(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 151 913 A1**

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

(43) Date of publication:
22.03.2023 Bulletin 2023/12

(21) Application number: **21847146.4**

(22) Date of filing: **19.07.2021**

(51) International Patent Classification (IPC):
F24F 1/0035 *(2019.01)*

(52) Cooperative Patent Classification (CPC):
F24F 1/0022; F24F 1/0035; F24F 13/06

(86) International application number:
PCT/CN2021/107198

(87) International publication number:
WO 2022/017335 (27.01.2022 Gazette 2022/04)

(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: **20.07.2020 CN 202021435973 U**

(71) Applicants:
- **GD Midea Air-Conditioning Equipment Co., Ltd.**
  Foshan, Guangdong 528311 (CN)
- **Midea Group Co., Ltd.**
  Foshan, Guangdong 528311 (CN)

(72) Inventors:
- **LIN, Jianhui**
  Foshan, Guangdong 528311 (CN)
- **ZHAO, Zisheng**
  Foshan, Guangdong 528311 (CN)
- **MA, Lie**
  Foshan, Guangdong 528311 (CN)

(74) Representative: **Whitlock, Holly Elizabeth Ann et al**
Maucher Jenkins
Seventh Floor Offices
Artillery House
11-19 Artillery Row
London SW1P 1RT (GB)

(54) FRESH AIR MODULE AND AIR CONDITIONER

(57) Provided are a fresh air module (200) and an air conditioner (100). The fresh air module (200) comprises a housing (10), a centrifugal wind wheel (70), and a separator (30); the housing (10) is provided with an air inlet (11), an air outlet (12), and a fresh air duct (20) communicated with the air inlet (11) and the air outlet (12); the centrifugal wind wheel (70) is provided in the fresh air duct (20); the separator (30) is provided in the fresh air duct (20) to separate the fresh air duct (20) into an air inlet cavity (21) close to the air inlet (11) and a centrifugal air cavity (22) provided with the centrifugal wind wheel (70); the separator (30) is provided with a vent (31); the vent (31) is communicated with the air inlet cavity (21) and the centrifugal air cavity (22), and is provided corresponding to an air inlet end of the centrifugal wind wheel (70); and the width ratio of the air inlet cavity (21) to the centrifugal air cavity (22) in the axial direction of the centrifugal wind wheel (70) is greater than or equal to 0.7 and is less than or equal to 1.3.

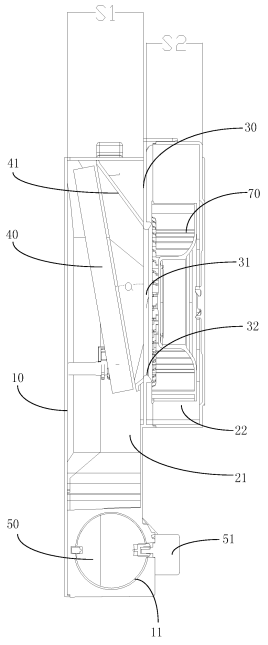

FIG. 7

EP 4 151 913 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202021435973.5, filed on July 20, 2020, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of air conditioners, and in particular relates to a fresh air module and an air conditioner.

BACKGROUND

[0003] In the related art, the air conditioner in the market is generally equipped with a fresh air module to introduce fresh air from the outdoor environment into the indoor environment, thereby supplementing the fresh air volume of the indoor environment and improving the air quality of the indoor environment.

[0004] The fresh air module is usually provided in the housing of the air conditioner, and the structure of the air conditioner is generally relatively compact, and the space inside the housing is limited. In order to install the fresh air module in the limited internal space of the air conditioner, the size of the fresh air duct of the fresh air module is usually small. However, in a narrow fresh air duct, if the size and structure of the fresh air duct are unreasonable, the fan will not be able to fully exert the air supply capacity, resulting in a small fresh air volume of the fresh air module.

SUMMARY

[0005] The main objective of the present disclosure is to provide a fresh air module, which aims to provide a fresh air module and an air conditioner with a reasonable size and which can fully utilize the air supply capacity of the fan.

[0006] To achieve the above objective, the present disclosure provides a fresh air module, including:

a casing provided with an air inlet, an air outlet and a fresh air duct communicated with the air inlet and the air outlet;
a centrifugal turbine provided in the fresh air duct; and
a separator provided in the fresh air duct to divide the fresh air duct into an air inlet chamber close to the air inlet and a centrifugal air chamber provided with the centrifugal turbine; a vent is provided on the separator, the vent is communicated with the air inlet chamber and the centrifugal air chamber, the vent is provided corresponding to an air inlet end of the centrifugal turbine, and
a ratio S1/S2 of a width dimension of the air inlet chamber and the centrifugal air chamber in an axial direction of the centrifugal turbine is not less than 0.7 and not greater than 1.3

[0007] In an embodiment, the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine is not less than 0.9 and not greater than 1.3.

[0008] In an embodiment, the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine is not less than 1.0 and not greater than 1.2.

[0009] In an embodiment, the fresh air module further includes a purification assembly provided in the fresh air duct and corresponding to the air inlet end of the centrifugal turbine.

[0010] In an embodiment, the air inlet is provided at an end of the air inlet chamber away from the centrifugal turbine, and the purification assembly is provided in the air inlet chamber.

[0011] In an embodiment, the purification assembly comprises a mounting bracket and a purification piece provided on the mounting bracket, the purification piece is flat and is mounted on the separator through the mounting bracket, and a ventilation area of the purification piece is larger than that of the vent.

[0012] In an embodiment, the purification piece is oblique relative to a plane where the vent is located, and the vent and the air inlet are located on two sides of the purification piece respectively.

[0013] In an embodiment, an angle "a" between the purification piece and the plane where the vent is located is not less than 10 degrees and not greater than 20 degrees.

[0014] In an embodiment, the mounting bracket comprises a collecting ring, one end of the collecting ring is covered with the purification piece, another end of the collecting ring is communicated with the vent, and an inner wall of the collecting ring is tapered from the purification piece to the vent.

[0015] In an embodiment, the fresh air module further includes a valve assembly including a damper openably provided in the air inlet, and a driving part for driving the damper to open or close the air inlet.

[0016] In an embodiment, a periphery of the vent is provided with a guide ring tapered from the air inlet chamber to the centrifugal air chamber.

[0017] In an embodiment, a diameter of the centrifugal turbine is not less than 100 mm and not greater than 150 mm.

