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(54) **AIR CONDITIONER**

(57) An air condition, comprising: a housing (1), a first refrigerant detection area (151) being provided in the housing (1), a second refrigerant detection area (152) being provided outside the housing (1), and the first refrigerant detection area (151) being communicated with the second refrigerant detection area (152); an indoor heat exchanger (2) arranged in the housing (1), the input port and output port of the indoor heat exchanger (2) being located in the first refrigerant detection area (151); a refrigerant input pipe (31) and a refrigerant output pipe (32) respectively connected to the input port and output port of the indoor heat exchanger (2), the ends of the refrigerant input pipe (31) and the refrigerant output pipe (32) distant from the indoor heat exchanger (2) being both provided with a pipe fitting connector (33), the pipe fitting connectors (33) passing through the housing (1) and being configured to be connected to indoor and outdoor unit connecting pipes (34) located outside the housing (1), and connection parts between the pipe fitting connectors (33) and the indoor and outdoor unit connecting pipes (34) being located in the second refrigerant detection area (152); and a refrigerant detection sensor (4), at

least one of the first refrigerant detection area (151) and the second refrigerant detection area (152) being provided with the refrigerant detection sensor (4).

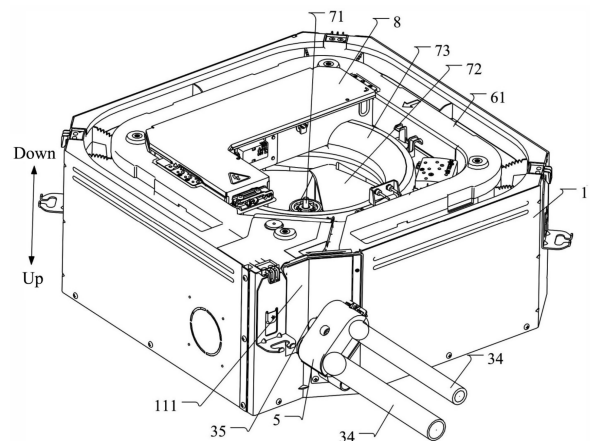


FIG. 3

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Description

[0001] This application claims priorities of a Chinese patent application filed on August 31, 2023 with application No. 202311121844.7 and entitled "Air Conditioner" and a Chinese patent application filed on August 31, 2023 with application No. 202322370692.6 and entitled "Air Conditioner", the contents of which should be understood to be incorporated herein by reference.

Technical Field

[0002] The present application relates to, but is not limited to, the technology of electrical equipment, and in particular an air conditioner.

Background

[0003] At present, some air conditioners cannot detect whether the refrigerant is leaked. When the refrigerant has been leaked for a period of time, there is a problem of high concentration of the leaked refrigerant, and some refrigerants are flammable, resulting in the risk of flammability and explosiveness.

Summary

[0004] The following is a summary of the subject matter described in detail herein. This summary is not intended to limit the protection scope of the claims.

[0005] An embodiment of the present disclosure provides an air conditioner, comprising: a housing, a first refrigerant detection area being provided in the housing, a second refrigerant detection area being provided outside the housing, and the first refrigerant detection area being in communication with the second refrigerant detection area; an indoor heat exchanger arranged in the housing, an input port and an output port of the indoor heat exchanger being located in the first refrigerant detection area; a refrigerant input pipe and a refrigerant output pipe respectively connected to the input port and the output port of the indoor heat exchanger, ends of the refrigerant input pipe and the refrigerant output pipe away from the indoor heat exchanger being provided with pipe-fitting connectors, the pipe-fitting connectors passing through the housing and being configured to be connected to indoor and outdoor unit connecting pipes located outside the housing, and connection parts between the pipe-fitting connectors and the indoor and outdoor unit connecting pipes being located in the second refrigerant detection area; and a refrigerant detection sensor, at least one of the first refrigerant detection area and the second refrigerant detection area being provided with the refrigerant detection sensor.

[0006] Other aspects will become apparent after reading and understanding the drawings and detailed description.

Brief Description of Drawings

[0007] Accompanying drawings are used to provide a further understanding of technical solutions of the present disclosure, and constitute a portion of the description, they are used together with embodiments of the present disclosure to explain the technical solutions of the present disclosure, and do not constitute a restriction on the technical solutions of the present disclosure.

FIG. 1 is a schematic exploded view of a structure of an indoor unit of an air conditioner according to some embodiments of the present disclosure;

FIG. 2 is a partial schematic bottom view of a structure of an indoor unit according to some embodiments of the present disclosure;

FIG. 3 is a schematic view of an assembly structure of the structure shown in FIG. 2 and indoor and outdoor unit connecting pipes and a sealing box;

FIG. 4 is a schematic view of the structure shown in FIG. 3 without the sealing box;

FIG. 5 is a schematic view of a partial three-dimensional structure of the indoor unit shown in FIG. 2;

FIG. 6 is a schematic view of a structure of a sealing box in an open state provided by some embodiments of the present disclosure; and

FIG. 7 is a schematic view of a structure of the sealing box shown in FIG. 6 in a closed state.

[0008] The reference signs are as follows:

1 housing, 11 side enclosure plate, 111 pipe-fitting pressing plate, 12 panel, 13 base plate, 14 heat exchanger connecting plate, 141 first end plate, 142 second end plate, 143 side plate, 151 first refrigerant detection area, 152 second refrigerant detection area;

2 indoor heat exchanger;

31 refrigerant input pipe, 32 refrigerant output pipe, 33 pipe-fitting connector, 34 indoor and outdoor unit connecting pipe, 35 refrigerant guide pipe;

4 refrigerant detection sensor;

5 sealing box, 51 box lid, 511 first connecting hole, 512 lug, 513 snap-fit member, 514 third connecting hole, 515 connecting boss, 516 reinforcing rib, 52 box body, 521 second connecting hole, 522 engagement slot, 523 extending plate, 524 connecting post, 531 first through hole, 532 second through hole, 533

third through hole, 534 fourth through hole, 535 fifth through hole;

61 water receiving pan, 62 water pump, 63 drain pipe;

71 motor, 72 wind wheel, 73 guide ring;

8 electrical control box.

Detailed Description

[0009] A plurality of embodiments are described in the present disclosure, but such description is exemplary and not restrictive, and for those skilled in the art, there may be more embodiments and implementations within the scope of the embodiments described in the present disclosure. Although many possible combinations of features are shown in the drawings and discussed in the implementations, many other combinations of the disclosed features are also possible. Unless specifically limited, any feature or element of any embodiment may be used in combination with, or may be substituted for, any other feature or element of any other embodiment.

[0010] Combinations with features and elements known to those skilled in the art are comprised and contemplated herein. The embodiments, features, and elements already disclosed in the present disclosure may also be combined with any conventional features or elements to form a unique technical scheme defined by the claims. Any feature or element of any embodiment may also be combined with features or elements from other technical schemes to form another unique technical scheme as defined by the claims. Accordingly, any of the features shown and/or discussed in the present disclosure may be implemented alone or in any suitable combination. Accordingly, the embodiments are not limited other than in accordance with the appended claims and their equivalents. Furthermore, various modifications and changes can be made within the scope of the appended claims.

[0011] An embodiment of the present disclosure provides an air conditioner, which may be, but is not limited to, a ceiling unit, as shown in FIG. 1.

[0012] Specifically, as shown in FIGs. 1 to 3, the air conditioner comprises a housing 1, an indoor heat exchanger 2, a refrigerant input pipe 31, a refrigerant output pipe 32, a refrigerant detection sensor 4, and an indoor and outdoor unit connecting pipe 34.

[0013] As shown in FIG. 2, a first refrigerant detection area 151 (as indicated by a large dashed line frame in FIG. 2) is provided in the housing 1, and a second refrigerant detection area 152 (as indicated by a small dashed line frame in FIG. 2) is provided outside the housing 1. The first refrigerant detection area 151 is in communication with the second refrigerant detection area 152.

[0014] The indoor heat exchanger 2 is disposed in the housing 1, and an input port and an output port of the indoor heat exchanger 2 are located in the first refrigerant detection area 151.

