether air circulation in the storage compartments is reasonable. If the refrigeration air flows randomly via the air passage, it is likely to cause excessive or insufficient refrigeration air in the storage compartments, such that the temperature distribution in the storage compartments is uneven, reducing the operating efficiency of the refrigerator. Therefore, it is necessary to accurately guide the directions and control the amounts of refrigeration air entering the storage compartments.

[0003] Similarly, in order to optimize the storage space, a single storage compartment is divided into a plurality of specific storage spaces via a shelf device such as a shelf or a drawer generally; and depending on the number of items stored in each storage space, the amounts of refrigeration air required by the storage spaces are different. Thus, the refrigeration air directly entering the storage compartment without control from somewhere thereof will cause excessive cooling for part of storage spaces but lack of refrigeration air for others.

[0004] Therefore, a branching air supply device is arranged at the air passage of the back part of the body of the refrigerator in the prior art, wherein an air inlet of the branching air supply device is communicated with a refrigeration air inlet, and a plurality of air outlets of the branching air supply device is communicated with a plurality of storage spaces. In the storage compartments, cold air is likely to sink but heat is likely to rise, such that distribution of air in each layer of the storage compartments should be accurate. However, it is difficult to accurately guide the directions and control the amounts of refrigeration air by the branching air supply device in the prior art. In addition, a centrifugal fan in the prior art is arranged at an air outlet position, which causes some trouble to a user as the air supply amount cannot meet the requirements due to shielding.

SUMMARY

[0005] With respect to the above problems, the present invention provides a refrigerator and a branching air supply device thereof for overcoming the above defects or at least partially solving the above problems.

[0006] It is an object of the present invention to control the air supply ratio of the branching air supply device.

[0007] It is a further object of the present invention to increase the air supply amount of the branching air supply device.

[0008] In particular, the present invention provides a branching air supply device for a refrigerator, the branching air supply device comprising: a housing provided with an air inlet and a plurality of air outlets; a regulating component configured to completely shield, partially shield or completely expose each air outlet in a controllable manner to adjust respective air discharging areas of the plurality of second air outlets; an air feeding device arranged in the housing and configured to prompt the air flow to flow into the housing from the air inlet and to flow out of the housing via one or more air outlets of the plurality of the air outlets; and an air distributing device arranged in the housing and configured to guide air flowing out of the air feeding device and to enable the air flowing out of the air feeding device to flow to each air outlet with a predetermined ratio.

[0009] Optionally, the air feeding device is a centrifugal impeller.

[0010] Optionally, the housing comprises a base and a distributor cover; the distributor cover is provided with a cover plate and a circumferential wall extending from the edge of the cover plate to the base, the cover plate is provided with an air inlet, the circumferential wall is provided with a plurality of air outlets, and the end, far away from the cover plate, of the circumferential wall is mounted on the base.

[0011] Optionally, the air distributing device comprises a plurality of flow guiding plates, each of which extends from the inner surface of the cover plate towards the base and is configured to enable the air flowing out of the air feeding device to flow to two adjacent air outlets from the two sides of the flow guiding plate.

[0012] Optionally, the circumferential wall includes a first circumferential wall section; a projection of the first circumferential wall section on the cover plate is arc-shaped; and a plurality of air outlets is sequentially formed on the first circumferential wall section in the circumferential direction of the base.

[0013] Optionally, the regulating component comprises one or more baffle plates arranged in the circumferential direction at intervals; each baffle plate is arranged coaxially with the first circumferential wall section; the regulating component is rotatably mounted in the housing along an axis of the first circumferential wall section, such that one or more baffle plates can completely shield, partially shield or completely expose each air outlet in a controllable manner when the regulating component is rotated to different rotational positions; and the end, close to the circumferential wall, of each flow guiding plate is spaced from the circumferential wall to define a letting a make-way passage allowing the regulating component to rotate.

[0014] Optionally, the regulating component further

comprises at least one circulation part, the baffle plates and the at least one circulation part are sequentially arranged in the circumferential direction of the base, one or more baffle plates and the at least one circulation part form a cylindrical structure, and one or more circulation holes are formed in each circulation part; and the regulating component is further configured to allow the air flow to enter partially-shielded or fully-exposed air outlets via the circulation hole(s) in the at least one circulation part when rotating to different rotational positions.

[0015] Optionally, the rotating axis of the air feeding device is parallel to and spaced from the axis of the base, such that the air feeding device is arranged in the housing in a biased manner.

[0016] Optionally, the branching air supply device comprises a flow gathering plate which extends from the inner surface of the cover plate towards the base and is configured to prompt air flowing out of the air feeding device to flow to the plurality of air outlets.

[0017] The present invention further provides a refrigerator, comprising: an air passage assembly including a refrigeration air inlet and a plurality of refrigeration air outlets; and any one of the above-mentioned branching air supply device arranged in the air passage assembly, wherein the air inlet of the branching air supply device is communicated with the refrigeration air inlet, and each air outlet of the branching air supply device is communicated with at least one refrigeration air outlet of the plurality of refrigeration air outlets of the air passage assembly.

[0018] Each of the refrigerator and the branching air supply device thereof provided by the present invention is provided with the air distributing device configured to guide the air flowing out of the air feeding device to flow to each air outlet with a predetermined ratio. Moreover, the regulating component can shield the plurality of air outlets in a controllable manner, such that an air outlet passage can be selected and the amount of air from each air outlet passage can be regulated again, and the accurate air distribution and air amount control can be performed according to the refrigeration air supply amount requirement of different storage compartments or different locations of one storage compartment, enhancing the preservation performance and operating efficiency of the refrigerator.

[0019] Further, as the adopted air feeding device is the centrifugal impeller, the maintenance is convenient and the ventilation effect is good. In addition, the rotating axis of the air feeding device is parallel to and spaced from the axis of the base, such that the air feeding device is arranged in the housing in a biased manner, reducing the air supply amount loss caused by the shielding of the air direction by the centrifugal impeller, increasing the maximum air supply amount of the branching air supply device, and satisfying the refrigeration air supply amount requirement of the storage compartments of the refrigerator.

[0020] The above and other objects, advantages and

features of the present invention will be understood by those skilled in the art more clearly with reference to the detailed description of the embodiments of this invention below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The followings will describe some embodiments of the present invention in detail in an exemplary rather than restrictive manner with reference to the accompanying drawings. The same reference signs in the drawings represent the same or similar components or parts. Those skilled in the art shall understand that these drawings are only schematic ones of the present invention, and may not be necessarily drawn according to the scales. In the drawings:

Fig. 1 is a schematic structure view of a branching air supply device according to an embodiment of the present invention;

Fig. 2 is a schematically exploded view of the branching air supply device shown in Fig. 1;

Fig. 3 is a schematically inner structure view of the branching air supply device shown in Fig. 1;

Fig. 4 is a schematically partial structure view of the branching air supply device shown in Fig. 1;

Fig. 5 is another schematically partial structure view of the branching air supply device shown in Fig. 1;

Fig. 6 is a schematic view of the first regulating state of the branching air supply device shown in Fig. 1;

Fig. 7 is a schematic view of the second regulating state of the branching air supply device shown in Fig. 1;

Fig. 8 is a schematic view of the third regulating state of the branching air supply device shown in Fig. 1;

Fig. 9 is a schematic view of the fourth regulating state of the branching air supply device shown in Fig. 1;

Fig. 10 is a schematic view of the fifth regulating state of the branching air supply device shown in Fig. 1;

Fig. 11 is a schematic view of the sixth regulating state of the branching air supply device shown in Fig. 1;

Fig. 12 is a schematic view of the seventh regulating state of the branching air supply device shown in Fig. 1;

Fig. 13 is a schematic view of the eighth regulating state of the branching air supply device shown in Fig. 1;

Fig. 14 is a schematically structural view of a refrigerator according to an embodiment of the present invention; and

Fig. 15 is a schematically partial structural view of the refrigerator shown in Fig. 14.