[0018] In an embodiment, the maximum dimension of the fresh air module in the axial direction of the centrifugal turbine is not less than 90 mm and not greater than 110 mm.

[0019] The present disclosure further provides an air conditioner, including:

a housing; and
the fresh air module as described above, the fresh air module is provided in the housing.

[0020] In an embodiment, the air conditioner is a wall-mounted indoor unit, the fresh air module is provided on an end of the housing along a length direction of the housing, and an axial direction of the centrifugal turbine extends along the length direction of the housing.

[0021] In technical solutions of the present disclosure, the fresh air module includes a casing, a centrifugal turbine and a separator. The casing is provided with an air inlet, an air outlet and a fresh air duct communicated with the air inlet and the air outlet, the centrifugal turbine is provided in the fresh air duct, and the separator is provided in the fresh air duct to divide the fresh air duct into an air inlet chamber close to the air inlet and a centrifugal air chamber provided with the centrifugal turbine. A vent is provided on the separator, the vent is communicated with the air inlet chamber and the centrifugal air chamber, the vent is provided corresponding to an air inlet end of the centrifugal turbine; and a ratio of a width dimension of the air inlet chamber and the centrifugal air chamber in an axial direction of the centrifugal turbine is not less than 0.7 and not greater than 1.3. In the above dimension range, an air intake volume of the air inlet chamber matches an air supply volume of the centrifugal turbine. Thus, the air supply capacity of the centrifugal turbine will not be insufficient due to a small size of the air inlet chamber and an excessive air resistance, and a space will not be wasted due to a large size of the air inlet chamber. In this way, the reasonable setting of the structure and the size in the fresh air duct can make the centrifugal turbine fully supply air in a limited space, so that the fresh air volume of the fresh air module is in a reasonable range, and the overall structure of the fresh air module is compact and occupies less space.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] In order to more clearly illustrate the technical solutions in the embodiments of the present disclosure or in the related art, drawings used in the embodiments or in the related art will be briefly described below. Obviously, the drawings in the following description are only some embodiments of the present disclosure. It will be apparent to those skilled in the art that other figures can be obtained according to the structures shown in the drawings without creative work.

FIG 1 is a front view of an air conditioner according to an embodiment of the present disclosure;
FIG 2 is a front view of the air conditioner shown in FIG 1 with a housing removed;
FIG 3 is a three-dimensional schematic structural view of the air conditioner shown in FIG 2;
FIG 4 is a front view of a fresh air module shown in FIG 2;
FIG 5 is a cross section view along line A-A shown in FIG 4;
FIG. 6 is a side view of the fresh air module shown in FIG 4;
FIG. 7 is a cross section view along line B-B shown in FIG 4;
FIG. 8 is an exploded schematic view of the three-dimensional structure of the fresh air module shown in FIG 4; and
FIG. 9 is a trend graph showing a change of the fresh air volume with the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine.

Description of reference signs

[0023]

[Table 1]

Reference sign	Name	Reference sign	Name
100	air conditioner	30	separator
101	housing	31	vent
200	fresh air module	32	guide ring
10	casing	40	purification piece

(continued)

Reference sign	Name	Reference sign	Name
11	air inlet	41	mounting bracket
12	air outlet	42	collecting ring
20	fresh air duct	50	damper
21	air inlet chamber	51	driving part
22	centrifugal air chamber	60	guide ring

[0024] The realization of the objective, functional characteristics, and advantages of the present disclosure are further described with reference to the accompanying drawings.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0025] The technical solutions of the embodiments of the present disclosure will be described in more detail below with reference to the accompanying drawings. It is obvious that the embodiments to be described are only some rather than all of the embodiments of the present disclosure. All other embodiments obtained by persons skilled in the art based on the embodiments of the present disclosure without creative efforts shall fall within the scope of the present disclosure.

[0026] It should be noted that all of the directional instructions in the embodiments of the present disclosure (such as, up, down, left, right, front, rear.....) are only used to explain the relative position relationship and movement of each component under a specific attitude (as shown in the drawings), if the specific attitude changes, the directional instructions will change correspondingly.

[0027] Besides, the descriptions in the present disclosure that refer to "first," "second," etc. are only for descriptive purposes and are not to be interpreted as indicating or implying relative importance or to implicitly indicate the number of technical features indicated. Thus, a feature defined as "first" or "second" may explicitly or implicitly include at least one of the feature. In addition, technical solutions between the embodiments can be combined with each other, but must be based on the realization of the technical solutions by those skilled in the art, and when the technical solutions are contradictory to each other or cannot be realized, the technical solutions should be considered that the combination does not exist, and the technical solutions are not fallen within the protection scope claimed in the present disclosure.

[0028] As shown in FIG 1 to FIG 8, the present disclosure provides a wall-mounted indoor unit and an air conditioner 100 including a fresh air module 200.

[0029] The air conditioner 100 can be an indoor unit or an outdoor unit, or a complete air conditioner including an indoor unit and an outdoor unit. In an embodiment, the fresh air module 200 is provided in the indoor unit to directly deliver fresh air to the indoor room, avoiding providing a fresh air transmission channel between the outdoor unit and the indoor room, resulting in too long fresh air transmission channel, large air resistance and difficult maintenance. The indoor unit may be any one of a wall-mounted indoor unit, a cabinet type indoor unit, an air machine, a ceiling-hanging indoor unit, a portable air conditioner 100. In the following embodiments, the air conditioner 100 is mainly introduced as an example of a wall-mounted indoor unit, and other types can be referred to embodiments.

[0030] As shown in FIG 1 to FIG 3, the air conditioner 100 is a wall-mounted indoor unit, the fresh air module 200 is provided at an end of the housing 101 along the length direction thereof. In this way, the shape and the structure of the housing 101 of the wall-mounted indoor unit can be fully used, so that the fresh air module 200 can be added without affecting the original structure, the production cost is low and the appearance of the air conditioner is beautiful.