5 **[0015]** As shown in FIGs. 1, 2 and 5, the refrigerant input pipe 31 and the refrigerant output pipe 32 are respectively connected to the input port and the output port of the indoor heat exchanger 2 (i.e., the refrigerant input pipe 31 is connected to the input port of the indoor heat exchanger 2, and the refrigerant output pipe 32 is connected to the output port of the indoor heat exchanger 2), and ends of the refrigerant input pipe 31 and the refrigerant output pipe 32 away from the indoor heat exchanger 2 are provided with pipe-fitting connectors 33. As shown in FIGs. 3 and 4, the pipe-fitting connectors 33 pass through the housing 1 and are configured to be connected to indoor and outdoor unit connecting pipes 34 located outside the housing 1. Connection parts between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34 are located in the second refrigerant detection area 152.

20 **[0016]** As shown in FIGs. 1 and 5, at least one of the first refrigerant detection area 151 and the second refrigerant detection area 152 is provided with a refrigerant detection sensor 4. In other words, only the first refrigerant detection area 151 may be provided with the refrigerant detection sensor 4. Alternatively, only the second refrigerant detection area 152 may be provided with the refrigerant detection sensor 4. Alternatively, both the first refrigerant detection area 151 and the second refrigerant detection area 152 may be provided with the refrigerant detection sensor 4.

30 **[0017]** The housing 1 is a housing 1 of an indoor unit. The air conditioner may further comprise an outdoor unit (not shown in the figure). The indoor unit and the outdoor unit are connected by two indoor and outdoor unit connecting pipes 34 to ensure that the refrigerant can circulate and flow between the indoor unit and the outdoor unit to form a refrigerant circulation.

35 **[0018]** After research and analysis, it is found that, as shown in FIG. 2, there are two main positions where refrigerant leakage is prone to occur in the air conditioner. The first position is located in the housing 1 of the indoor unit, which is the connection position between the indoor heat exchanger 2 and the refrigerant input pipe 31 and the refrigerant output pipe 32, and the position of the U-shaped tube of the refrigerant input pipe 31 and the refrigerant output pipe 32. The second position is located outside the housing 1 of the indoor unit, and is the connection part between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34.

40 **[0019]** Therefore, in the embodiment of the present disclosure, the first refrigerant detection area 151 is provided in the housing 1, and the second refrigerant detection area 152 is provided outside the housing 1. As shown in FIG. 2, the first refrigerant detection area 151 corresponds to the first position where refrigerant leakage is prone to occur in the housing 1, and the second

refrigerant detection area 152 corresponds to the second position where refrigerant leakage is prone to occur outside the housing 2. Further, the leaked refrigerant is usually in a gaseous state, and since the first refrigerant detection area 151 is in communication with the second refrigerant detection area 152, the refrigerant in the first refrigerant detection area 151 can flow to the second refrigerant detection area 152, and the refrigerant in the second refrigerant detection area 152 can flow to the first refrigerant detection area 151. Therefore, at least one of the first refrigerant detection area 151 and the second refrigerant detection area 152 is provided with the refrigerant detection sensor 4, which can detect two positions where refrigerant leakage is prone to occur inside and outside the housing 1. Moreover, the refrigerants in the two refrigerant detection areas can be collected to increase the concentration of the refrigerant, which is beneficial for improving the detection sensitivity of the refrigerant detection sensor 4, and beneficial for the refrigerant detection sensor 4 to quickly detect the refrigerant leakage and give an alarm in time. Additionally, the two refrigerant detection areas inside and outside can be quickly detected by using only one refrigerant detection sensor 4 so as to save cost.

[0020] The refrigerant detection sensor 4 may be configured with an alarm device, or the air conditioner may be additionally provided with an alarm device, so that when the refrigerant detection sensor 4 detects the refrigerant leakage, the alarm device issues a detection alarm in time.

[0021] In some embodiments, if only the first refrigerant detection area 151 is provided with the refrigerant detection sensor 4, the refrigerant detection sensor 4 is located in the housing 1. This is convenient for quickly detecting whether there is refrigerant leakage in the housing 1, so as to prevent the accumulation of refrigerant in the housing 1, which could lead to risks or discharge of leaked refrigerant into the room and cause adverse impacts on users. After testing, when the refrigerant leakage occurs in the air conditioner, the refrigerant detection sensor 4 can detect the refrigerant in thirty to forty seconds and give an alarm.

[0022] Alternatively, the second refrigerant detection area 152 may be provided with the refrigerant detection sensor 4.

[0023] In some exemplary embodiments, as shown in FIG. 3, the air conditioner may further comprise a sealing box 5. The sealing box 5 is sleeved over the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34 so as to seal the connection parts between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34 in the sealing box 5. An internal space of the sealing box 5 forms the second refrigerant detection area 152. The sealing box 5 is in communication with the first refrigerant detection area 151 through a refrigerant guide pipe 35, and the refrigerant guide pipe 35 passes through the housing 1.

[0024] In this way, the refrigerant leaked from the con-

nection parts between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34 can be sealed in the sealing box 5, so that the leaked refrigerant can be prevented from spreading outward to a wide range. This is conducive to rapidly increasing the concentration of the refrigerant leaked from the second refrigerant detection area 152, thus improving the detection sensitivity of the refrigerant detection sensor 4.

[0025] In some exemplary embodiments, as shown in FIG. 6, the sealing box 5 is provided with a first through hole 531, a second through hole 532, and a third through hole 533. The two pipe-fitting connectors 33 pass through the first through hole 531 and the second through hole 532, respectively. As shown in FIG. 3, the refrigerant guide pipe 35 passes through the third through hole 533. The first through hole 531 and the second through hole 532 are located at an end of the sealing box 5 that is closer to the housing 1. A fourth through hole 534 and a fifth through hole 535 are provided at an end of the sealing box 5 away from the housing 1. The two indoor and outdoor unit connecting pipes 34 pass through the fourth through hole 534 and the fifth through hole 535, respectively.

[0026] In this way, it is possible to ensure that the connection parts between the two pipe-fitting connectors 33 and the two indoor and outdoor unit connecting pipes 34 are located in the sealing box 5, and the detection requirements can be met by adopting one sealing box 5 and one refrigerant guide pipe 35. This is beneficial for reducing the number of components, simplifying the structure and improving the assembly efficiency.

[0027] As shown in FIGs. 6 and 7, the first through hole 531, the second through hole 532, the third through hole 533, the fourth through hole 534, and the fifth through hole 535 may extend outwardly to form a tubular structure. This is beneficial for improving the reliability of fitting between the sealing box 5 and the pipe-fitting connectors 33, the indoor and outdoor unit connecting pipes 34, and the refrigerant guide pipe 35, and for preventing refrigerant leakage.

[0028] Alternatively, a plurality of sealing boxes 5 may be provided. For example, two sealing boxes 5 respectively seal the connection parts between the two pipe-fitting connectors 33 and the two indoor and outdoor unit connecting pipes 34. That is, one sealing box 5 seals the connection part between one pipe-fitting connector 33 and the corresponding indoor and outdoor unit connecting pipe 34, and the other sealing box 5 seals the connection part between the other pipe-fitting connector 33 and the other indoor and outdoor unit connecting pipe 34. Each of the sealing boxes 5 may be in communication with the first refrigerant detection area 151 through one refrigerant guide pipe 35, respectively. Alternatively, the two sealing boxes 5 are in communication with each other through one refrigerant guide pipe 35, and one of the sealing boxes 5 is in communication with the first refrigerant detection area 151 through the other refrigerant guide pipe 35.

[0029] In some exemplary embodiments, the third through hole 533 is also located at an end of the sealing box 5 that is closer to the housing 1, and is located between the first through hole 531 and the second through hole 532, as shown in FIG. 6.

[0030] Such design is beneficial for reducing the length of the refrigerant guide pipe 35 (the refrigerant flow path can be shortened), and the refrigerant guide pipe 35 can be a straight pipe (the refrigerant flow resistance can be reduced). As a result, the refrigerant in the second refrigerant detection area 152 can quickly enter the first refrigerant detection area 151, which is beneficial for improving the refrigerant detection sensitivity of the refrigerant detection sensor 4.