DETAILED DESCRIPTION

[0022] Fig. 1 is a schematic structure view of a branching air supply device according to an embodiment of the present invention; Fig. 2 is a schematically exploded view of the branching air supply device shown in Fig. 1; Fig. 3 is a schematically inner structure view of the branching air supply device shown in Fig. 1; and Fig. 14 is a schematically structural view of a refrigerator according to an embodiment of the present invention. Referring to Figs. 1, 2, 3 and 14, the embodiments of the present invention provide a branching air supply device 10 for a refrigerator 1. The branching air supply device 10 may comprise a housing 100, a regulating component 200, an air feeding device 300 and an air distributing device 400.

[0023] The housing 100 may be provided with an air inlet 124 and a plurality of air outlets, such that the air flow can enter the housing 100 via the air inlet 124, and then flow out of the housing 100 from the plurality of air outlets. In particular, the housing may include a base 110 and a distributor cover 120. The distributor cover 120 comprises a cover plate and a circumferential wall extending from the edge of the cover plate towards the base 110. The air inlet 124 is formed in the cover plate; the plurality of air outlets are formed in the circumferential wall; and the end, far away from the cover plate, of the circumferential wall is mounted on the base 110. In particular, an edge of the base 110 may be provided with a plurality of connecting arms 112 extending towards the distributor cover 120. A clamping groove or a bulge is formed on the inner surface of each connecting arm 112, and a plurality of bulges or clamping grooves correspondingly matched with the clamping grooves or the bulges on the connecting arms respectively is formed on the outer surface of the circumferential wall, such that the distributor cover 120 is clamped with the base 110.

[0024] In some preferred embodiments, a mounting groove 111 is also formed on the inner surface of the base 110, and the air feeding device 300 is mounted in the mounting groove 111. For example, the centrifugal impeller is mounted on the bottom surface of the mounting groove 111. The circumferential wall may include a first circumferential wall section 125 and a second circumferential wall section 126. Preferably, the projection of the first circumferential wall section 125 on the cover plate is arc-shaped; and a plurality of air outlets may be

formed in the first circumferential wall section 125.

[0025] The regulating component 200 may be arranged inside the housing 100, and configured to completely shield, partially shield or completely expose each air outlet in a controllable manner to adjust respective air discharging areas of the plurality of second air outlets. For example, the regulating component 200 comprises one or more baffle plates 220 arranged in the circumferential direction at intervals; each baffle plate 220 is arranged coaxially with the first circumferential wall section 125; the regulating component 200 is rotatably mounted in the housing 100 along the axis of the first circumferential wall section 125, such that one or more baffle plates can completely shield, partially shield or completely expose each air outlet in a controllable manner when the regulating component is rotated to different rotational positions. Further, the regulating component 200 may further include at least one circulation part 210; the baffle plates 220 and the at least one circulation part 210 are sequentially arranged in the circumferential direction of the base 110; one or more baffle plates 220 and the at least one circulation part 210 form a cylindrical structure; and one or more circulation holes are formed in each circulation part 210. The regulating component 200 is further configured to allow the air flow to enter the partially-shielded or fully-exposed air outlets via the circulation holes in the at least one circulation part 210 when rotating to the different rotational positions.

[0026] The air feeding device 300 may be arranged in the housing 100 and configured to prompt the air flow to flow into the housing 100 from the air inlet 124 and to flow out of the housing 100 via one or more air outlets of the plurality of the air outlets. Through this arrangement, the branching air supply device 10 in a single-system refrigerator can again provide driving force to the air flow blown by an air supply device in an evaporator chamber to improve the air supply efficiency of the branching air supply device 10; and moreover, the branching air supply device 10 can independently realize air intake, such that the branching air supply device 10 is particularly suitable for a dual-system or multi-system refrigerator 1. In some embodiments, the air feeding device 300 may be a centrifugal impeller and arranged in the housing 100, such that the structure is compact, the maintenance is convenient and the ventilation effect is good.

[0027] The air distributing device 400 may be arranged in the housing 100 and configured to guide air flowing out of the air feeding device 300 and to enable the air flowing out of the air feeding device 300 to flow to each air outlet with a predetermined ratio. In this embodiment, the air distributing device 400 and the regulating component 200 are cooperated to control the branching air supply device 10, such that the air outlet can be selected and the air amount of each air outlet can be regulated by virtue of the distribution function of the air distributing device 400 and the controllable shielding function of the regulating component 200 on the plurality of air outlets, and the accurate air flowing distribution and air amount

control can be performed according to the refrigeration air supply amount requirement of different storage compartments or different locations of one storage compartment.

[0028] In some embodiments of the present invention, the air distributing device 400 may include a plurality of flow guiding plates, each of which extends from the inner surface of the cover plate towards the base 110 and is configured to enable the air flow flowing out of the air feeding device 300 to flow to two adjacent air outlets from the two sides of the flow guiding plate. That is, there is one flow guiding plate arranged between every two adjacent air outlets. Further, the end, close to the circumferential wall, of each flow guiding plate is spaced from the circumferential wall to define a make-way passage allowing the regulating component 200 to rotate.

[0029] Figs. 4 and 5 are schematically partial structure views of the branching air supply device, respectively. The rotating axis of the air feeding device 300 may be parallel to and spaced from the axis of the base 110, such that the air feeding device 300 is arranged in the housing 100 in a biased manner. The branching air supply device 10 may also include a flow gathering plate 500 which extends from the inner surface of the cover plate to the base 110 and is configured to prompt the air flowing out of the air feeding device 300 to flow to the plurality of air outlets. In some preferred embodiments, the flow gathering plate 500 is arc-shaped with one end directed towards the edge, far away from the first air outlet 121, of the third air outlet and the other end close to the centrifugal impeller, such that the air supply amount loss caused by the shielding of the air direction by the centrifugal impeller is reduced, and part of air flowing out of the centrifugal impeller is smoothly guided to the air outlets, increasing the air supply amount of the branching air supply device 10, and meeting the refrigeration air requirement of the storage compartments of the refrigerator 1.