[0031] As shown in FIG 4 to FIG 8, the fresh air module 200 includes a casing 10, a centrifugal turbine 70 and a separator 30, the casing 10 is provided with an air inlet 11, an air outlet 12, and a fresh air duct communicated with the air inlet 11 and the air outlet 12, the centrifugal turbine 70 and the separator are provided in the fresh air duct, the separator 30 divides the fresh air duct into an air inlet chamber 21 close to the air inlet 11 and a centrifugal air chamber 22 provided with a centrifugal turbine 70, the separator 30 is provided with a vent 31 communicated with the air inlet chamber 21 and the centrifugal air chamber 22, and is provided corresponding to an air inlet end of the centrifugal turbine 70, a ratio S1/S2 of a width dimension of the air inlet chamber and the centrifugal air chamber in an axial direction of the centrifugal turbine is not less than 0.7 and not greater than 1.3.

[0032] In an embodiment, the fresh air inlet is communicated with the outdoor to introduce the outdoor air into the air inlet chamber 21, the centrifugal turbine 70 drives the air to flow, so that the air flows through the air inlet chamber 21, then further flows into the centrifugal turbine 70 in the centrifugal air chamber 22 from the vent 31, and finally flows out from the air outlet 12 to the indoor room. In this way, the fresh air of the indoor environment gets supplied by providing the fresh air module 200 and the air quality of the indoor environment is improved.

[0033] As shown in FIG 2 and FIG 7, in the embodiment, an axial direction of the centrifugal turbine 70 extends along the length direction of the wall-mounted indoor unit, that is, the air inlet chamber 21 and the centrifugal air chamber 22 are distributed successively along the length direction of the wall-mounted indoor unit, in this way, a cross-section of the wall-mounted indoor unit housing 101 matches with the size of the centrifugal turbine 70, the housing 101 can provide enough space for mounting the centrifugal turbine 70, while the thickness of the fresh air module 200 in the length direction of the wall-mounted indoor unit is thin, so that the fresh air module 200 is flat, and matches the housing 101 of the wall-mounted indoor unit in shape. In this way, compared to the traditional indoor unit, the wall-mounted indoor unit provided with the fresh air module 200 is just longer in length, and is slightly different in appearance, both of them are quite beautiful.

[0034] The centrifugal turbine 70 has air inlet in the axial direction and air outlet in the radial direction. In an embodiment, the air outlet 12 is communicated with the centrifugal air chamber 22, and is located at a side of the centrifugal turbine 70. In this embodiment, as shown in FIG 7 and FIG 8, the separator divides the fresh air duct into an air inlet chamber 21 and a centrifugal air chamber 22, the separator 30 may be detachably communicated with the casing 10, and can also be integrally formed with the casing 10. The specific shape of the separator 30 can be a plate or in other forms, which can form a vent 31 corresponding to the centrifugal turbine 70. The vent 31 is communicated with the air inlet chamber 21 and the centrifugal air chamber 22 to guide the airflow flowing into the centrifugal air chamber 22 through the air inlet chamber 21 and the vent 31. The shape and size of the vent 31 match with the air inlet end of the centrifugal air turbine 70 to provide an inlet air to the axial direction of the centrifugal turbine 70. An area of the vent 31 is basically same as or slightly smaller than an area of the air inlet end of the centrifugal turbine 70. It can be understood that a cross-sectional area of the air inlet chamber in the axial direction of the centrifugal turbine 70 is larger than an area of the vent 31. The overall shape and size of the centrifugal air chamber 22 should match with the centrifugal turbine 70, the centrifugal air chamber 22 can be in a shape of volute housing, so that the airflow in the centrifugal air chamber 22 can be smoothly sent out of the air outlet 12 by the centrifugal turbine 70.

[0035] A width dimension in an axial direction of the centrifugal turbine 70 of the air inlet chamber 21 and the centrifugal air chamber 22 should match with each other, otherwise, when the size of the air inlet chamber 21 is small relative to the centrifugal air chamber 22, a distance between the inner wall of the air inlet chamber 21 is too close, the air resistance of the air inlet chamber 21 is too large, the pressure loss in the process of the airflow flowing from the air inlet 11 to the vent 31 is excessive, resulting in an insufficient air pressure at an air inlet end of the centrifugal turbine 70, so that the air supply capacity of the centrifugal turbine 70 cannot be fully performed, and the fresh air volume of the fresh air module 200 is small. However, when the size of the air inlet chamber is larger than the centrifugal air chamber 22, the overall size of the fresh air duct will be larger, so that the size of the fresh air chamber will be further enlarged, without increasing the size of the centrifugal turbine 70, the improvement effect of the fresh air volume is limited, and the overall structure of the fresh air module 200 is not compact enough, which causes unnecessary waste of space.

[0036] In the embodiment, the ratio S1/S2 of the width dimension of the air inlet chamber 21 and the centrifugal air chamber 22 in an axial direction of the centrifugal turbine 70 is not less than 0.7 and not greater than 1.3. In the above range, the air intake volume of the air inlet chamber 21 matches with the air supply volume of the centrifugal turbine 70, so that the air supply capacity of the centrifugal turbine 70 will not be insufficient due to the small size of the air inlet chamber 21 and an excessive air resistance, and the space will not be wasted due to the large size of the air inlet chamber 21. In this way, the reasonable setting of the structure and the size in the fresh air duct can make the centrifugal turbine 70 fully supply air in a limited space, so that the fresh air volume of the fresh air module 200 is in a reasonable range, and the overall structure of the fresh air module 200 is compact and occupies less space.

[0037] It should be noted that, as shown in FIG 7, the width dimension of the air inlet chamber 21 and the centrifugal air chamber 22 in the axial direction of the centrifugal turbine 70 refers to a net size of the two inner walls of the chamber in the axial direction of the centrifugal turbine 70, when the net size is inconsistent within the chamber, the net size refers to an average value of the net size of each place within the chamber.

[0038] FIG. 9 is a trend graph showing a change of the fresh air volume with the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine 70. As shown in FIG 9, in an embodiment, when the ratio S1/S2 of a width dimension of the air inlet chamber 21 and the centrifugal air chamber 22 in an axial direction of the centrifugal turbine 70 is not less than 0.7 and not greater than 1.3, the fresh air volume corresponds to be in the range of 20-26 m^3/h. It can be further seen from the figure that the ventilation effect will be better when the width dimension of the air inlet chamber 21 in the axial direction of the centrifugal turbine 70 is closer to but no larger than that of the centrifugal air chamber 22. However, if continue to enlarge the size of the air inlet chamber 21, the improvement effect of the fresh air volume will not be significant when the width dimension of the air inlet chamber 21 in the axial direction of the centrifugal turbine 70 is larger than that of the centrifugal air chamber 22. Thus, in an embodiment, the ratio S1/S2 of the width dimension of the air inlet chamber 21 and the centrifugal air chamber 22 in an axial direction of the centrifugal turbine 70 is not less than 0.9 and not greater than 1.3, in the above range, the fresh air volume corresponds to be in the range of 23-26 m^3/h. In an embodiment, the ratio S1/S2 of a width dimension of the air inlet chamber and the centrifugal air chamber in an axial direction of the centrifugal turbine is not less than 1.0

and not greater than 1.2, and in the above range, the fresh air volume of the fresh air module 200 is above 25 m^3/h, which can achieve better ventilation effect.