[0031] This arrangement allows the refrigerant guide pipe 35 to be located between the two pipe-fitting connectors 33 and to be very close to the two pipe-fitting connectors 33. Therefore, when refrigerant leakage occurs at the connection part between any pipe-fitting connector 33 and the corresponding indoor and outdoor unit connecting pipe 34, the leaked refrigerant can quickly reach the refrigerant guide pipe 35 and quickly enter the other refrigerant detection area (i.e., the first refrigerant detection area 151), which is also beneficial for improving the refrigerant detection sensitivity of the refrigerant detection sensor 4.

[0032] In addition, this enables the sealing box 5 to have a relatively regular structure, which is convenient for processing and forming.

[0033] Alternatively, the third through hole 533 may be provided at other positions on the sealing box 5, such as on the bottom wall of the sealing box 5.

[0034] In some exemplary embodiments, the sealing box 5 comprises a box body 52 and a box lid 51, as shown in FIGs. 6 and 7. The box body 52 and the box lid 51 are connected and enclose to form the second refrigerant detection area 152.

[0035] Such design can simplify the respective structures of the box body 52 and the box lid 51, and facilitate processing and forming. It also facilitates first connecting the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34, then opening the sealing box 5 and mounting it on the pipe-fitting connectors 33, the indoor and outdoor unit connecting pipes 34 and the refrigerant guide pipe 35. This approach reduces the connection difficulty between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34, improves the connection reliability between the pipe-fitting connectors 33 and the indoor and outdoor unit connecting pipes 34, and also helps to reduce the mounting difficulty of the sealing box 5.

[0036] In some exemplary embodiments, the box body 52 and the box lid 51 enclose to form a first through hole 531, a second through hole 532, a third through hole 533, a fourth through hole 534, and a fifth through hole 535, as shown in FIGs. 6 and 7.

[0037] In this way, both the box body 52 and the box lid 51 can be machined with five semicircular grooves cor-

respondingly, as shown in FIG. 6. Ten semicircular grooves are spliced correspondingly to form five through holes, as shown in FIG. 7. In this way, it is possible to eliminate the process of passing the pipe-fitting connectors 33, the indoor and outdoor unit connecting pipes 34, and the refrigerant guide pipe 35 through the corresponding through holes of the sealing box 5, which is beneficial for reducing the mounting difficulty of the sealing box 5.

[0038] In some exemplary embodiments, an end of the box body 52 is rotatably connected to an end of the box lid 51, and the other end of the box body 52 is detachably connected to the other end of the box lid 51, as shown in FIGs. 6 and 7.

[0039] When assembling, the box lid 51 can be opened, and then the box body 52 can be aligned with and snapped onto the pipe-fitting connectors 33, the indoor and outdoor unit connecting pipes 34 and the refrigerant guide pipe 35, and then the box lid 51 can be closed and fixedly connected to the box body 52. Since the box lid 51 cannot be completely detached, it is only required to ensure that the other end of the box lid 51 is aligned and connected with the other end of the box body 52, which is beneficial for simplifying the mounting process of the sealing box 5.

[0040] Of course, the connection manner of the box lid 51 and the box body 52 is not limited thereto, and for example, the two ends of the box lid 51 may be detachably connected to the box body 52.

[0041] In some exemplary embodiments, an end of the box body 52 and an end of the box lid 51 form a rotatable integral structure, as shown in FIG. 6. The other end of the box body 52 and the other end of the box lid 51 are detachably connected by a snap-fit member 513 and a first fastener.

[0042] The box lid 51 can be rotated 180° along an end thereof to cover the box body 52, and can be rotated 180° in a reverse direction to open.

[0043] As shown in FIGs. 6 and 7, the other end of the box lid 51 may be provided with a first connecting hole 511, the other end of the box body 52 may be provided with a second connecting hole 521, and the first fastener (such as a screw) may be threaded through the second connecting hole 521 and the first connecting hole 511 to realize the fixed connection between the box lid 51 and the box body 52. One of the box lid 51 and the box body 52 is provided with a snap-fit member 513, and the other of the box lid 51 and the box body 52 is provided with an engagement slot 522. The snap-fit member 513 is snap-fitted with the engagement slot 522, so that the snapping fixation of the box lid 51 and the box body 52 can be realized, and the first connecting hole 511 of the box lid 51 is aligned with the second connecting hole 521 of the box body 52, so as to facilitate the mounting of the first fastener. The number of first fasteners and snap-fit members 513 is not limited, and may be reasonably provided as required.

[0044] In one embodiment, as shown in FIGs. 6 and 7, the other end of the box lid 51 is provided with two snap-fit

members 513 and one lug 512, the two snap-fit members 513 are symmetrically arranged on two sides of the lug 512, and the first connecting hole 511 is provided on the lug 512. The other end of the box body 52 is provided with an extending plate 523, the extending plate 523 is provided with two engagement slots 522 and the second connecting hole 521, and the two engagement slots 522 are symmetrically arranged on two sides of the second connecting hole 521. Two ends of the lug 512 may also be provided with two reinforcing ribs 516, and the first connecting hole 511 is located between the two reinforcing ribs 516.

[0045] During the assembly process, the two snap-fit members 513 are first snapped into the two engagement slots 522, so that the lug 512 is fitted against the extending plate 523, and the first connecting hole 511 is aligned with the second connecting hole 521, and then the first fastener can be screwed. In this way, the number of first fasteners can be reduced, which is beneficial for improving the mounting efficiency of the sealing box 5.

[0046] The other end of the box lid 51 and the other end of the box body 52 may also be configured to form a rabbet joint fit, as shown in FIG. 6, so as to improve the sealing performance of the sealing box 5.

[0047] Alternatively, the other end of the box lid 51 and the other end of the box body 52 may be detachably connected by other manners, such as only by fasteners or only by snap-fit members 513.

[0048] In some exemplary embodiments, as shown in FIGs. 3 and 6, a rotational axis of the box lid 51 is parallel to a central axis of the pipe-fitting connector 33, and an end of the box lid 51 and the other end of the box lid 51 are arranged opposite to each other along an arrangement direction of the two pipe-fitting connectors 33.

[0049] In this way, the box body 52 can be directly placed under and snapped onto the two pipe-fitting connectors 33, and then the box lid 51 can be closed. The pipe-fitting connectors 33, the indoor and outdoor unit connecting pipes 34 and the refrigerant guide pipes 35 are not required to be carefully passed through the sealing box 5, thereby reducing the mounting difficulty and improving the assembly efficiency.

[0050] In some exemplary embodiments, a middle portion of the box lid 51 and a middle portion of the box body 52 are fixedly connected by a second fastener, and the second fastener is located between the two pipe-fitting connectors 33, and locks the box lid 51 and the box body 52 in a direction perpendicular to the rotational axis of the box lid 51, as shown in FIGs. 6 and 7.

[0051] The second fastener can lock and reinforce the middle portion of the sealing box 5 to avoid local gaps on the sealing box 5 caused by the refrigerant pressure or the like, resulting in refrigerant leakage.

[0052] In an embodiment, as shown in FIGs. 6 and 7, the middle portion of the box lid 51 is provided with a third connecting hole 514, an inner wall surface of the box body 52 is provided with a connecting post 524, and the second fastener (such as a screw) is fixedly connected to

the connecting post 524 through the third connecting hole 514. An inner wall surface of the box lid 51 is provided with a hollow connecting boss 515 abutting against the connecting post 524, so that the sealing box 5 can be prevented from being excessively squeezed and deformed. The third connecting hole 514 may be a counter bore, so that a head portion of the second fastener can be hidden in the box lid 51, so as to avoid the interference with other structures.

[0053] In some exemplary embodiments, sealing sponges (not shown in the figure) are provided between the sealing box 5 and the refrigerant guide pipe 35, between the sealing box 5 and the pipe-fitting connectors 33, and between the sealing box 5 and the indoor and outdoor unit connecting pipes 34. The sealing sponges can improve the sealing reliability of the sealing box 5, and is beneficial for alleviating the vibration noise of the pipe.

