



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

(43) Date of publication:
22.12.2021 Bulletin 2021/51

(51) Int Cl.:
H05B 6/02 (2006.01) H05B 6/36 (2006.01)
F24F 13/00 (2006.01)

(21) Application number: **20787252.4**

(86) International application number:
PCT/CN2020/080948

(22) Date of filing: **24.03.2020**

(87) International publication number:
WO 2020/207240 (15.10.2020 Gazette 2020/42)

(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: **08.04.2019 CN 201920476599 U**
08.04.2019 CN 201910277490
08.04.2019 CN 201920469021 U

(71) Applicants:
• **GD Midea Heating & Ventilating Equipment Co., Ltd.**
Foshan, Guangdong 528311 (CN)
• **Midea Group Co., Ltd.**
Foshan, Guangdong 528311 (CN)

(72) Inventors:
• **WU, Duode**
Foshan, Guangdong 528311 (CN)

• **WANG, Peng**
Foshan, Guangdong 528311 (CN)
• **ZHANG, Hao**
Foshan, Guangdong 528311 (CN)
• **ZHAN, Lei**
Foshan, Guangdong 528311 (CN)
• **LIU, Shuqing**
Foshan, Guangdong 528311 (CN)
• **LUO, Bin**
Foshan, Guangdong 528311 (CN)
• **YANG, Kun**
Foshan, Guangdong 528311 (CN)
• **LIU, Yuan**
Foshan, Guangdong 528311 (CN)
• **YI, Tengda**
Foshan, Guangdong 528311 (CN)

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

(54) **QUICK HEATING MODULE AND AIR CONDITIONER**

(57) Disclosed are a quick heating module (5) and an air conditioner (1000). The quick heating module (5) includes: a refrigerant heat exchanger (54) defining a refrigerant passage; an electromagnetic induction heating member (53) provided at the refrigerant heat exchanger (54); and an alternating magnetic field generator (52) provided close to the electromagnetic induction heating member (53) and emitting an alternating magnetic field to the electromagnetic induction heating member (53).

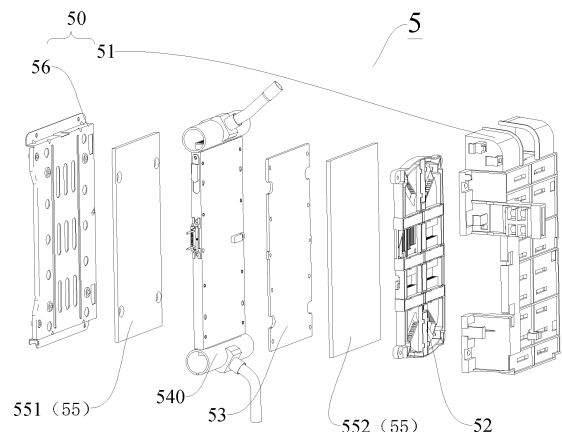


FIG. 5

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application is based on and claims priority to Chinese Patent Application Serial Nos. 201920476599.4, 201910277490.2 and 201920469021.6, all filed on April 08, 2019, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The present application relates to the field of heating apparatus technologies, and particularly to a quick heating module and an air conditioner.

BACKGROUND

[0003] In a low-temperature environment, most air conditioners, due to their system limitations, are unable to increase heat of a refrigerant quickly in a starting stage, and thus, heating speed is low, and an indoor temperature is unable to be increased quickly, which can not meet a requirement of users for quick heating after starting the air conditioner in winter, and becomes a common problem of the air conditioner on the market.

[0004] In order to solve the problem, a refrigerant heating structure is provided in a prior art, in which an electric heater is directly mounted in a copper tube to heat the refrigerant, so as to improve thermal efficiency of the refrigerant. However, the copper tube of this structure has an over complicated molding manufacturing technology, and a junction of the electric heater and the copper tube has a poor sealing reliability, and the electric heater may have a dry heating phenomenon under certain conditions. In addition, since an electric heating tube directly contacts the refrigerant, that is, electricity is not completely isolated from the refrigerant, electrical safety problems, such as the dry heating phenomenon of an electric heating portion, a line breakdown, or the like, are unable to be avoided.

SUMMARY

[0005] The present application seeks to solve at least one of the problems existing in the prior art. To this end, the present application provides a quick heating module for quickly heating a refrigerant.

[0006] The present application aims to provide an air conditioner in which air discharged from a compressor may be quickly heated.

[0007] A quick heating module according to an embodiment of the present application includes: a refrigerant heat exchanger defining a refrigerant passage therein; an electromagnetic induction heating member configured to heat the refrigerant heat exchanger; and an alternating magnetic field generator provided close to the electromagnetic induction heating member and emitting

an alternating magnetic field to the electromagnetic induction heating member.