[0039] In an embodiment, as shown in FIG 7 and FIG 8, the fresh air module 200 further includes a purification assembly provided in the fresh air duct, and the purification assembly corresponds to the air inlet end of the centrifugal turbine 70. When the fresh air module 200 is working, the centrifugal turbine 70 is turned on, the centrifugal turbine 70 drives the fresh air to enter the fresh air duct from the air inlet 11, the fresh air flows into the air inlet end of the centrifugal turbine 70, and is purified into a cleaned fresh air by the purification assembly at the air inlet end of the centrifugal turbine 70, then the cleaned fresh air flows into the inner part of the centrifugal turbine 70 from the air inlet end, then is thrown out to the air outlet 12 by the centrifugal turbine 70 along its radial direction, and finally blow out from the air outlet 12.

[0040] Apparently, the centrifugal turbine 70 has air inlet in the axial direction and air outlet in the radial direction, compared with the air inlet 11 and the relatively narrow air inlet surface near the air inlet 11, a larger air inlet surface is formed at the air inlet end of the centrifugal turbine 70, so that the air inlet space formed here is large. Therefore, the purification assembly corresponds to the air inlet end of the centrifugal turbine 70, and the purification surface used for purifying the air of the purification assembly can be larger to improve the air purification efficiency of the purification assembly. Besides, due to the large purification assembly, the purification capacity of the purification assembly (the air volume that can be purified by the purification assembly) is correspondingly larger, and a life of the purification assembly can further be elongated, resulting in a longer cycle of replacing the purification assembly.

[0041] As for the structure of the purification assembly, there may be various design schemes, which is not limited herein. For example but not limited to: the purification assembly may be suitable for removing any one or more of air pollutants such as dust, fine particles, microorganisms, organic volatile gases such as formaldehyde, etc. The specific type of a purification piece 40 may be selected according to its function, for example, the purification piece 40 may be any one or a combination of ordinary filter net or HEPA net or formaldehyde remover or IFD filter, and can also be any one or a combination of a primary filter net, medium-efficiency filter net, and a high-efficiency filter net.

[0042] The opening position of the air inlet 11 can be set as required. In an embodiment, as shown in FIG 7, the air inlet 11 is provided at an end of the air inlet chamber 21 away from the vent 31, which alleviates a disturbing from an inlet airflow to the airflow of the vent 31 that flows to the air inlet end of the centrifugal turbine 70 along the axial direction of the centrifugal turbine 70. Furthermore, the purification assembly is provided in the air inlet chamber 21, the airflow is able to fully flow through the purification assembly in the air inlet chamber 21 and sent to the centrifugal turbine 70 after purification due to the providing of the air inlet 11. Specifically, the bottom of the casing 10 of the fresh air module 200 is provided with the air inlet 11, the top or front side or left side or right side of the casing 10 can also be provided with the air outlet 12, which can be correspondingly designed according to the specific type of the air conditioner 100 applied to the fresh air module 200 in practical applications. As shown in FIG 2 and FIG 3, according to the structure of the wall-mounted indoor unit, the bottom of the casing 10 may be provided with the air inlet 11, the front side of the casing 10 may be provided with the air outlet 12, the air inlet 11 and the air outlet 12 are located different axial directions of the centrifugal turbine 70, an angle "a" is formed in the direction of the air inlet and the air outlet, so that the fresh airflow can be fully purified and pumped to the air outlet 12 through the centrifugal turbine 70 to be blown to the indoor room.

[0043] In an embodiment, the purification assembly includes a mounting bracket 41 and a purification piece 40 provided on the mounting bracket 41, the purification piece 40 is mounted on the separator 30 through the mounting bracket 31, and the purification piece 40 is flat, which may be a common filter net or HEPA net, and a ventilation area of the purification piece 40 is larger than the that of the vent 31 to completely cover the vent 31, so that the purification assembly can obtain a larger purification surface, capture more air pollutants and improve the purification efficiency of the purification assembly.

[0044] Furthermore, as shown in FIG 7 and FIG. 8, the purification piece 40 is obliquely provided relative to a plane where the vent 31 is located, so that the vent 31 and the air inlet 11 are located on two sides of the purification piece 40 respectively. In the embodiment, the space of the air inlet chamber 21 allows the purification room to be oblique, which further enlarges the ventilation area of the purification room to improve a purification effect. Specifically, considering the size of the air inlet chamber 21 and the effect of the improvement to the ventilation area of the purification piece 40, the angle "a" between the purification piece 40 and the plane where the vent is located is not less than 10 degrees and not greater than 20 degrees, so that the space of the air inlet chamber 21 can be fully used and the ventilation area of the purification piece 40 is effectively increased to improve the purification effect.

[0045] Based on the embodiment, as shown in FIG 7 and FIG. 8, the mounting bracket 41 includes an collecting ring 42, one end of the collecting ring 42 is covered with the purification piece 40, another end of the collecting ring 40 is communicated with the vent 31, and an inner wall of the collecting ring 40 is tapered from the purification piece 40 to the vent 31. In the embodiment, due to the affection of the purification piece 40, the velocity of the airflow flowing through the purification piece 40 is slow. Thus, the collecting ring 42 is provided to collect the air flowing through the purification piece 40, and guide the airflow to flow to the centrifugal turbine 70 through the vent 31.

[0046] In an embodiment, as shown in FIG 7, the fresh air module 200 further includes a valve assembly including a damper 50 openably provided in the air inlet 11 and a driving part 51 for driving the damper to open or close the air inlet.

In this way, the valve can be opened when the fresh air module 200 is working and can be closed when the fresh air module 200 is turned off to avoid the airflow flowing back to the fresh air module 200. For example, in winter, the outdoor temperature is low, the air inlet 11 can be closed through the damper 50 to avoid the outdoor cold air entering and freezing the fresh air module 200 or entering the indoor room through the fresh air module 200.