[0054] In some exemplary embodiments, the sealing box 5 may be a plastic member, such as a PP (polypropylene) member, which facilitates processing and forming, and has high processing accuracy and low cost.

[0055] In some exemplary embodiments, the housing 1 comprises a pipe-fitting pressing plate 111, and as shown in FIGs. 3 and 4, the refrigerant guide pipe 35 and the pipe-fitting connectors 33 pass through the pipe-fitting pressing plate 111.

[0056] An inner diameter of the refrigerant guide pipe 35 is greater than or equal to 8 mm. This facilitates ensuring the flow guiding effect of the refrigerant guide pipe 35.

[0057] Of course, the inner diameter of the refrigerant guide pipe 35 is not limited to the above range, and may be adjusted as required.

[0058] In some exemplary embodiments, as shown in FIGs. 1 and 5, the indoor heat exchanger 2 is disposed along a circumferential direction of the housing 1. Two ends of the indoor heat exchanger 2 along the circumferential direction of the housing 1 are spaced apart (that is, the indoor heat exchanger 2 is not a complete annular structure along the circumferential direction of the housing 1, but has two ends spaced apart), and at least a part of the first refrigerant detection area 151 is located between two ends of the indoor heat exchanger 2 along the circumferential direction of the housing 1. The housing 1 may have a substantially quadrangular prism shape, and as shown in FIG. 1, the circumferential direction of the housing 1 is a circumferential direction of a side enclosure plate 11 of the housing 1.

[0059] Both the input port and the output port of the indoor heat exchanger 2 are generally located at an end of the indoor heat exchanger 2 along the circumferential direction of the housing 1, and the refrigerant input pipe 31 and the refrigerant output pipe 32 are usually disposed in this area. Therefore, at least a part of the first refrigerant detection area 151 is located between the two ends of the indoor heat exchanger 2 along the circumferential direction of the housing 1.

[0060] There may be a certain gap between the indoor heat exchanger 2 and the side enclosure plate 11 of the housing 1, and a part of the first refrigerant detection area 151 may be located in a gap between the two ends of the indoor heat exchanger 2 along the circumferential direction of the housing 1 and the pipe-fitting pressing plate 111. The pipe-fitting pressing plate 111 may be a part of the side enclosure plate 11 of the housing 1.

[0061] In some exemplary embodiments, as shown in FIG. 1, the housing 1 comprises a base plate 13 and a panel 12 disposed opposite to each other, and a side enclosure plate 11 connected to the base plate 13 and the panel 12. The indoor heat exchanger 2 is fixedly connected to the base plate 13 through a heat exchanger connecting plate 14, and the refrigerant detection sensor 4 is provided in the first refrigerant detection area 151 and fixed to the heat exchanger connecting plate 14, as shown in FIG. 1.

[0062] In this way, the heat exchanger connecting plate 14 can be reasonably utilized to fix the refrigerant heat exchanger, and it is convenient to machine the heat exchanger connecting plate 14 into the desired shape as required.

[0063] Alternatively, the refrigerant detection sensor 4 may be fixed to other components, such as the base plate 13 or the side enclosure plate 11, as long as the refrigerant detection sensor 4 can detect refrigerant.

[0064] In some exemplary embodiments, the air conditioner may further comprise a water pump 62 disposed in the first refrigerant detection area 151, as shown in FIGs. 1 and 5. The water pump 62 is fixed to the heat exchanger connecting plate 14, and the water pump 62 and the refrigerant detection sensor 4 are arranged along a height direction of the side enclosure plate 11 (that is, an up-down direction in FIG. 1).

[0065] In some exemplary embodiments, as shown in FIG. 5, the heat exchanger connecting plate 14 comprises a first end plate 141, a side plate 143, a second end plate 142, and two flanges (not shown in the figure).

[0066] The first end plate 141 is fixedly connected to the base plate 13. An end (upper end) of the side plate 143 in a height direction of the side plate 143 is connected to the first end plate 141, and the refrigerant detection sensor 4 is fixed to a plate surface of the side plate 143 that faces the second refrigerant detection area 152. The second end plate 142 is connected to the other end (lower end) of the side plate 143 in the height direction of the side plate 143, and is arranged opposite to the first end plate 141. The water pump 62 is fixed to a plate surface (lower plate surface) of the second end plate 142 away from the first end plate 141. The two flanges are connected to two ends of the side plate 143 in a width direction, respectively, and to the two ends of the indoor heat exchanger 2 along the circumferential direction of the housing 1, respectively.

[0067] This is equivalent to dividing the heat exchanger connecting plate 14 into upper and lower layers, one layer is mounted with the refrigerant detection sensor 4, and

the other layer is mounted with the water pump 62, which is beneficial for saving space.

[0068] Of course, the heat exchanger connecting plate 14 is not limited to the above-described shape, and may be, for example, a shape straight in up-down direction.

[0069] In some exemplary embodiments, as shown in FIGs. 1, 2, 3, and 4, the air conditioner may further comprise a water receiving pan 61 disposed between the indoor heat exchanger 2 and the panel 12, and disposed along the circumferential direction of the indoor heat exchanger 2. The water pump 62 is in communication with the water receiving pan 61. The water pump 62 is connected to a drain pipe 63 that extends out of the housing 1 through the side enclosure plate 11 to discharge condensed water in the water receiving pan 61, as shown in FIGs. 1 and 4.

[0070] The panel 12 may be provided with an air suction port, and the side enclosure plate may be provided with an air outlet. As shown in FIGs. 1, 2, 3, and 4, components such as a wind wheel 72, a motor 71, the water receiving pan 61, an electrical control box 8, and a guide ring 73 may be further provided in the housing 1. The wind wheel 72 may be a centrifugal wind wheel, and the motor 71, the centrifugal wind wheel, and the guide ring 73 may be located in a space enclosed by the indoor heat exchanger 2. The electrical control box 8 may be fixed to the guide ring 73.

[0071] During pre-factory mounting, the base plate 13 may be on the lower side and the panel 12 on the upper side. In the mounting process after leaving the factory, the base plate 13 is on the upper side, the panel 12 is on the lower side, the air is discharged downward, the refrigerant detection sensor 4 is located at the top of the first refrigerant detection area 151, the water receiving pan 61 is located below the indoor heat exchanger 2, and an outlet of the drain pipe 63 is located on an upper side of the two pipe-fitting connectors 33. As shown in FIGs. 1-5, the water receiving pan 61 may collect the condensed water dropped from the indoor heat exchanger 2, and the water pump 62 may pump the condensed water in the water receiving pan 61 upward to the drain pipe 63 for discharging. The up-down direction in FIGs. 1 to 5 is based on the direction in which assembly is completed after leaving the factory.

[0072] In summary, the air conditioner provided by the embodiment of the present disclosure can quickly detect the refrigerant leakage in at least one of the inside and outside the housing of the indoor unit, and cause the air conditioner to issue a detection alarm in time, so as to reduce the risk of flammability and explosion caused by the refrigerant leakage.

[0073] In the description of the embodiments of the present disclosure, the orientation or positional relationship indicated by the terms "upper", "lower", "one side", "the other side", "one end", "the other end", "side", "opposite", "four corners", "periphery", "structure like a Chinese character "口" and the like are based on the or-

ientation or positional relationship shown in the drawings, which are only for convenience and simplification of the description of the present disclosure, and do not indicate or imply that the referred structure has a specific orientation, or is constructed and operated in a specific orientation, and therefore cannot be understood as a limitation on the present disclosure.

[0074] In the description of the embodiments of the present disclosure, unless otherwise expressly specified and limited, the terms "connection", "direct connection", "indirect connection", "fixed connection", "mounting", and "assembly" should be understood in a broad sense. For example, it may be a fixed connection, a detachable connection or an integrated connection. The terms "mounting", "connection", "fixed connection" may be a direct connection, or an indirect connection through an intermediary, or may be an internal communication between two elements. Specific meanings of the above terms herein may be understood by those of ordinary skills in the art according to a specific situation.