[0008] In the quick heating module according to the embodiment of the present application, the electromagnetic induction heating member is provided on the refrigerant heat exchanger, and the alternating magnetic field generator is provided for the electromagnetic induction heating member, such that the electromagnetic induction heating member generates heat under the action of electromagnetic induction to heat a refrigerant in the refrigerant heat exchanger; with this refrigerant heating method, the refrigerant in a cooling apparatus or a heating apparatus may be quickly heated, and electricity may be separated from the refrigerant. Compared with a structure that an electric heating portion is directly provided in a refrigerant copper tube, a process requirement and a machining difficulty of the refrigerant heat exchanger are reduced, and electrical safety problems such as a dry heating phenomenon of the electric heating portion, a line breakdown, or the like, may be avoided.

[0009] In some embodiments, the electromagnetic induction heating member is provided between the refrigerant heat exchanger and the alternating magnetic field generator, and the electromagnetic induction heating member directly contacts the refrigerant heat exchanger.

[0010] In some embodiments, the refrigerant heat exchanger is configured as a microchannel heat exchanger.

[0011] In some embodiments, the electromagnetic induction heating member is configured as a plate.

[0012] Optionally, the electromagnetic induction heating member has a thickness less than or equal to 5 mm.

[0013] In some embodiments, the electromagnetic induction heating member is connected to the refrigerant heat exchanger by a fastener.

[0014] In some embodiments, the electromagnetic induction heating member and the refrigerant heat exchanger are provided with solder or a soldering flake therebetween and connected by welding.

[0015] In some embodiments, the electromagnetic induction heating member and the refrigerant heat exchanger are provided with a heat conducting agent layer therebetween.

[0016] In some embodiments, the alternating magnetic field generator and the electromagnetic induction heating member are provided with a heat insulation member therebetween.

[0017] In some embodiments, the alternating magnetic field generator is configured as a coil disk.

[0018] Optionally, the coil disk and the electromagnetic induction heating member have a distance of 1-20 mm therebetween.

[0019] Specifically, an overlapping area of orthographic projections of the coil disk and the electromagnetic induction heating member on the refrigerant heat exchanger at least accounts for half of an area of an orthographic projection of the electromagnetic induction heating member on the refrigerant heat exchanger.

[0020] Further, the coil disk includes: a coil support;

and a wire body wound on the coil support, two ends of the wire body serving as wiring terminals.

[0021] Still further, the coil disk further includes a magnetic strip, which is provided on the coil support.

[0022] Optionally, an extension line of the magnetic strip is perpendicular to a tangent line of the wire body at an intersection with the extension line.

[0023] Optionally, the coil support is provided with a magnetic-strip fixing groove configured to limit the magnetic strip.

[0024] Optionally, the coil support defines a wire slot, and the wire body is clamped in the wire slot.

[0025] Optionally, the coil support is provided with a wire pressing hook configured to lock the wiring terminal.

[0026] Optionally, the coil support is substantially rectangular, and the wire body is wound into a flat annular coil.

[0027] Optionally, the coil disk includes a voltage resistant sheet provided on the coil support and located on a side of the wire body facing the electromagnetic induction heating member.

[0028] In some embodiments, the electromagnetic induction heating member is provided on the refrigerant heat exchanger, and the quick heating module further includes an outer protective member, and the refrigerant heat exchanger and the coil disk are connected to the outer protective member, so as to keep a distance between the coil disk and the electromagnetic induction heating member.

[0029] An air conditioner according to an embodiment of the present application includes: a compressor; and the quick heating module according to the above-mentioned embodiment of the present application, the refrigerant passage of the refrigerant heat exchanger being connected with a discharge port of the compressor.

[0030] In the air conditioner according to the embodiment of the present application, an exhaust side of the compressor is provided with the above-mentioned quick heating module, such that the air discharged from the compressor is heated quickly, thus meeting a requirement of quick heating after the air conditioner is started in winter. The electromagnetic induction heating member is provided on the refrigerant heat exchanger, and the alternating magnetic field generator is provided for the electromagnetic induction heating member, such that the electromagnetic induction heating member generates the heat under the action of electromagnetic induction to heat the refrigerant in the refrigerant heat exchanger, and the electricity may be separated from the refrigerant, thus reducing the process requirement and the machining difficulty of the refrigerant heat exchanger, and avoiding the electrical safety problems, such as the dry heating phenomenon of the electric heating portion, the line breakdown, or the like.

[0031] Additional aspects and advantages of the present application will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the em-

bodiments of the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] The above and/or additional aspects and advantages of the present application will become apparent and more readily appreciated from the following descriptions made with reference to the drawings, in which:

FIG. 1 is a schematic diagram of assembly correspondence between a refrigerant heat exchanger and an electromagnetic induction heating member of a quick heating module according to an embodiment.

FIG. 2 is a side view of the refrigerant heat exchanger and the electromagnetic induction heating member according to an embodiment.