[0047] Furthermore, in order to facilitate the airflow to enter the centrifugal turbine 70 through the vent 31, as shown in FIG 8, a periphery of the vent 31 is constructed with a guide ring 32 tapered from the air inlet chamber 21 to the centrifugal air chamber 22. In order to reduce the resistance of the airflow passing through the vent 31 and increase the air pressure on the air outlet side of the vent 31, which helps to guide the airflow to flow through the vent 31 and enter the centrifugal rotor 70.

[0048] Furthermore, considering the requirement of the fresh air volume of the fresh air module 200 and the space size of the casing 10 of the air conditioner 100, the diameter of the centrifugal turbine 70 is not less than 100 mm and not greater than 150 mm, which makes the size of the centrifugal turbine 70 meet the air volume requirement and occupy a narrow space, so that the fresh air module 200 has a compact structure and can meet a need of the wall-mounted indoor unit.

[0049] In an embodiment, the maximum dimension of the fresh air module 200 in the axial direction of the centrifugal turbine70 is not less than 90 mm and not greater than 110 mm. In this way, the overall fresh air module 200 has a relatively thin thickness, which can meet the requirement of the narrow space in the housing 101 of the air conditioner 100, and can be mounted in the housing 101 of the air conditioner 100.

[0050] As shown in FIG 1 to FIG 3, the present disclosure further provides an air conditioner 100, the air conditioner 100 includes a housing 101 and the fresh air module 200 provided in the housing 101. The specific structure of the fresh air module 200 refers to the above-mentioned embodiments. Since the air conditioner 100 adopts all the technical solutions of the above-mentioned embodiments, it at least has all the beneficial effects brought by the technical solutions of the above-mentioned embodiments, and will not be repeated here. The air conditioner 100 is any one of a wall-mounted indoor unit, a cabinet type indoor unit, an air machine, a ceiling type indoor unit, or a portable air conditioner. In an embodiment, the air conditioner 100 is a wall-mounted indoor unit.

[0051] The above are only some embodiments of the present disclosure, and do not limit the scope of the present disclosure thereto. Under the inventive concept of the present disclosure, equivalent structural transformations made according to the description and drawings of the present disclosure, or direct/indirect application in other related technical fields are included in the scope of the present disclosure.

Claims

1. Afresh air module, **characterized by** comprising:

   a casing provided with an air inlet, an air outlet and a fresh air duct communicated with the air inlet and the air outlet;
   a centrifugal turbine provided in the fresh air duct; and
   a separator provided in the fresh air duct to divide the fresh air duct into an air inlet chamber close to the air inlet and a centrifugal air chamber provided with the centrifugal turbine,
   wherein a vent is provided on the separator, the vent is communicated with the air inlet chamber and the centrifugal air chamber, the vent is provided corresponding to an air inlet end of the centrifugal turbine; and
   wherein a ratio S1/S2 of a width dimension of the air inlet chamber and the centrifugal air chamber in an axial direction of the centrifugal turbine is not less than 0.7 and not greater than 1.3.

2. The fresh air module of claim 1, wherein the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine is not less than 0.9 and not greater than 1.3.

3. The fresh air module of claim 2, wherein the ratio S1/S2 of the width dimension of the air inlet chamber and the centrifugal air chamber in the axial direction of the centrifugal turbine is not less than 1.0 and not greater than 1.2.

4. The fresh air module of claim 1, further comprising:
   a purification assembly provided in the fresh air duct and corresponding to the air inlet end of the centrifugal turbine.

5. The fresh air module of claim 4, wherein the air inlet is provided at an end of the air inlet chamber away from the centrifugal turbine, and the purification assembly is provided in the air inlet chamber.

6. The fresh air module of claim 4, wherein the purification assembly comprises a mounting bracket and a purification piece provided on the mounting bracket, the purification piece is flat and is mounted on the separator through the

mounting bracket, and a ventilation area of the purification piece is larger than that of the vent.

7. The fresh air module of claim 6, wherein the purification piece is oblique relative to a plane where the vent is located, and the vent and the air inlet are located on two sides of the purification piece respectively.

8. The fresh air module of claim 7, wherein an angle "a" between the purification piece and the plane where the vent is located is not less than 10 degrees and not greater than 20 degrees.

9. The fresh air module of any one of claims 6 to 8, wherein the mounting bracket comprises a collecting ring, one end of the collecting ring is covered with the purification piece, another end of the collecting ring is communicated with the vent, and an inner wall of the collecting ring is tapered from the purification piece to the vent.

10. The fresh air module of any one of claims 1 to 3, further comprising:
a valve assembly, comprising:

a damper openably provided in the air inlet; and
a driving part for driving the damper to open or close the air inlet.

11. The fresh air module of any one of claims 1 to 3, wherein a periphery of the vent is provided with a guide ring tapered from the air inlet chamber to the centrifugal air chamber.

12. The fresh air module of any one of claims 1 to 3, wherein a diameter of the centrifugal turbine is not less than 100 mm and not greater than 150 mm.

13. The fresh air module of claim 12, wherein the maximum dimension of the fresh air module in the axial direction of the centrifugal turbine is not less than 90 mm and not greater than 110 mm.

14. An air conditioner, **characterized by** comprising:

a housing; and
the fresh air module of any one of claims 1 to 13,
wherein the fresh air module is provided in the housing.

15. The air conditioner of claim 14, wherein the air conditioner is a wall-mounted indoor unit, the fresh air module is provided on an end of the housing along a length direction of the housing, and an axial direction of the centrifugal turbine extends along the length direction of the housing.