[0075] Although implementations disclosed in the present disclosure are described above, the described contents are only implementations used for facilitating understanding of the present disclosure, and are not intended to limit the present disclosure. It should be noted that the above-described embodiments or implementations are merely exemplary and not limiting. Accordingly, embodiments of the present disclosure are not limited to what is specifically shown and described herein. Various modifications, substitutions, or omissions may be made to the forms and details of the embodiments without departing from the scope of the present disclosure.

Claims

1. An air conditioner comprising:

a housing, a first refrigerant detection area being provided in the housing, a second refrigerant detection area being provided outside the housing, and the first refrigerant detection area being in communication with the second refrigerant detection area;
an indoor heat exchanger disposed in the housing, an input port and an output port of the indoor heat exchanger being located in the first refrigerant detection area;
a refrigerant input pipe and a refrigerant output pipe, respectively connected with the input port and the output port of the indoor heat exchanger, ends of the refrigerant input pipe and the refrigerant output pipe away from the indoor heat exchanger being provided with pipe-fitting connectors; the pipe-fitting connectors passing through the housing and being configured to be connected to indoor and outdoor unit connecting pipes located outside the housing, and

connection parts between the pipe-fitting connectors and the indoor and outdoor unit connecting pipes being located in the second refrigerant detection area; and

a refrigerant detection sensor provided in at least one of the first refrigerant detection area and the second refrigerant detection area.

2. The air conditioner of claim 1, further comprising: a sealing box sleeved over the pipe-fitting connectors and the indoor and outdoor unit connecting pipes to seal the connection parts between the pipe-fitting connectors and the indoor and outdoor unit connecting pipes in the sealing box, an internal space of the sealing box forming the second refrigerant detection area; the sealing box being in communication with the first refrigerant detection area through a refrigerant guide pipe, and the refrigerant guide pipe passing through the housing.
3. The air conditioner of claim 2, wherein the sealing box is provided with a first through hole, a second through hole and a third through hole, two pipe-fitting connectors respectively pass through the first through hole and the second through hole, the refrigerant guide pipe passes through the third through hole, and the first through hole and the second through hole are located at an end of the sealing box that is closer to the housing; and an end of the sealing box away from the housing is provided with a fourth through hole and a fifth through hole, and two indoor and outdoor unit connecting pipes respectively pass through the fourth through hole and the fifth through hole.
4. The air conditioner of claim 3, wherein the third through hole is also located at the end of the sealing box that is closer to the housing and is located between the first through hole and the second through hole.
5. The air conditioner of any one of claims 2 to 4, wherein the sealing box comprises a box body and a box lid, and the box body and the box lid are connected and enclose to form the second refrigerant detection area.
6. The air conditioner of claim 5, wherein an end of the box body is rotatably connected to an end of the box lid, and an other end of the box body is detachably connected to an other end of the box lid.
7. The air conditioner of claim 6, wherein the end of the box body and the end of the box lid form a rotatable integral structure, and the other end of the box body and the other end of the box lid are detachably connected by a snap-fit member and a first fastener.

8. The air conditioner of claim 6, wherein a rotational axis of the box lid is parallel to a central axis of the pipe-fitting connectors, and the end of the box lid and the other end of the box lid are disposed opposite to each other along an arrangement direction of two pipe-fitting connectors; and
a middle portion of the box lid and a middle portion of the box body are fixedly connected by a second fastener, and the second fastener is located between the two pipe-fitting connectors, and locks the box lid and the box body along a direction perpendicular to the rotational axis of the box lid. 5
9. The air conditioner of any one of claims 2 to 4, wherein the housing comprises a pipe-fitting pressing plate, the refrigerant guide pipe and the pipe-fitting connectors pass through the pipe-fitting pressing plate, and an inner diameter of the refrigerant guide pipe is greater than or equal to 8 mm. 10
10. The air conditioner of any one of claims 1 to 4, wherein the indoor heat exchanger is disposed along a circumferential direction of the housing, two ends of the indoor heat exchanger along the circumferential direction of the housing are spaced apart, and at least a part of the first refrigerant detection area is located between the two ends of the indoor heat exchanger along the circumferential direction of the housing. 15
11. The air conditioner of any one of claims 1 to 4, wherein the housing comprises: a base plate and a panel disposed opposite to each other, and a side enclosure plate connected to the base plate and the panel; 20
- the indoor heat exchanger is fixedly connected with the base plate through a heat exchanger connecting plate, and the refrigerant detection sensor is disposed in the first refrigerant detection area and fixed to the heat exchanger connecting plate; and 25
- the air conditioner further comprises a water pump disposed in the first refrigerant detection area, the water pump is fixed to the heat exchanger connecting plate, and the water pump and the refrigerant detection sensor are arranged along a height direction of the side enclosure plate. 30
12. The air conditioner of claim 11, wherein the heat exchanger connecting plate comprises: 35
- a first end plate fixedly connected to the base plate; 40
- a side plate, an end of the side plate in a height direction of the side plate being connected to the first end plate, and the refrigerant detection 45
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sensor being fixed to a plate surface of the side plate that faces the second refrigerant detection area;

a second end plate connected to an other end of the side plate in the height direction of the side plate and disposed opposite to the first end plate, the water pump being fixed to a plate surface of the second end plate away from the first end plate; and

two flanges respectively connected with two ends of the side plate in a width direction and respectively connected with two ends of the indoor heat exchanger along a circumferential direction of the housing.