FIG. 3 is a top view of the quick heating module according to an embodiment.

FIG. 4 is a side view of the quick heating module according to another embodiment.

FIG. 5 is a schematic exploded diagram of the quick heating module according to another embodiment.

FIG. 6 is a rear view of a coil disk of the quick heating module according to an embodiment.

FIG. 7 is a side view of the coil disk of the quick heating module according to an embodiment.

FIG. 8 is a front view of the coil disk of the quick heating module according to an embodiment.

FIG. 9 is an exploded view of the coil disk of the quick heating module according to an embodiment.

FIG. 10 is a front view of a coil support in the quick heating module according to an embodiment.

FIG. 11 is a partial front view of the coil support in the quick heating module according to an embodiment.

FIG. 12 is a partial rear view of the coil support in the quick heating module according to an embodiment.

FIG. 13 is a schematic assembly diagram of the coil disk, the electromagnetic induction heating member and a microchannel heat exchanger according to an embodiment.

FIG. 14 is an exploded view of the quick heating module according to an embodiment.

FIG. 15 is a schematic diagram of an orthographic projection plane of the electromagnetic induction heating member on the refrigerant heat exchanger according to an embodiment.

FIG. 16 is a schematic diagram of an orthographic projection plane of the coil disk on the refrigerant heat exchanger according to the embodiment shown in FIG. 15.

FIG. 17 is a front view of a structure of the quick heating module according to another embodiment.

FIG. 18 is a side view of the structure of the quick heating module according to the embodiment shown in FIG. 17.

FIG. 19 is a perspective view of an air-conditioner outdoor unit according to an embodiment (with a component housing hidden).

REFERENCE NUMERALS

[0033]

Air conditioner 1000;
air-conditioner outdoor unit 100;
enclosure 1; fan chamber 11; mechanical chamber 12; mesh cover 13; front panel 14; middle partition 2; outdoor heat exchanger 3; compressor 4; electric control component 7.
Quick heating module 5;
outer protective member 50; fixed cover 51; fixing column 511; fixing clip 512; mounting hole 513; supporting plate 56; fixing hole 561;
alternating magnetic field generator 52; coil support 521; magnetic-strip fixing groove 5211; wire slot 5212; wire pressing hook 5213; heat dissipation opening 5214; wire pressing protrusion 5215; calendered protrusion 5216; fool-proof block 5217; fixing lug 5218; support fixing hole 5219; wire body 522; wiring terminal 5221; magnetic strip 523; voltage resistant sheet 524; leg 525;
electromagnetic induction heating member 53; heating-member via hole 531; heating-member escaping hole 532; heating-member fastener 533;
refrigerant heat exchanger 54; microchannel heat exchanger 540; collecting pipe 541; inlet-outlet pipe 542; microchannel base plate 543; heat-exchanger threaded hole 545; heat-exchanger via hole 546;
heat-exchanger fastener 547;
heat insulation member 55; first heat insulation member 551; second heat insulation member 552.

DETAILED DESCRIPTION

[0034] Reference will be made in detail to embodiments of the present application, and the examples of

the embodiments are illustrated in the drawings, wherein the same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to drawings are illustrative, and merely used to explain the present application. The embodiments shall not be construed to limit the present application.

[0035] A quick heating module 5 according to an embodiment of the present application will be described below with reference to the accompanying drawings, and the quick heating module 5 is used in a refrigerant circulation system, such as an air conditioner, a water heater, or the like.

[0036] The quick heating module 5 according to the embodiment of the present application, as shown in FIGS. 1 and 5, includes: a refrigerant heat exchanger 54, an electromagnetic induction heating member 53 and an alternating magnetic field generator 52. The refrigerant heat exchanger 54 has a refrigerant passage defined therein, and the electromagnetic induction heating member 53 is configured to heat the refrigerant heat exchanger 54, so as to heat a refrigerant flowing through the refrigerant passage, and the alternating magnetic field generator 52 is provided close to the electromagnetic induction heating member 53 and emits an alternating magnetic field to the electromagnetic induction heating member 53.

[0037] It may be understood that when the electromagnetic induction heating member 53 is located in a changing magnetic field, an induced electromotive force is generated in the electromagnetic induction heating member 53 by electromagnetic induction. Since the electromagnetic induction heating member 53 has a resistance, a current may be generated in the electromagnetic induction heating member 53, and the distribution of the current in the electromagnetic induction heating member 53 is different along with a surface shape and magnetic flux distribution of the electromagnetic induction heating member 53, and an eddy current formed by a path of the current generates heat in the electromagnetic induction heating member 53, such that after the alternating magnetic field generator 52 generates an alternating magnetic field, and the electromagnetic induction heating member 53 may heat the refrigerant heat exchanger 54, so as to quickly heat the refrigerant in the refrigerant passage.