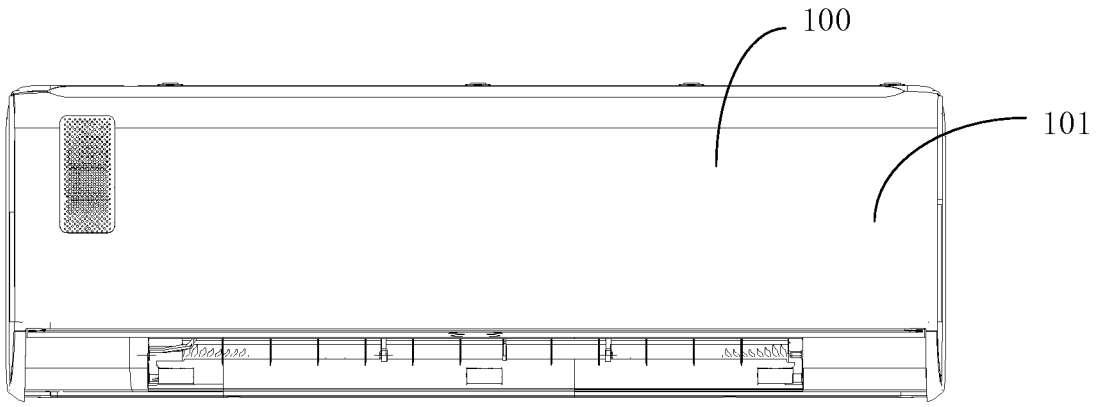

FIG. 1

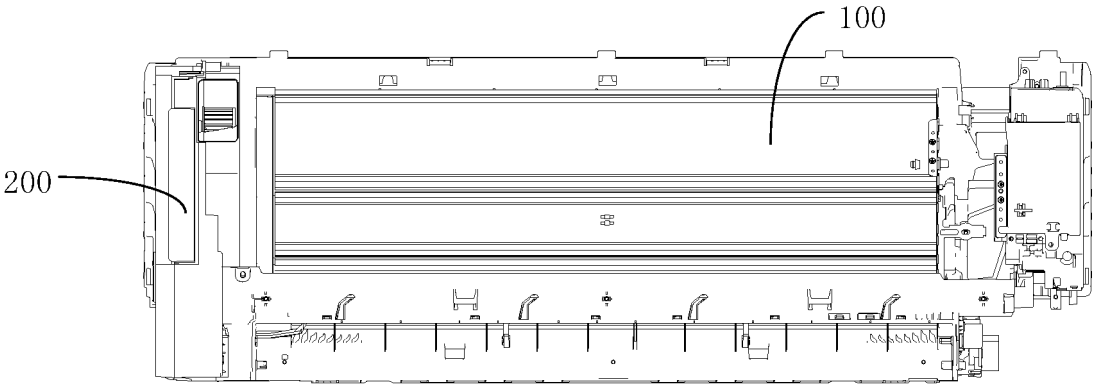

FIG. 2

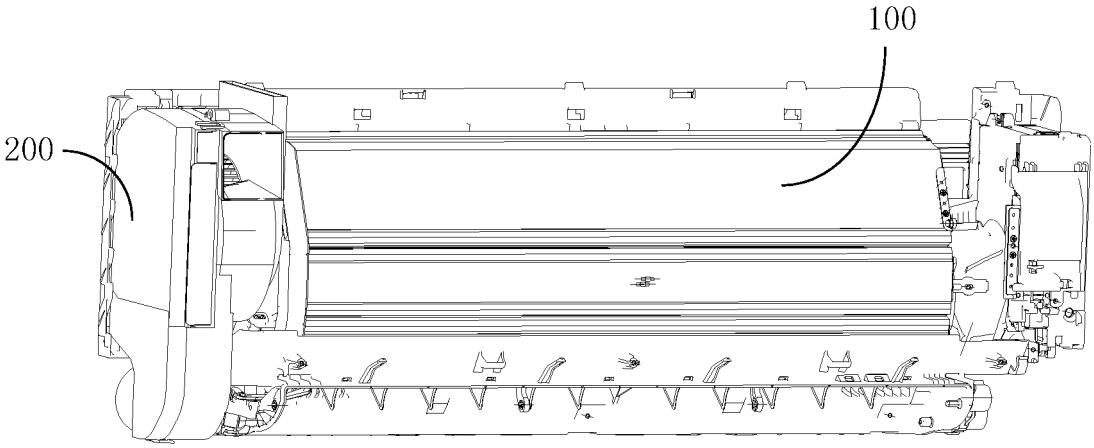

FIG. 3

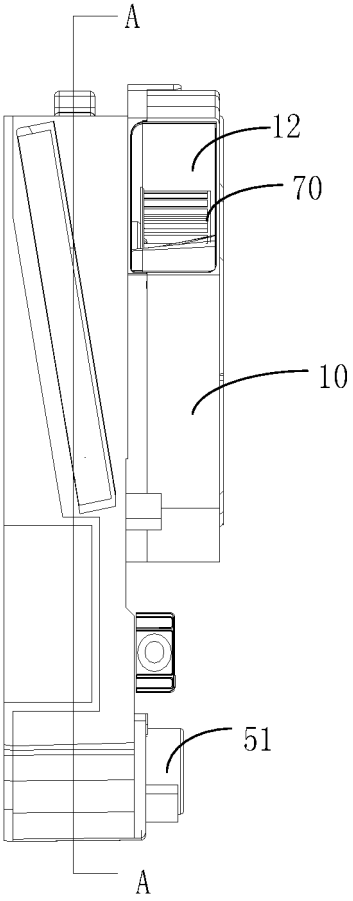

FIG. 4

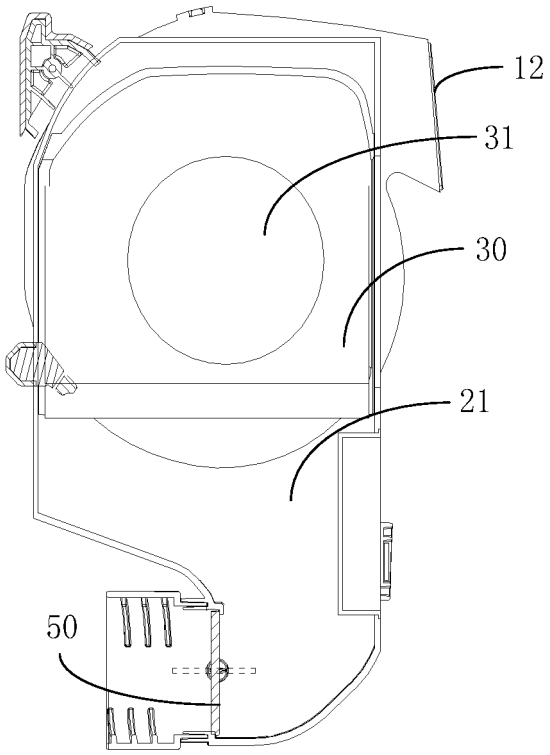

FIG. 5

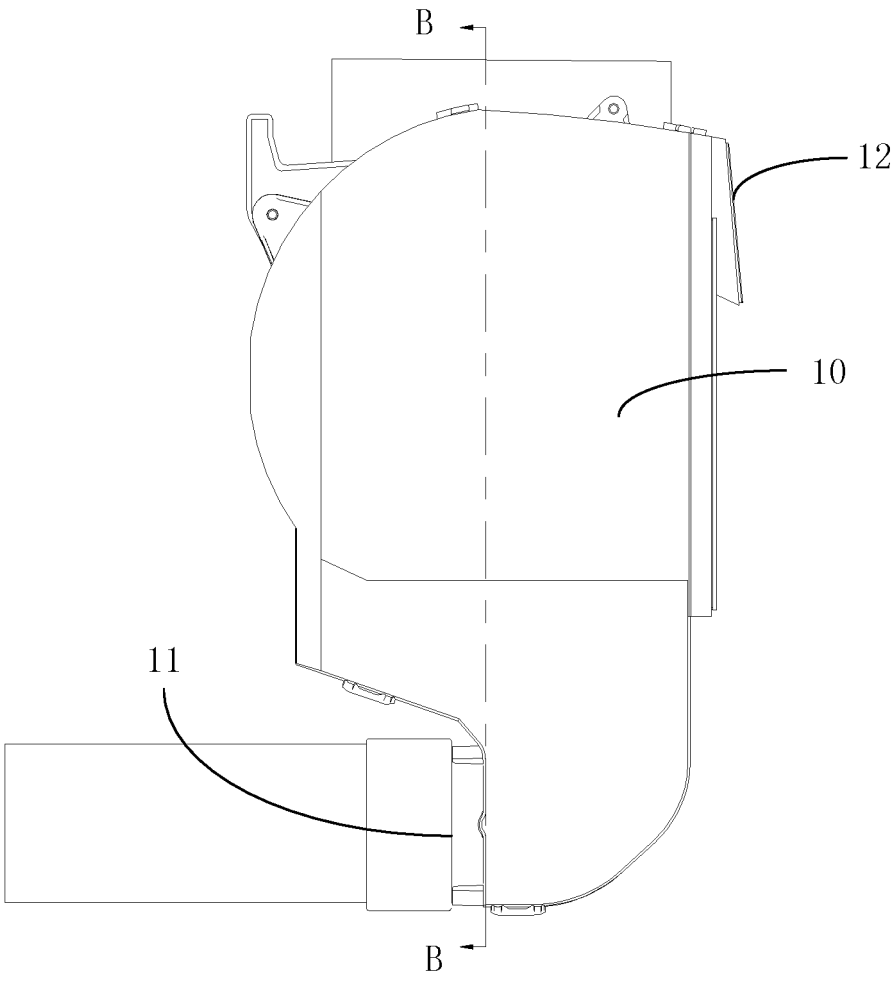

FIG. 6

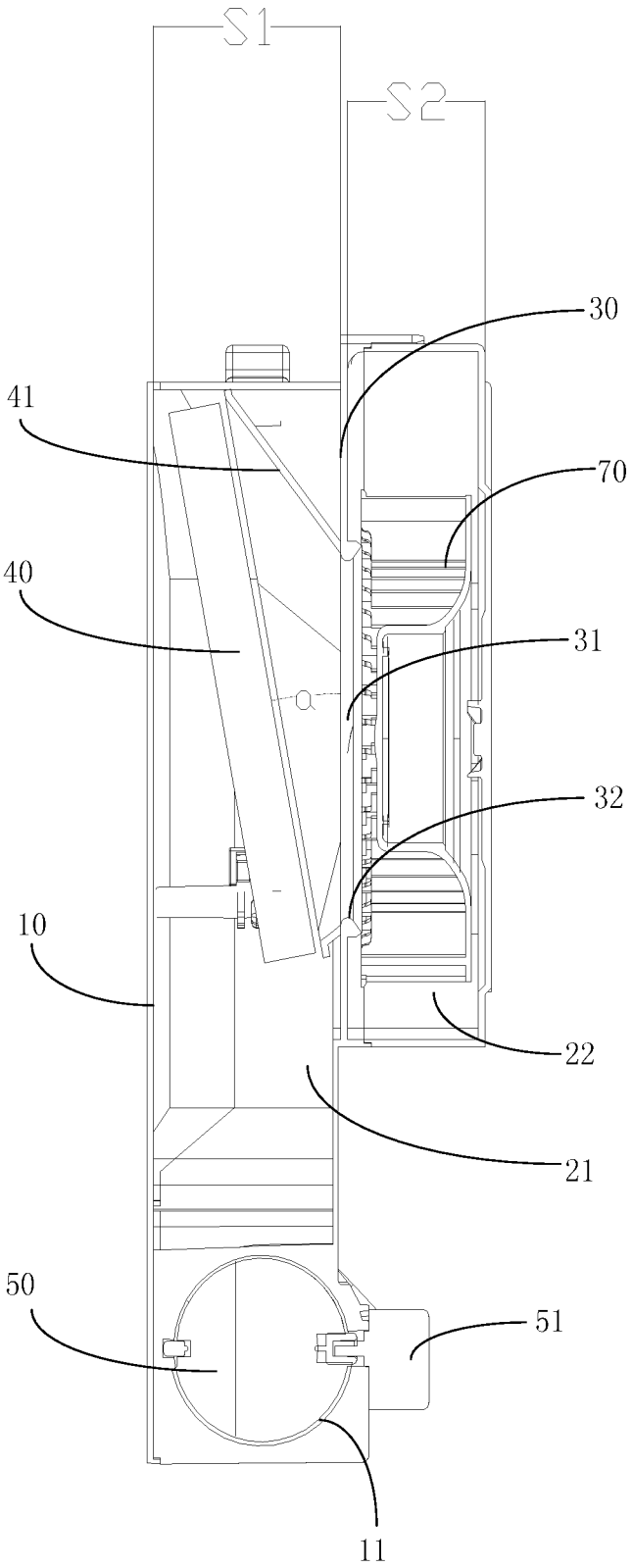

FIG. 7

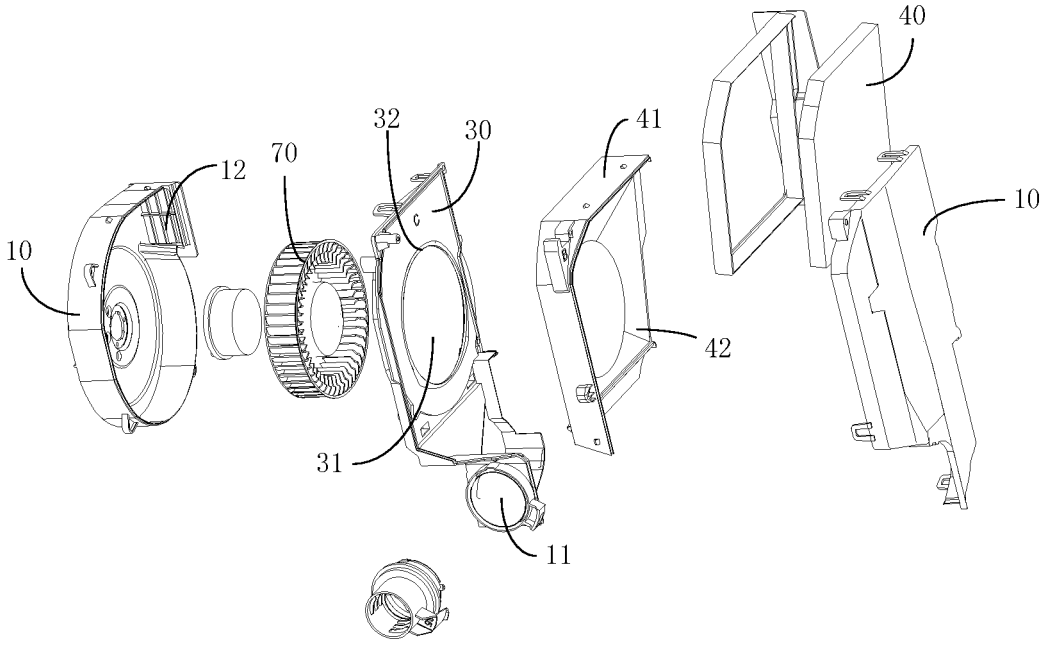

FIG. 8

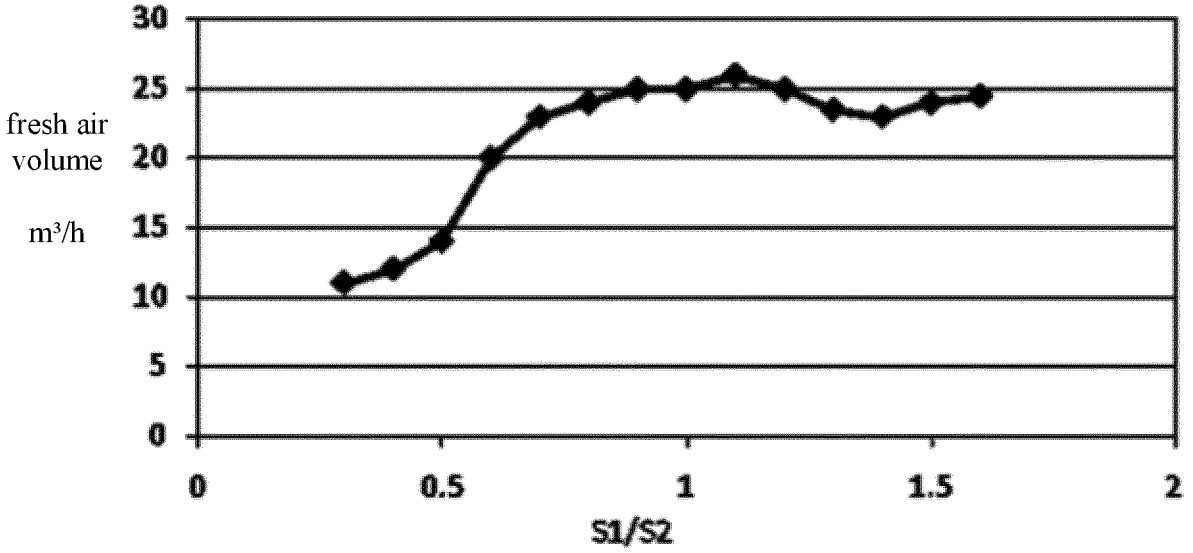

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/107198

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/0035(2019.01)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)

F24F1

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)

CNABS, VEN, CNTXT, CNKI: 新风, 空调, 尺寸, 空间, 宽度, 长度, 比例, 进风, 出风, 送风, 腔, 离心, 风机, 风扇, 净化, 导风, fresh air, air condition+, size, space, width, length, ratio, suction, discharge, chamber, centrifug+, fan, blower, purifi+, air guid+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 212618748 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 26 February 2021 (2021-02-26) description, paragraphs [0040]-[0065], and figures 1-9	1-15