[0030] In some further embodiments of the present invention, the number of the air outlets may be three, and the air outlets are sequentially arranged in the circumferential direction of the base 110 at intervals. The three air outlets comprise the first air outlet 121, the second air outlet 122 and the third air outlet 123 arranged along the circumferential direction of the base 110. There may be two flow guiding plates, namely, the first flow guiding plate 410 and the second flow guiding plate 420. In particular, both the first flow guiding plate 410 and the second flow guiding plate 420 are long plates. The first flow guiding plate 410 is arranged towards the air feeding device 300, and the second flow guiding plate 420 is longer than the first flow guiding plate 410, and extends towards the side, far away from centrifugal impeller, of the inside of the housing 100 to guide the air flowing out of the air feeding device 300 and to enable the air flowing out of the air feeding device 300 to flow to each air outlet with a predetermined ratio. Through the three air outlets and the flow gathering plate 500, the air amount ratio of the first

air outlet 121, the second air outlet 122 and the third air outlet 123 may be defined as 65%: 25%: 10%, accurately quantifying refrigeration air supply amount of the storage compartments or different storage spaces of each storage compartment.

[0031] In some embodiments, the number of baffle plates 220 and the circulation parts 210 is two respectively. The two baffle plates 220 include a first baffle plate 221 and a second baffle plate 222. The two circulation parts 210 include a first circulation part 211 and a second circulation part 212 which are counterclockwise arranged in the circumferential direction of the base 110 at intervals sequentially. The first baffle plate 221 is configured to completely shield one air outlet. The second baffle plate 222 is configured to at least completely shield two air outlets, and in this embodiment, for example, the second baffle plate 222 can at least completely shield three air outlets. The first circulation part 211 is provided with a circulation hole, and the second circulation part 212 is provided with three circulation holes sequentially formed along the circumferential direction of the base 110 at intervals; and each circulation hole is configured to completely expose one second air outlet, and the three circulation holes in the second circulation part 212 are configured to completely expose the three second air outlets.

[0032] As shown in Figs. 6-13, when the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 6, the three circulation holes in the second circulation part 212 allow the first, second and third air outlets 121, 122 and 123 to be in an open state. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 7, the second baffle plate 221 may completely shield the second and third air outlets 122 and 123, and the circulation hole in the second circulation part 212 allows the second air outlet 121 to be fully exposed. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 8, the first baffle plate 221 may completely shield the third air outlet 123, the second baffle plate 222 may completely shield the first air outlet 121, and the circulation hole in the first circulation part 211 allows the second air outlet 122 to be fully exposed. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 9, the second baffle plate 222 completely shields the first and second air outlets 121 and 122, and the circulation hole in the first circulation part 211 allows the third air outlet 123 to be fully exposed.

[0033] When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 10, the second baffle plate 222 may completely shield the third air outlet 123, and two circulation holes in the second circulation part 212 allow the first and second air outlets 121 and 122 to be fully exposed. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 11, the first baffle plate 221 only can completely shield the first air outlet 121, and two circulation holes in the second circulation

part 212 allow the second and third air outlets 122 and 123 to be fully exposed. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 12, the first baffle plate 221 may completely shield the second air outlet 122, the circulation hole in the first circulation part 212 allows the first air outlet 121 to be fully exposed, and the circulation hole in the second circulation part 212 allows the third air outlet 123 to be fully exposed. When the first baffle plate 221 and the second baffle plate 222 are rotated to the positions shown in Fig. 13, the second baffle plate 222 may completely shield the first, second and third air outlets 121, 122 and 123. Of course, the first baffle plate 221 and the second baffle plate 222 may also be rotated to other rotational positions to regulate the air path and the air supply amount.

[0034] In the other further embodiments of the present invention, the regulating component 200 may only comprise one or more baffle plates 220. If only one baffle plate 220 is included, both sides of the baffle plate allow air to pass. If the regulating component 200 comprises a plurality of baffle plates 220, a gap between every two adjacent baffle plates 220 allows air to pass.

[0035] Particularly, in this embodiment, the number of the air outlets may be three, and the air outlets are sequentially arranged in the circumferential direction of the base 110 at intervals. The three air outlets comprise the first air outlet 121, the second air outlet 122 and the third air outlet 123 counterclockwise arranged along the circumferential direction of the base 110 at intervals sequentially. The number of baffle plates 220 is two. The two baffle plates 220 include a first baffle plate 221 and a second baffle plate 222 which are counterclockwise arranged in the circumferential direction of the base 110 at intervals sequentially. The first baffle plate 221 is configured to completely shield one air outlet. The first baffle plate 222 is configured to completely shield two air outlets. A gap between the first baffle plate 221 and the second baffle plate 222 is configured to completely shield one air outlet. When neither the first baffle plate 221 nor the second baffle plate 222 shields the air outlet, the first, second and third air outlets 121, 122 and 123 are in the open state. When the second baffle plate 222 completely shields the second and third air outlets 122 and 123, a gap between the two baffle plates 220 allows the first air outlet 121 to be fully exposed. When the first baffle plate 221 completely shields the first air outlet 121, the second baffle plate 222 may completely shield the third air outlet 123, and the gap between the two baffle plates 220 allows the second air outlet 122 to be fully exposed. When the second baffle plate 222 completely shields the first and second air outlets 121 and 122, the third air outlet 123 is fully exposed. When the first baffle plate 221 completely shields the third air outlet 123, the first and second air outlets 121 and 122 are fully exposed. When the second baffle plate 222 only completely shields the first air outlet 121, the second and third air outlets 122 and 123 are fully exposed. When the first baffle plate 221 completely

shields the second air outlet 122, the first air outlet 121 is fully exposed, and a gap between the two baffle plates 220 allows the third air outlet 123 to be fully exposed.

[0036] In some embodiments of the present invention, a driving device 600 is also mounted outside the housing 100, and particularly mounted in a space defined by a second circumferential wall section 126 and the corresponding cover plate. The driving device 600 may include a motor 610 and a gear 620 mounted on a rotation shaft of the motor 610. In combination with Fig. 2, a gear ring 230 matched with the gear 620 is arranged on the regulating component 200, such that the regulating component 200 is driven to rotate through the rotation of the gear 620. The driving device is simple and compact in structure, and can be widely applied.

[0037] In some embodiments of the present invention, a water outlet 127 is arranged at the cover plate of the distributor cover 120 of the branching air supply device 10, and in particular, the water outlet 127 is formed in the inner side of the flow gathering plate 500. A small amount of water vapor enters the inner part of the air passage along with the refrigeration air due to the incomplete sealing of the air passage of the branching air supply device 10 and the refrigerator 1, resulting in accumulation of water in the branching air supply device 10, even freezing, and affecting the performance of the refrigerator 1. The water outlet 127 of the present embodiment enables the water vapor to deposit on the inner wall along with the rotation of a fan, and then the deposited water flows out along the water outlet 127, preventing freezing.

[0038] In some embodiments of the present invention, when the air outlets are shielded by the baffle plates 220 of the regulating component 200, the outer surfaces of the baffle plates 220 can be propped against the inner surface of the first circumferential wall section 125. In some alternative embodiments, in order to facilitate the rotation of the regulating component 200, a distance between each of the baffle plates 220 and the first circumferential wall section 125 can be slightly increased; however, if the distance between each of the baffle plates 220 and the first circumferential wall section 125 is increased, cold air leakage will occur, resulting in an incomplete and useless shielding effect. Thus, the branching air supply device 10 in the embodiments of the present invention may further comprise a sealing device configured to at least partially prevent the air flow from flowing to each air outlet via a gap between the outer surface of each baffle plate 220 and the inner surface of the first circumferential wall section 125. In particular, the sealing device may comprise at least two sealing gaskets, each of which extends in a direction parallel to the rotating axis of the regulating component 200. A sealing gasket is arranged at each of the two ends of the arcuate outer surface of each baffle plate 220 along its rotating direction. In the case that the regulating component 200 comprises the baffle plates 220 and the circulation parts 210, the sealing device may further comprise other sealing gaskets which may be arranged between every two adjacent

circulation holes of each circulation part 210.