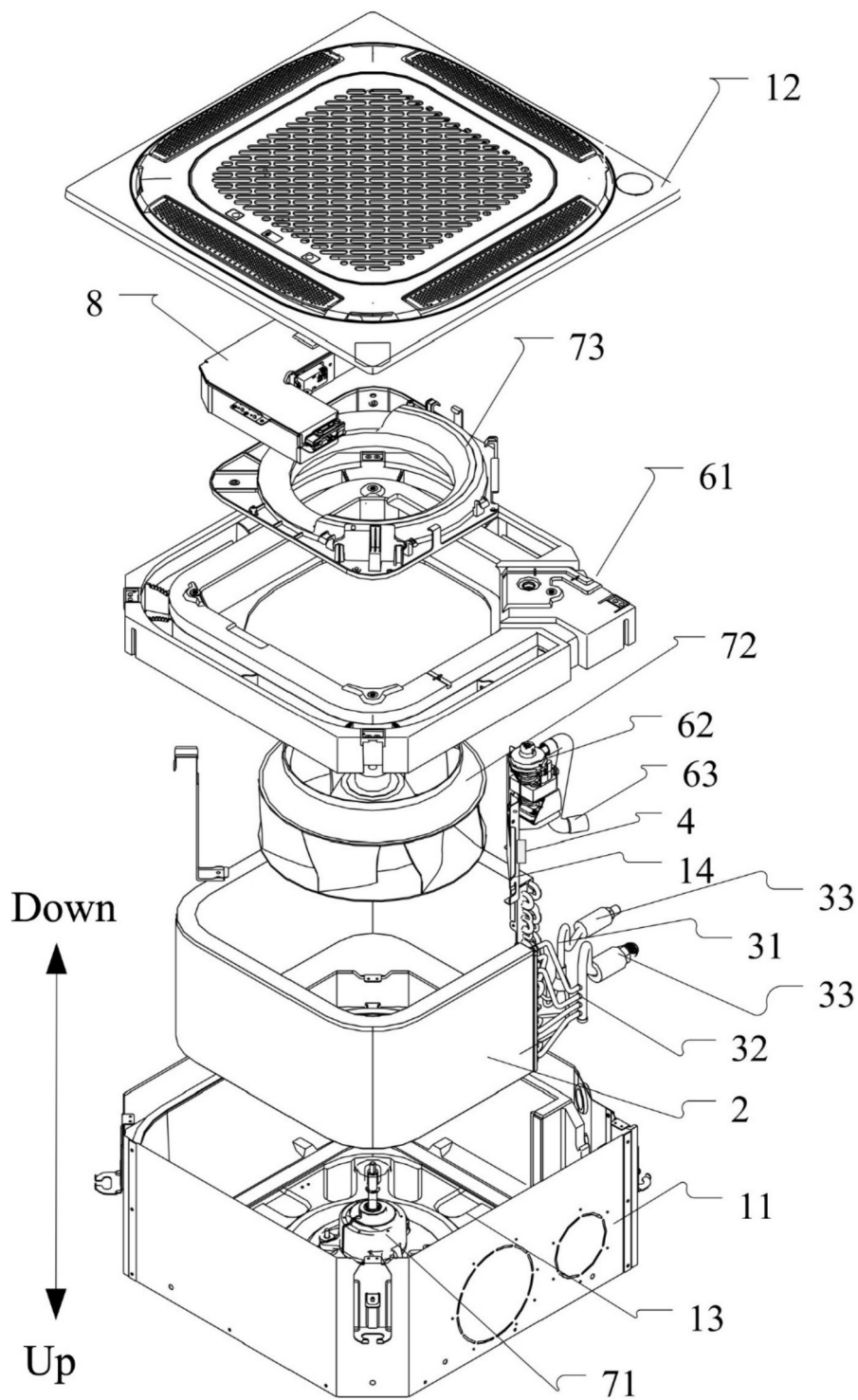


FIG. 1

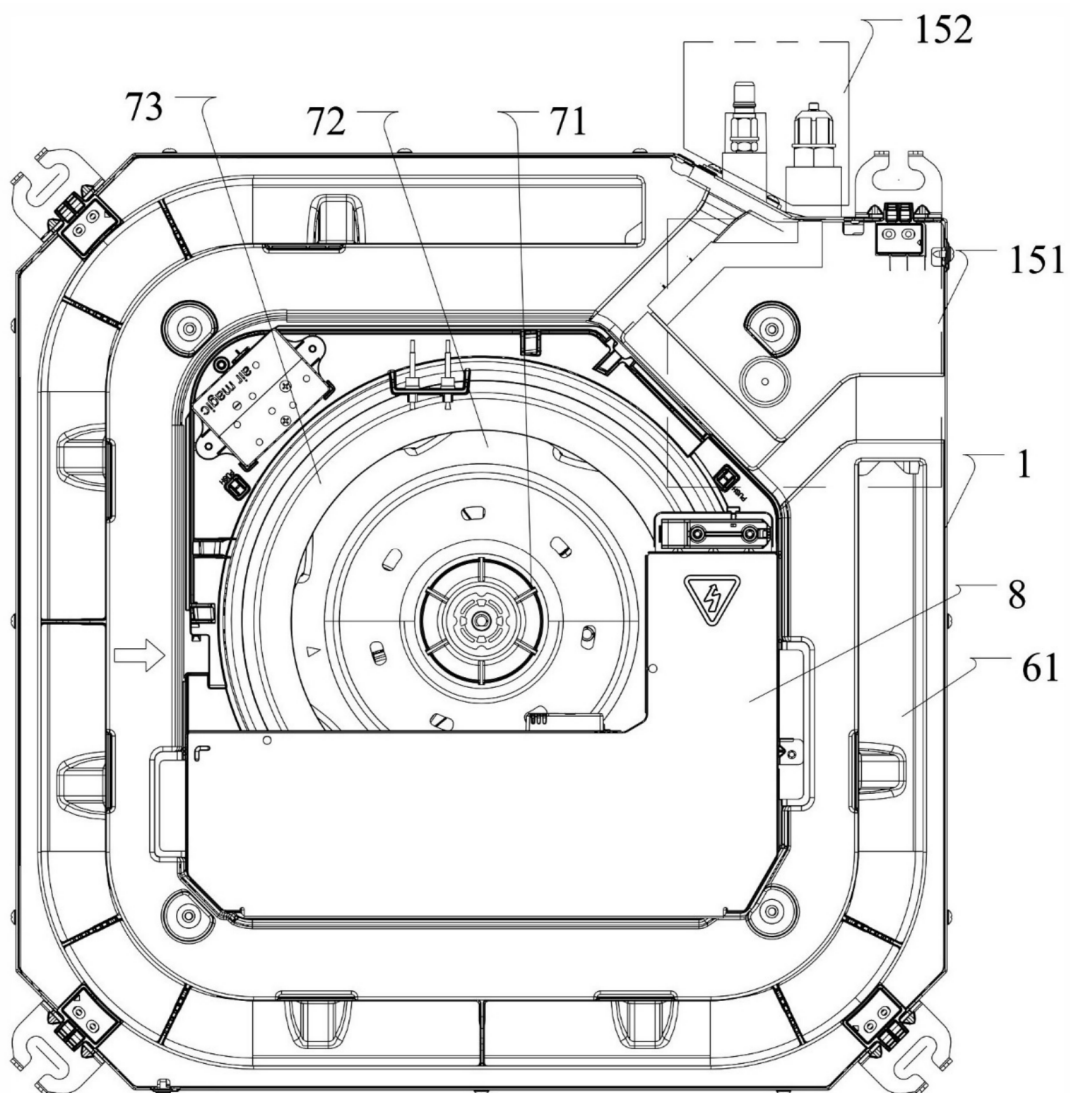


FIG. 2

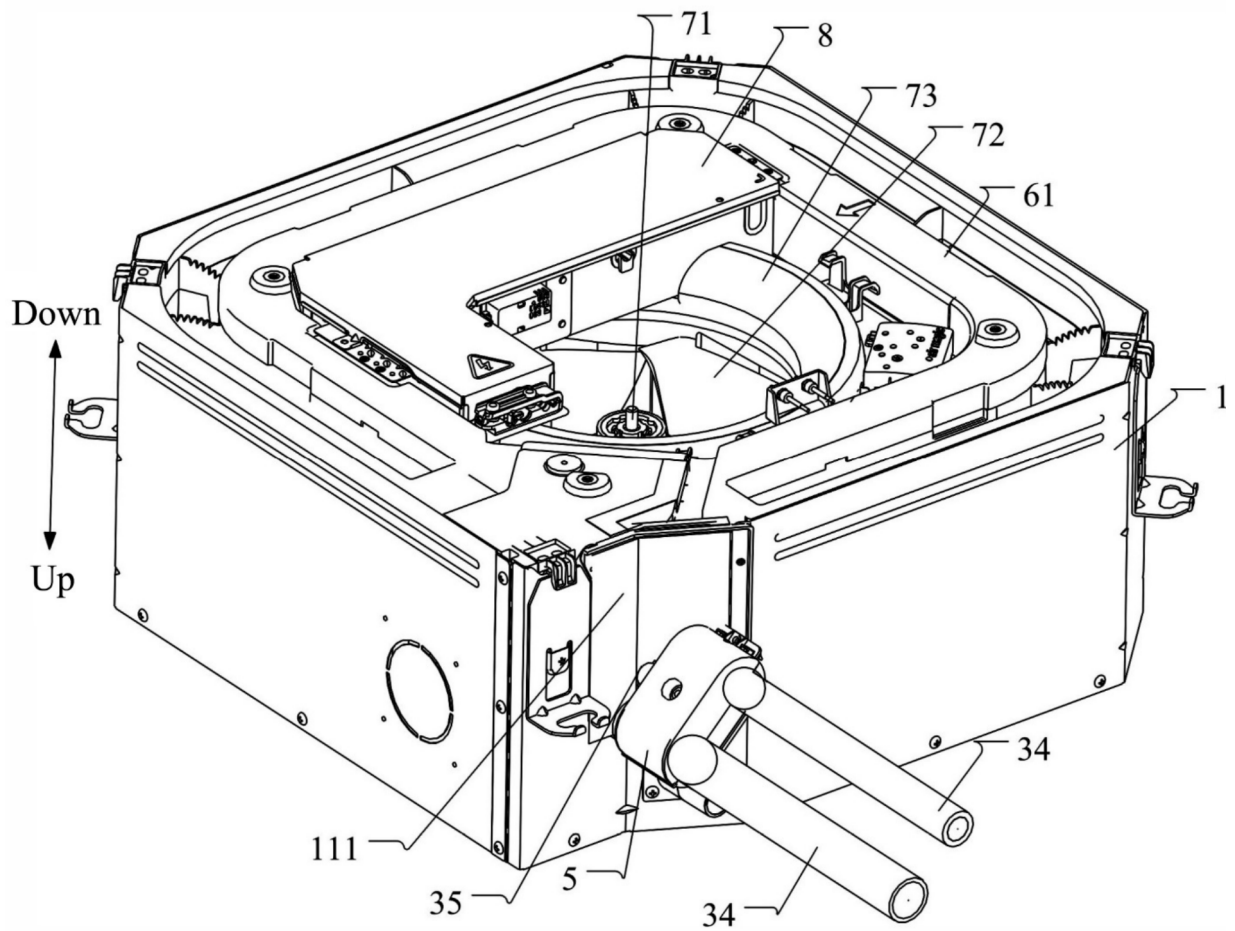


FIG. 3

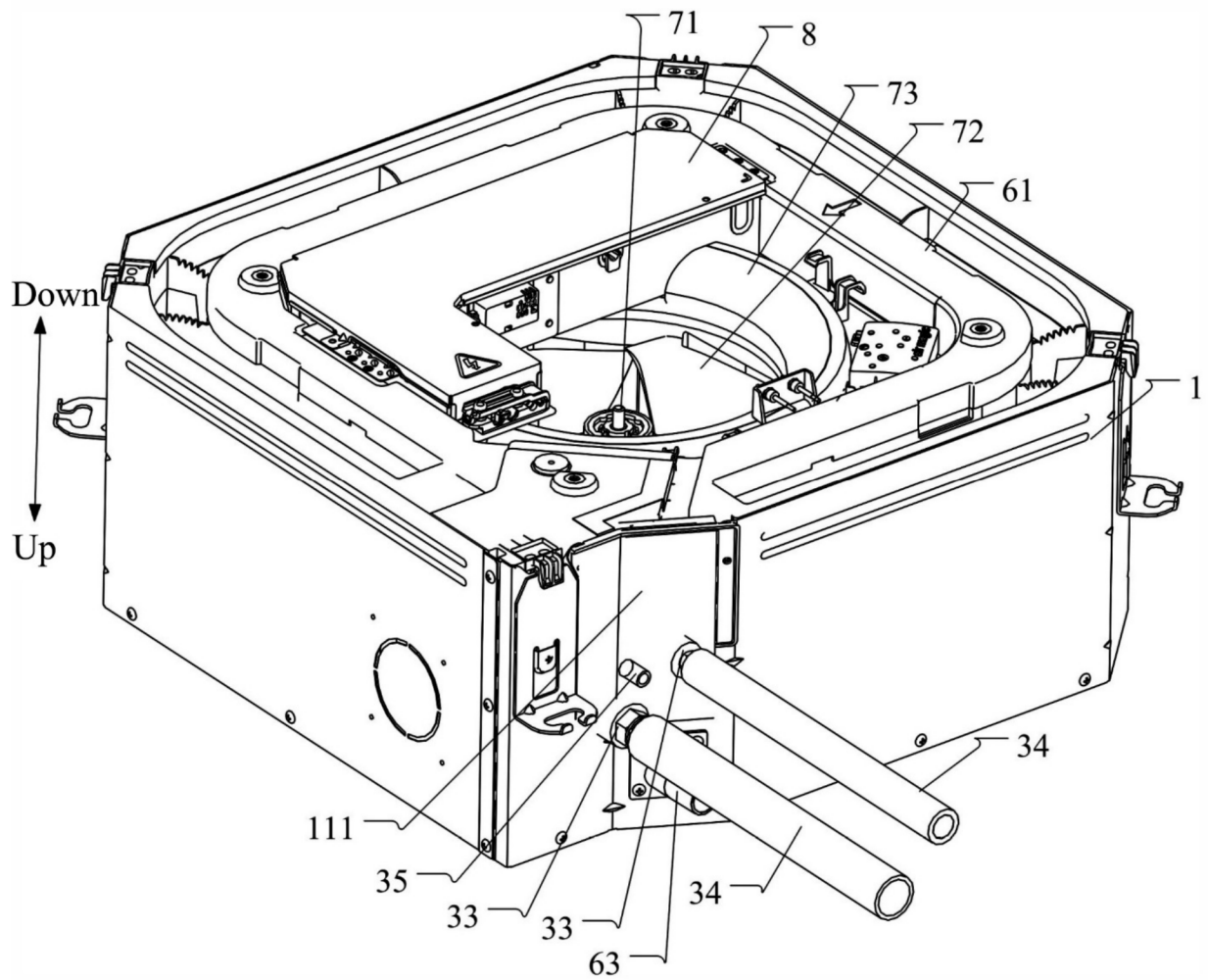


FIG. 4

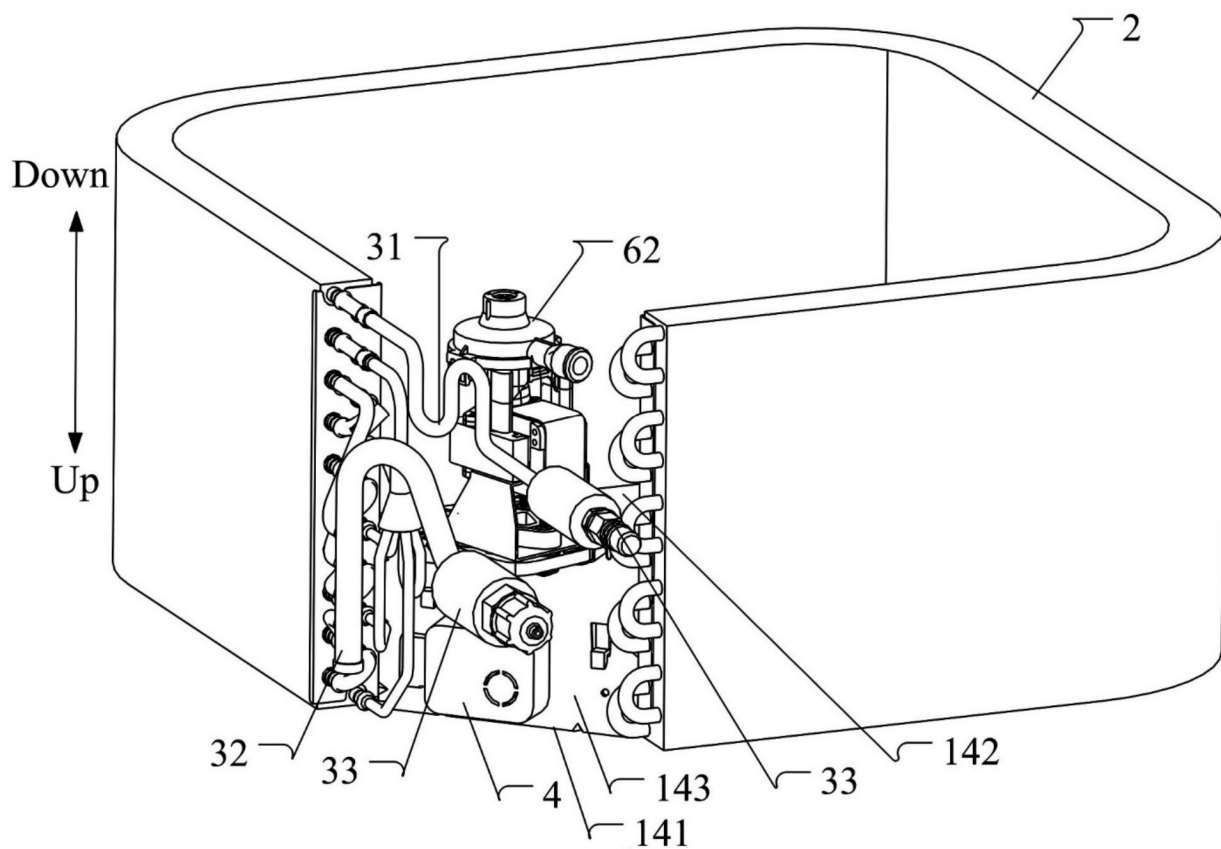


FIG. 5

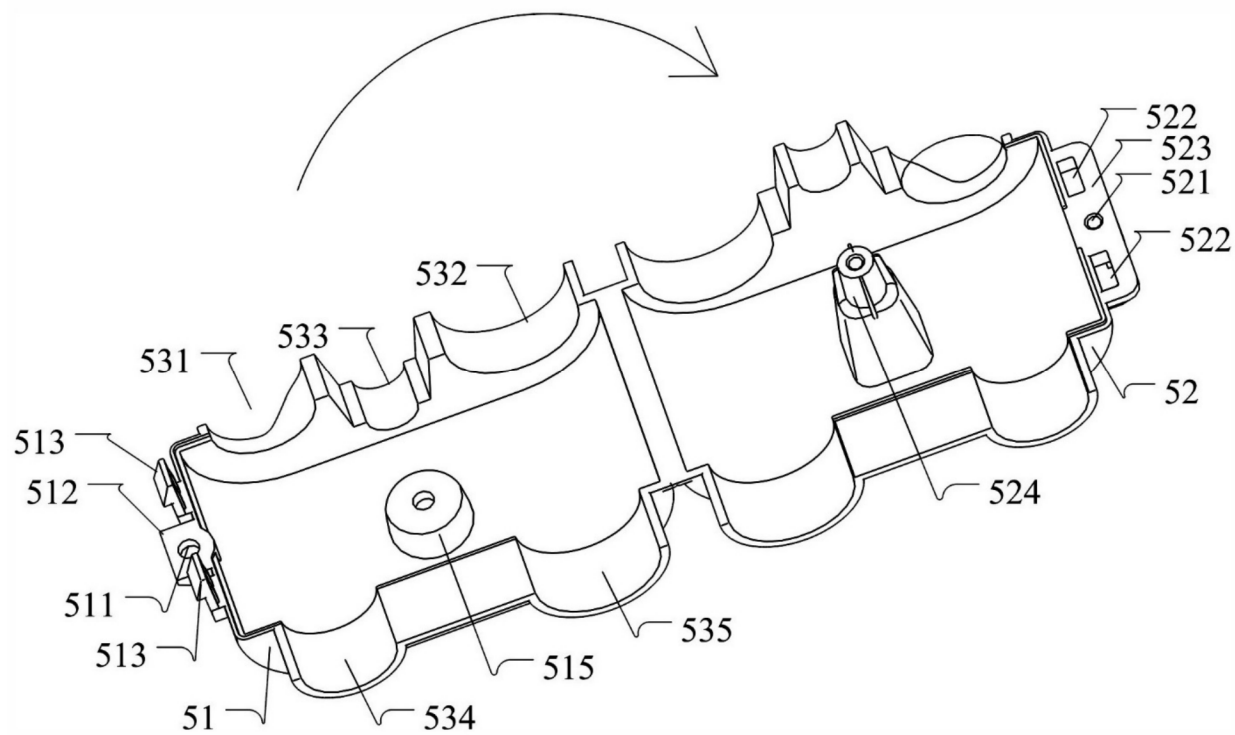


FIG. 6

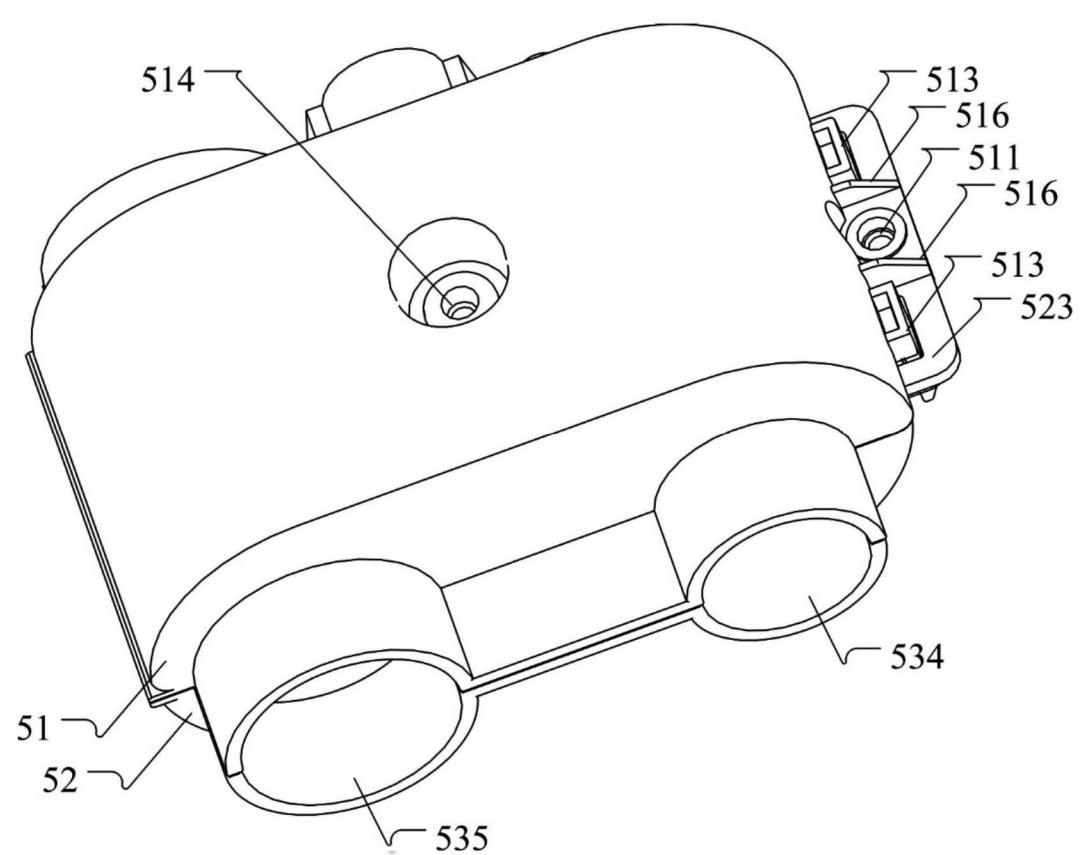


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/086826

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/36(2018.01)i; F24F13/30(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)

IPC: F24F

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, CNTXT, CNKI, ENTXTC, VEN: 空调, 室内, 制冷剂, 冷媒, 泄露, 检测, 换热器, 热交换器, 区域, 连通, 管, 密封, 盒, air condition, refrigerant, medium, leakage, detect, heat exchanger, area, zone, communicat+, pipe, seal, box, case

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 220648556 U (GUANGDONG MEDIA REFRIGERATION EQUIPMENT CO., LTD. et al.) 22 March 2024 (2024-03-22) description, specific embodiments, and the drawings	1-12