Y	CN 111306631 A (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD.) 19 June 2020 (2020-06-19) description paragraphs [0039]-[0047], figures 3, 5, 9	1-15
Y	CN 209926453 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 10 January 2020 (2020-01-10) description, paragraphs [0034]-[0040]	1-15
A	CN 106545981 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 29 March 2017 (2017-03-29) entire document	1-15
A	CN 210345665 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 17 April 2020 (2020-04-17) entire document	1-15

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
15 September 2021	**18 October 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.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/107198

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 108266797 A (HISENSE (SHANDONG) AIR-CONDITIONING CO., LTD.) 10 July 2018 (2018-07-10) entire document	1-15
A	CN 111059622 A (NINGBO AUX ELECTRIC CO., LTD. et al.) 24 April 2020 (2020-04-24) entire document	1-15
A	CN 209557295 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 29 October 2019 (2019-10-29) entire document	1-15
A	JP 2016164468 A (MITSUBISHI HEAVY IND. LTD.) 08 September 2016 (2016-09-08) entire document	1-15

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/107198

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 212618748 U	26 February 2021	None	
CN 111306631 A	19 June 2020	None	
CN 209926453 U	10 January 2020	None	
CN 106545981 A	29 March 2017	CN 106545981 B	15 March 2019
		CN 107957123 A	24 April 2018
		CN 107957123 B	26 November 2019
CN 210345665 U	17 April 2020	None	
CN 108266797 A	10 July 2018	WO 2019137557 A1	18 July 2019
CN 111059622 A	24 April 2020	None	
CN 209557295 U	29 October 2019	None	
JP 2016164468 A	08 September 2016	None	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 202021435973 **[0001]**