[0039] Fig. 14 is a schematically structural view of a refrigerator according to an embodiment of the present invention. Fig. 15 is a schematically partial structural view of the refrigerator shown in Fig. 14. As shown in Figs. 14 and 15, the embodiments of the present invention also provide a refrigerator 1. The refrigerator 1 may include an air passage assembly 20 and a branching air supply device 10. In particular, the air passage assembly 20 includes a refrigeration air inlet 21 and a plurality of refrigeration air outlets. The branching air supply device 10 may be arranged in the air passage assembly 20. Moreover, the air inlet 124 of the branching air supply device 10 is communicated with the refrigeration air inlet, and each air outlet of the branching air supply device 20 is communicated with at least one refrigeration air outlet of the plurality of refrigeration air outlets of the air passage assembly 20.

[0040] As shown in Fig. 15, in some preferred embodiments, the plurality of refrigeration air outlet groups of the air passage assembly 20 of the refrigerator 1 are vertically arranged in a multi-layer manner, such that the air passage is provided with a plurality of air flowing-out layers, realizing air flowing out of the air passage assembly 20 at multiple heights. In particular, there are three air flowing-out layers, namely, the first air flowing-out layer, the second air flowing-out layer and the third outlet layer; each air flowing-out layer may have at least one refrigeration air outlet; and the refrigeration air outlet of each air flowing-out layer is communicated with the first, second and third air outlets 121, 122 and 123 of the branching air supply device 10 via an air passage corresponding to this air flowing-out layer, such that refrigeration air discharged from the branching air supply device 10 is supplied to the vertically-arranged storage compartments of the refrigerator 1 or the upper portion, the middle portion and the lower portion of the wall of one storage compartment 30 to meet the refrigeration air supply amount requirement of each storage compartment 30 of the refrigerator 1, improving the overall performance of the refrigerator 1. In this embodiment, as the refrigeration air outlet in the same layer is in communication with one air outlet of the branching air supply device 10 and the number of the refrigeration air outlet in the same layer may be at least one, each air outlet of the branching air supply device 10 arranged in the air passage assembly 20 is in communication with at least one refrigeration air outlet of the plurality of refrigeration air outlets of the air passage assembly 20. In some preferred embodiments, the first air flowing-out layer may include a plurality of refrigeration air outlets, for example, four refrigeration air outlets 22, which are arranged at the upper portion of the air passage assembly 20 and the upper portion of its side walls respectively, such that the first air outlet 121 may be communicated with multiple refrigeration air outlets, such as four refrigeration air outlets. For example, the second air flowing-out layer includes two refrigeration air outlets 23, which are arranged at the upper middle por-

tions of the two side walls of the air passage assembly 20, respectively, such that the second air outlet 122 may be communicated with two refrigeration air outlets. The third outlet layer may include only one refrigeration air outlet 24 arranged at the middle of one side of the air passage assembly 20, such that the third air outlet 123 is communicated with only one refrigeration air outlet.

[0041] Although multiple embodiments of this invention have been illustrated and described in detail, those skilled in the art may make various modifications and variations to the invention based on the content disclosed by this invention or the content derived therefrom without departing from the spirit and scope of the invention. Thus, the scope of this invention should be understood and deemed to include these and other modifications and variations.

Patentansprüche

1. A branching air supply device for a refrigerator, the branching air supply device comprising:
 - a housing provided with an air inlet and a plurality of air outlets;
 - a regulating component configured to completely shield, partially shield or completely expose each air outlet in a controllable manner to adjust respective air discharging areas of the plurality of air outlets;
 - an air feeding device arranged in the housing and configured to prompt the air flow to flow into the housing from the air inlet and to flow out of the housing via one or more air outlets of the plurality of the air outlets; and
 - an air distributing device arranged in the housing and configured to guide air flowing out of the air feeding device and to enable the air flowing out of the air feeding device to flow to each air outlet with a predetermined ratio.
2. The branching air supply device of claim 1, wherein the air feeding device is a centrifugal impeller.
3. The branching air supply device of claim 2, wherein the housing comprises a base and a distributor cover; and the distributor cover is provided with a cover plate and a circumferential wall extending from the edge of the cover plate towards the base, the cover plate is provided with the air inlet, the circumferential wall is provided with the plurality of air outlets, and the end, far away from the cover plate, of the circumferential wall is mounted on the base.
4. The branching air supply device of claim 3, wherein the air distributing device comprises a plurality of flow guiding plates, each of which extends from the inner

surface of the cover plate towards the base; and each flow guiding plate is configured to enable air flowing out of the air feeding device to flow to two adjacent air outlets from the two sides of the flow guiding plate.

5. The branching air supply device of claim 4, wherein the circumferential wall includes a first circumferential wall section, and the projection of the first circumferential wall section on the cover plate is arc-shaped; and the plurality of air outlets are sequentially formed on the first circumferential wall section in the circumferential direction of the base. 5
6. The branching air supply device of claim 5, wherein the regulating component comprises one or more baffle plates arranged in the circumferential direction at intervals, and each baffle plate is arranged coaxially with the first circumferential wall section; the regulating component is rotatably mounted in the housing along an axis of the first circumferential wall section, such that one or more baffle plates completely shield, partially shield or completely expose each air outlet in a controllable manner when the regulating component is rotated to different rotational positions; and the end, close to the circumferential wall, of each flow guiding plate is spaced from the circumferential wall to define a make-way passage allowing the regulating component to rotate. 10
7. The branching air supply device of claim 6, wherein the regulating component further comprises at least one circulation part, the baffle plates and the at least one circulation part are sequentially arranged in the circumferential direction of the base, one or more baffle plates and the at least one circulation part form a cylindrical structure, and one or more circulation holes are formed in each circulation part; and the regulating component is further configured to allow the air flow to enter the partially-shielded or fully-exposed air outlets via the circulation hole(s) in the at least one circulation part when rotating to different rotational positions. 15
8. The branching air supply device of claim 3, wherein the rotating axis of the air feeding device is parallel to and spaced from the axis of the base, such that the air feeding device is arranged in the housing in a biased manner. 20
9. The branching air supply device of claim 8, further comprising: a flow gathering plate which extends from the inner surface of the cover plate towards the base and is configured to prompt air flowing out of the air feeding device to flow to the plurality of air outlets. 25

10. A refrigerator, comprising:

an air passage assembly including a refrigeration air inlet and a plurality of refrigeration air outlets; and the branching air supply device of any of claims 1-9, wherein the branching air supply device is arranged in the air passage assembly, the air inlet of the branching air supply device is communicated with the refrigeration air inlet, and each air outlet of the branching air supply device is communicated with at least one refrigeration air outlet of the plurality of refrigeration air outlets of the air passage assembly. 30