Y	EP 3719405 A1 (PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.) 07 October 2020 (2020-10-07) description, paragraphs [0050]-[0080], and figures 1-12	1-12
Y	KR 20140144479 A (LG ELECTRONICS INC.) 19 December 2014 (2014-12-19) description, paragraphs [0054]-[0057], and figure 2	1-12
Y	CN 217357426 U (QINGDAO HAIER AIR CONDITIONER GENERAL CO., LTD. et al.) 02 September 2022 (2022-09-02) description, paragraphs [0040]-[0042], and figures 1-4	1-12
A	CN 212057533 U (GUANGDONG MIDEA REFRIGERATION EQUIPMENT CO., LTD.) 01 December 2020 (2020-12-01) entire document	1-12

☒ 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	"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
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

22 May 2024

Date of mailing of the international search report

28 May 2024

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
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Beijing 100088

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/086826

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	JP 2020106175 A (HITACHI JOHNSON CONTROLS AIR CONDITIONING INC.) 09 July 2020 (2020-07-09) entire document	1-12
A	WO 2023021882 A1 (PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.) 23 February 2023 (2023-02-23) entire document	1-12

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2024/086826

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CN	212057533	U	01 December 2020	None			
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				EP	3933288	C0	25 October 2023
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WO	2023021882	A1	23 February 2023	JP	2023029008	A	03 March 2023

Form PCT/ISA/210 (patent family annex) (July 2022)

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