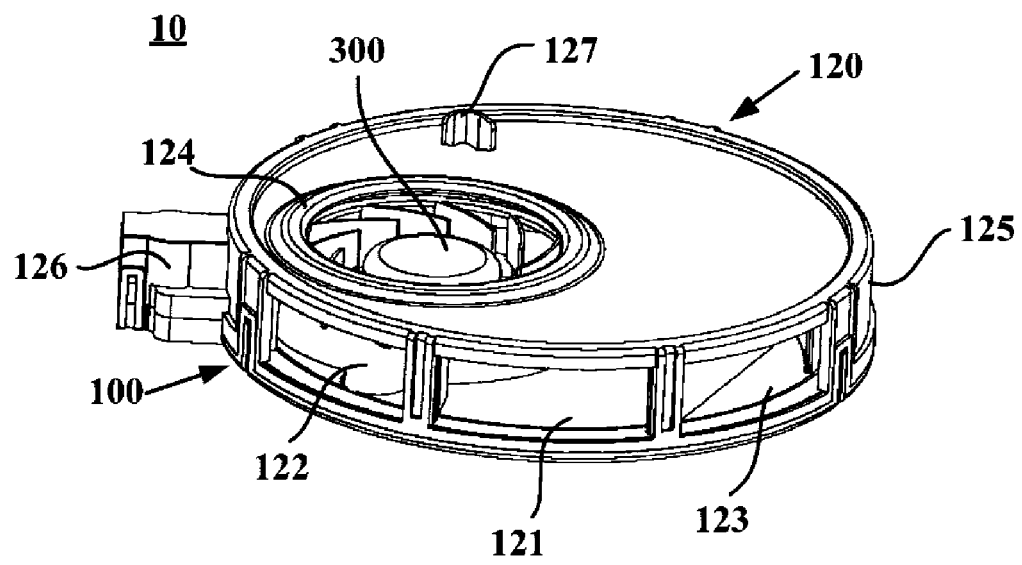


Fig. 1

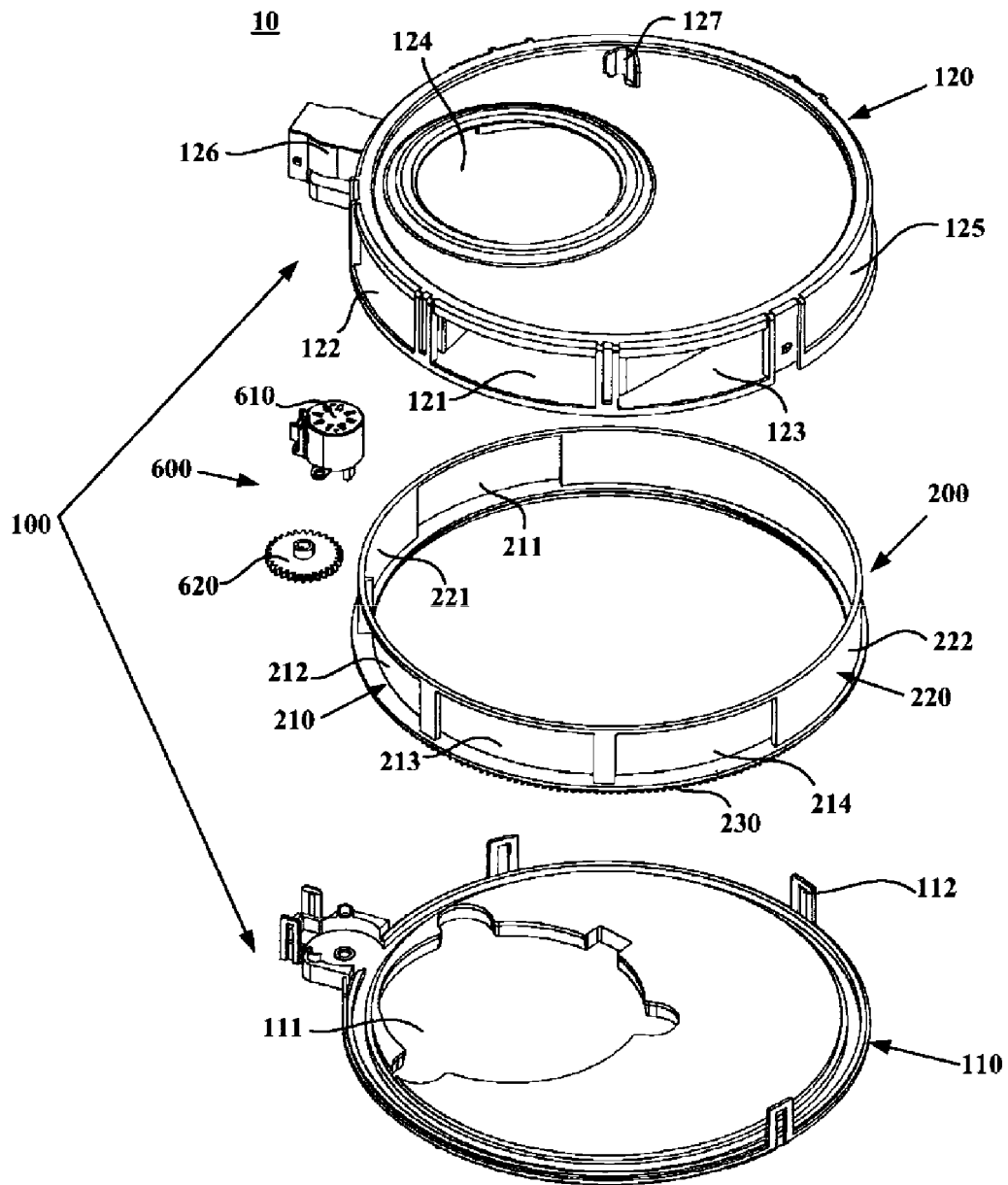


Fig. 2

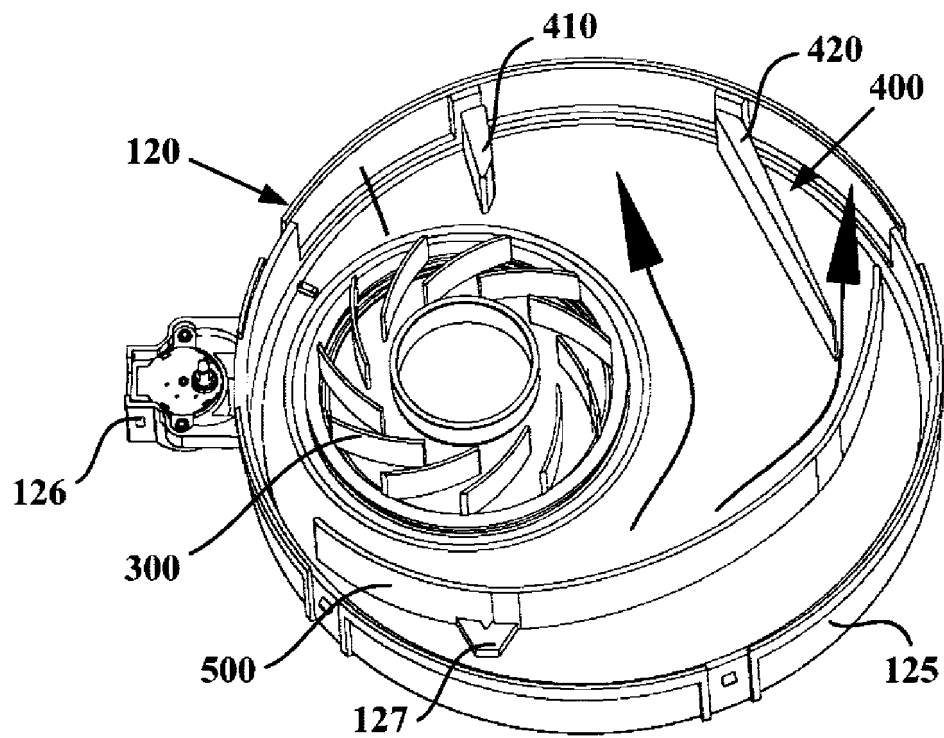


Fig. 3

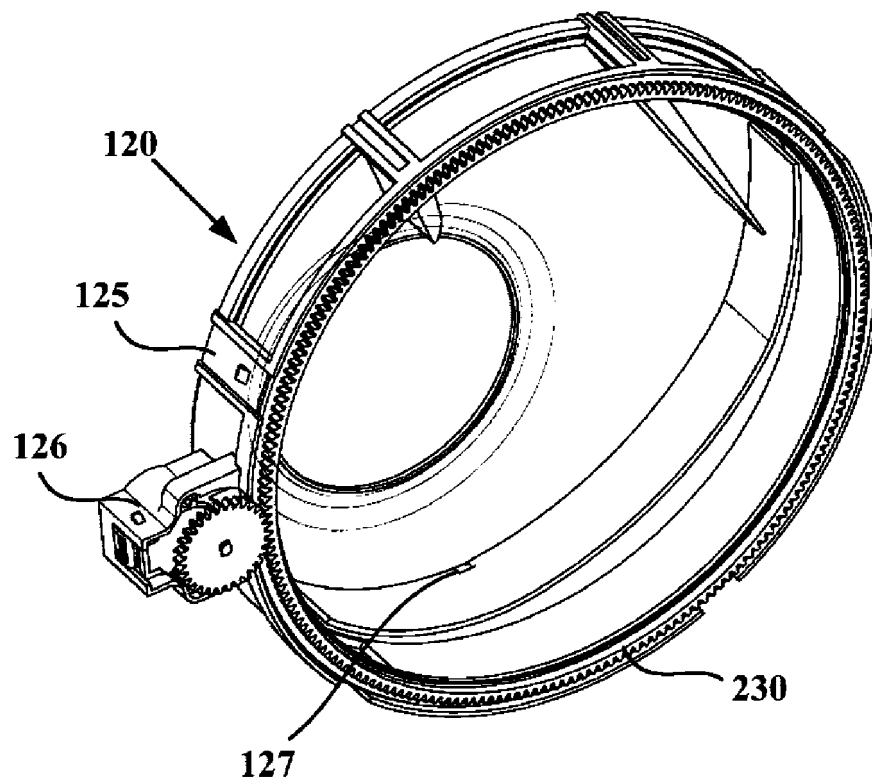


Fig. 4

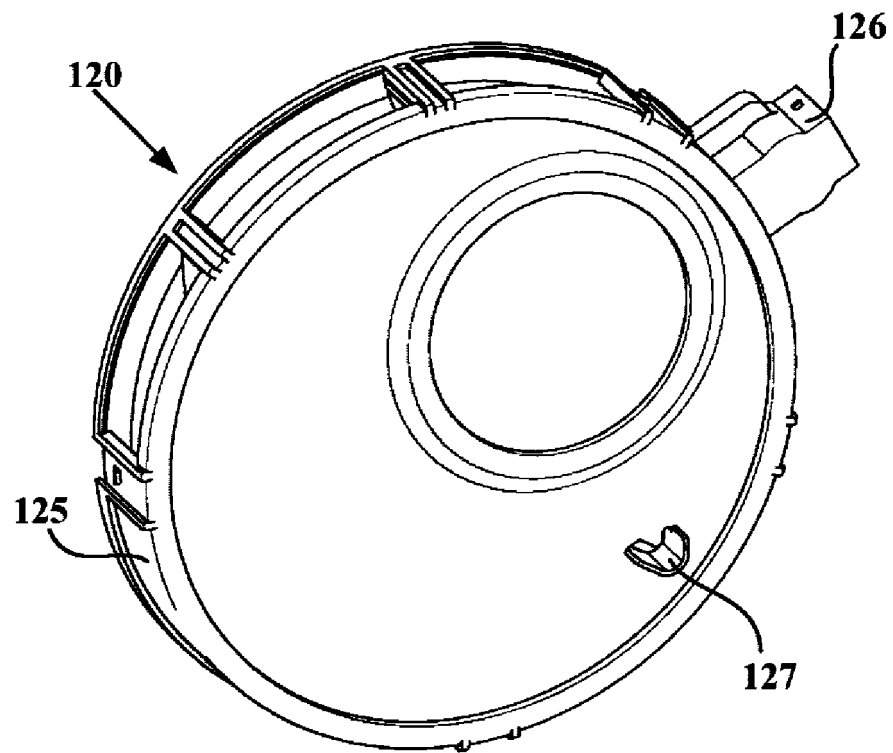


Fig. 5

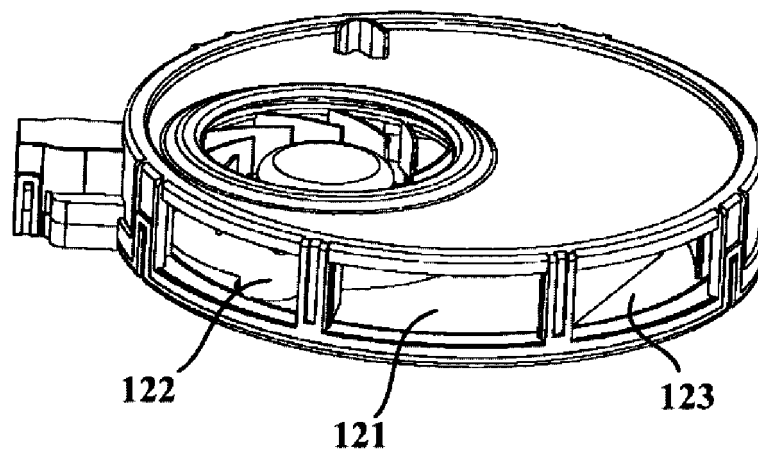


Fig. 6

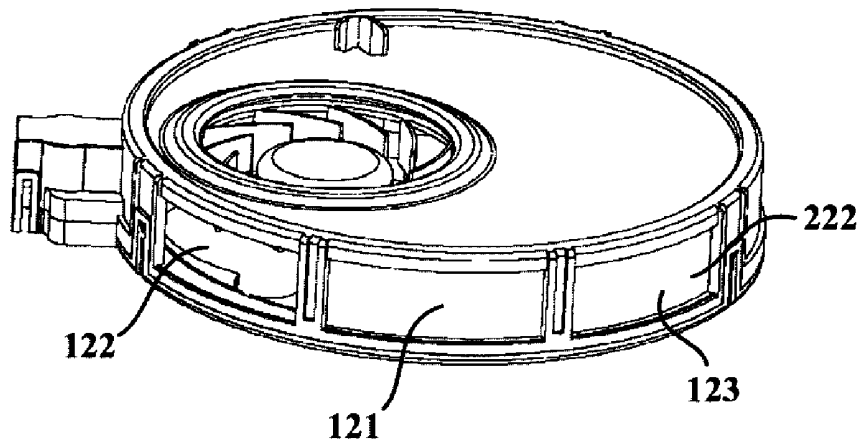


Fig. 7

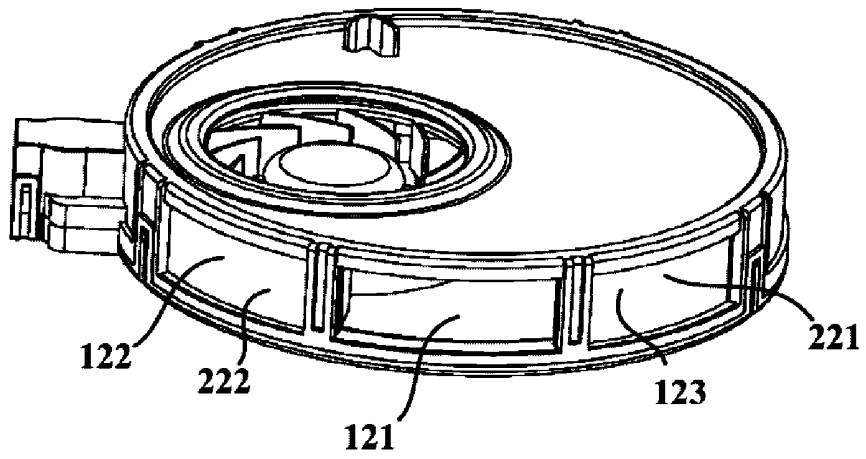


Fig. 8

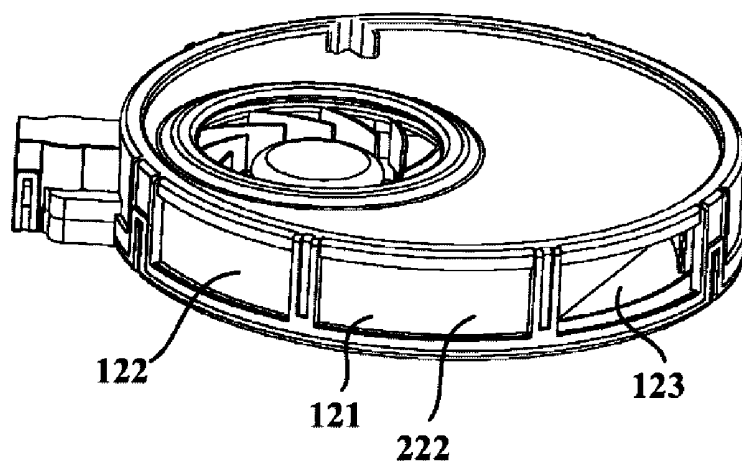


Fig. 9

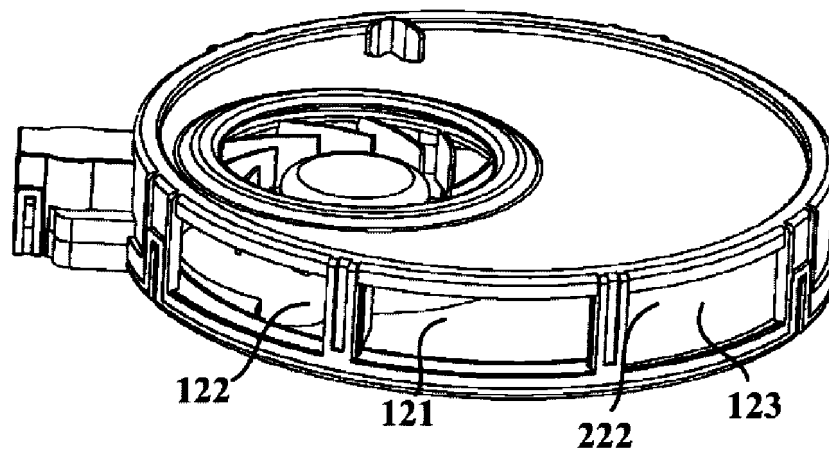


Fig. 10

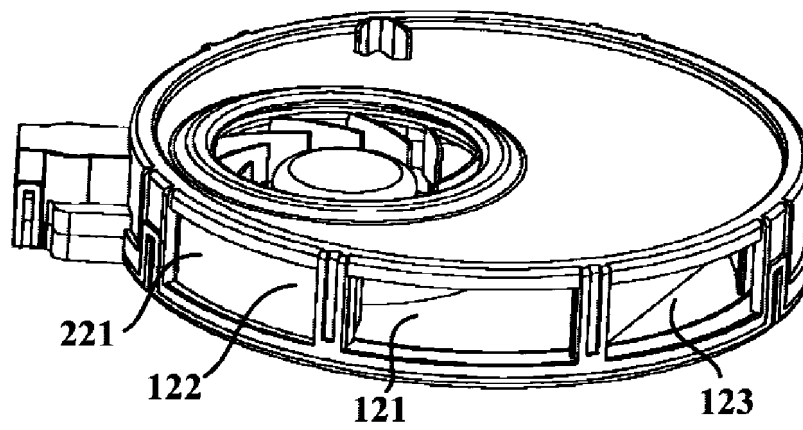


Fig. 11

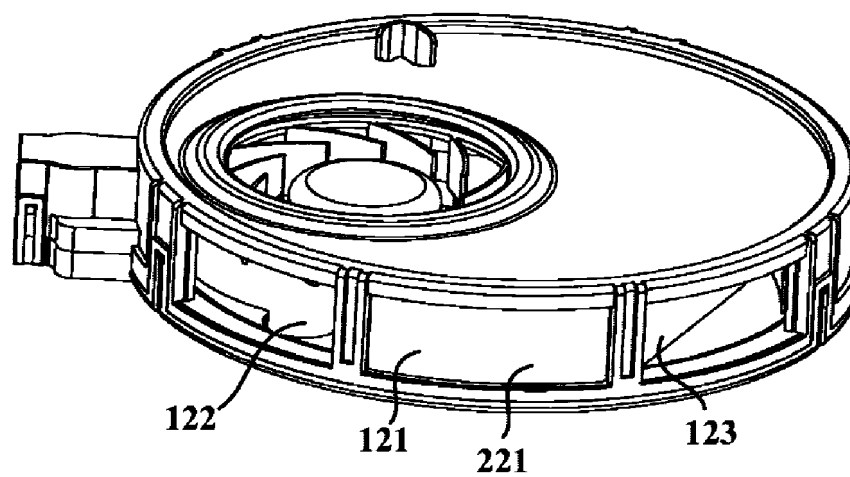


Fig. 12

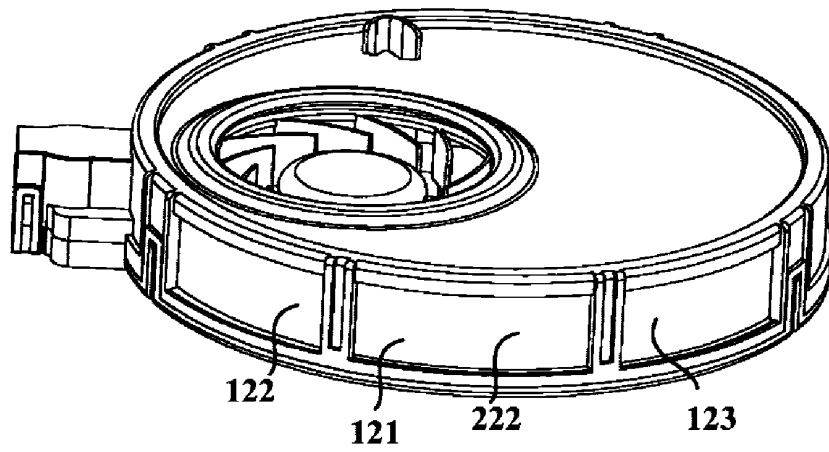


Fig. 13

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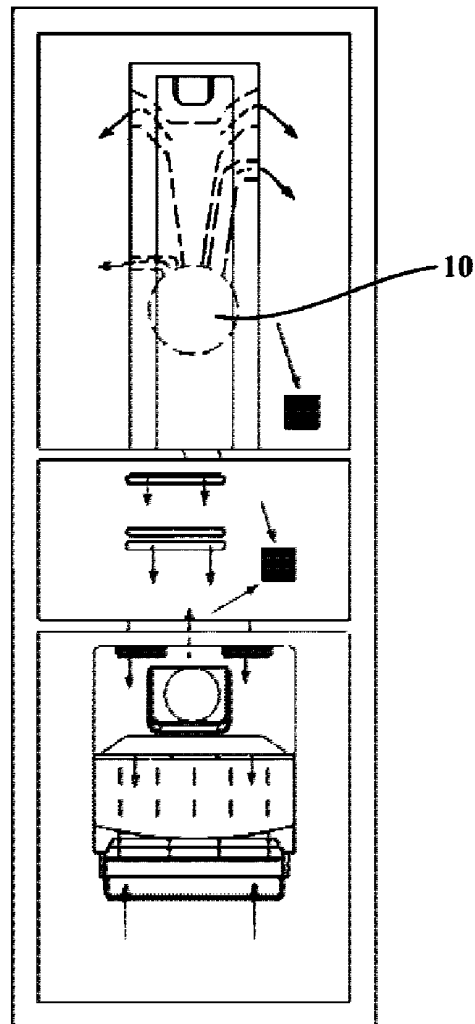


Fig. 14

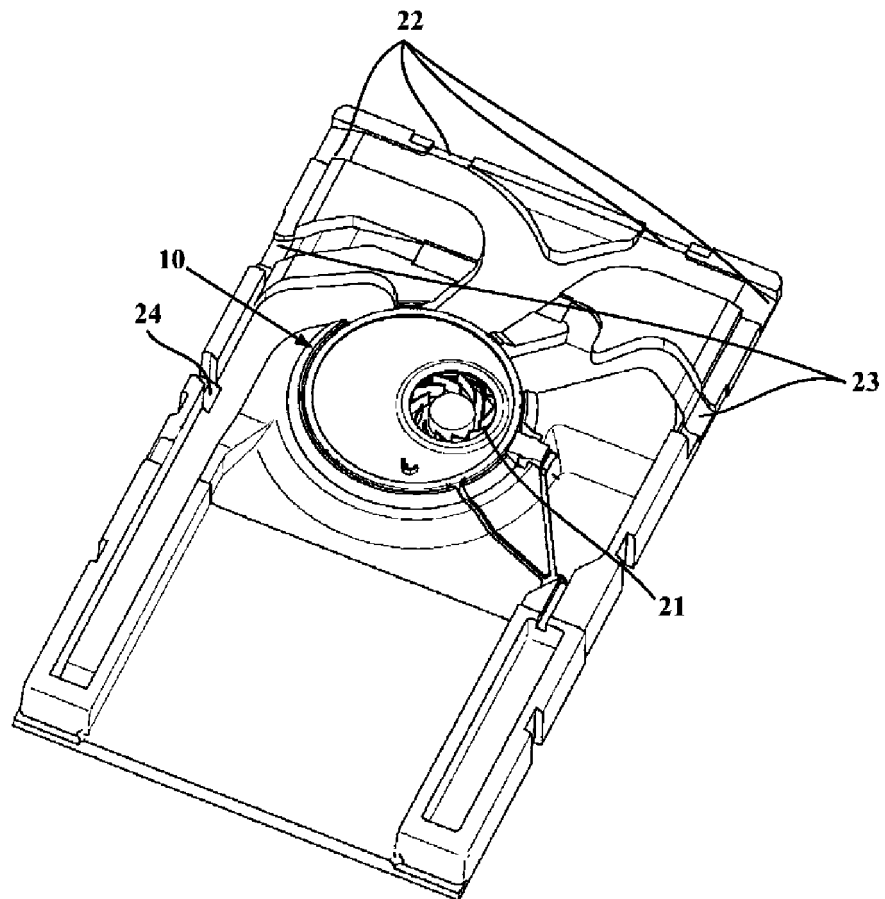


Fig. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/095265

A. CLASSIFICATION OF SUBJECT MATTER

F25D 17/06 (2006.01) i; F25D 17/08 (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)

WPI, EPODOC, CNPAT, CNKI: cold storage, branching, air delivery, air cooling, air inlet, air outlet, air supply, air passage, flow guide, refrigerator?, icebox+, air, supply, casing?, intake?, inlet?, outlet?, regulat+, carousel, shield+, expos+, distributar+, supply+, base?, cover?, lid?, diversion+, board?, plate?

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105758093 A (QINGDAO HAIER CO., LTD.), 13 July 2016 (13.07.2016), description, paragraphs [0043]-[0061], and figures 1-15	1-10
A	EP 2789937 A1 (WHIRLPOOL CO.), 15 October 2014 (15.10.2014), description, paragraphs [0009]-[0024], and figures 1-10	1-10
A	KR 101390448 B1 (SAMSUNG ELECTRONICS CO., LTD.), 29 April 2014 (29.04.2014), the whole document	1-10
A	WO 2009069900 A2 (LG ELECTRONICS INC. et al.), 04 June 2009 (04.06.2009), the whole document	1-10
A	US 5735138 A (SAMSUNG ELECTRONICS CO., LTD.), 07 April 1998 (07.04.1998), the whole document	1-10
A	CN 1708664 A (BSH BOSCH AND SIEMENS HOMEAPPLIANCE GMBH), 14 December 2005 (14.12.2005), the whole document	1-10

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search

17 November 2016 (17.11.2016)

Date of mailing of the international search report

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Name and mailing address of the ISA/CN:
State Intellectual Property Office of the P. R. China
No. 6, Xitucheng Road, Jimenqiao
Haidian District, Beijing 100088, China
Facsimile No.: (86-10) 62019451

Authorized officer

LIU, Xuanfei

Telephone No.: (86-10) 62084863

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/095265

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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Form PCT/ISA/210 (continuation of second sheet) (July 2009)

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International application No.

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