[0038] In this heating method, the alternating magnetic field generator 52 is energized to impel the electromagnetic induction heating member 53 to generate heat, instead of concentrating a heat source at one point and then diffusing outwards by the heat source point, such that no heat concentration point exists on the refrigerant heat exchanger 54, and electrical safety problems, such as a dry heating phenomenon, a line breakdown, or the like, may be avoided.

[0039] In the quick heating module 5 according to the embodiment of the present application, the electromag-

netic induction heating member 53 is provided on the refrigerant heat exchanger 54, and the alternating magnetic field generator 52 is provided for the electromagnetic induction heating member 53, such that the electromagnetic induction heating member 53 generates heat under the action of electromagnetic induction to heat the refrigerant in the refrigerant heat exchanger 54; with this refrigerant heating method, the refrigerant in a cooling apparatus or a heating apparatus may be quickly heated.

[0040] In a prior art, an electric heater of a refrigerant heating structure is directly mounted in a copper tube to heat the refrigerant, and the refrigerant may be in an electricity contact state. In the quick heating module 5 according to the embodiment of the present application, the alternating magnetic field generator 52 is only required to be energized to generate the alternating magnetic field, without direct electrification of the refrigerant heat exchanger 54, such that the electricity may be isolated from the refrigerant. Since an electric heating portion is not required to be directly buried in the refrigerant copper tube, there is no higher sealing requirement for the refrigerant heat exchanger 54, which reduces the process requirement and the machining difficulty of the refrigerant heat exchanger 54, and further avoids electrical safety problems, such as the dry heating phenomenon of the electric heating portion, the line breakdown, and the like.

[0041] In the embodiment of the present application, the electromagnetic induction heating member 53 has various structural forms.

[0042] In some embodiments, as shown in FIGS. 1 to 3, the electromagnetic induction heating member 53 is configured as a plate, and fixedly mounted after being machined, such that the electromagnetic induction heating member 53 is quite easy to be machined and mounted. In some embodiments, at least a part of the electromagnetic induction heating member 53 has a strip shape, and the electromagnetic induction heating member 53 is inserted between adjacent refrigerant pipes, such that a heat exchange space may be fully used to dispose the electromagnetic induction heating member 53.

[0043] Optionally, the electromagnetic induction heating member 53 has a thickness less than or equal to 5 mm, and the thickness thereof satisfies the relation: $0 < t \leq 5$ mm. The electromagnetic induction heating member 53 serves as both a heating member and a heat conductor, and the heat generated by the electromagnetic induction heating member 53 may be quickly conducted to the refrigerant passage of the refrigerant heat exchanger 54, and the electromagnetic induction heating member 53 is not required to store heat. The whole plate should not be too thick; on the one hand, an over-thick plate consumes too much heat, thus reducing a heat utilization efficiency, and on the other hand, the over-thick plate may increase a volume and a weight of the whole quick heating module 5.

[0044] Specifically, the electromagnetic induction heating member 53 is configured as a component made

of a magnetic conduction material; for example, the electromagnetic induction heating member 53 contains iron, nickel, iron oxide, chromium oxide, or the like. The magnetic conduction material capable of generating electromagnetic induction may be any material disclosed in the prior art, which is not limited herein.

[0045] More specifically, the electromagnetic induction heating member 53 may be configured as a single-layer plate integrally formed of a magnetic conduction material, such as an iron plate, an iron oxide plate, or a chromium oxide plate. The electromagnetic induction heating member 53 may also be configured as a composite layer member, and at least one layer of the electromagnetic induction heating member 53 is configured as a magnetic conduction material layer, and other layers may be provided as required.

[0046] In other embodiments of the present application, the electromagnetic induction heating member 53 may also be configured as a sprayed layer or a coating made of a magnetic conduction material. For example, a protection plate or a supporting plate, or the like, may be provided on a surface of the refrigerant heat exchanger 54, and the electromagnetic induction heating member 53 may be configured as a coating sprayed on a surface of the protection plate or the supporting plate. The electromagnetic induction heating member 53 is even configured as a coating sprayed on the surface of the refrigerant heat exchanger 54. When the electromagnetic induction heating member 53 is provided in this way, selection of a position and a shape thereof is more flexible, and the spraying form may enlarge a heated surface on the refrigerant heat exchanger 54.

[0047] In still other embodiments, a pipe wall of the refrigerant passage is made of a magnetic conduction material and forms the electromagnetic induction heating member 53. For example, the pipes of the refrigerant heat exchanger 54 configured to circulate the refrigerant are made of magnetic conduction materials, such that the pipe wall of the refrigerant passage directly generates heat and heats the refrigerant under an alternating magnetic field, and the heat utilization efficiency may be further improved.

[0048] In the embodiment of the present application, a structure type of the refrigerant heat exchanger 54 is not limited. The refrigerant heat exchanger 54 may be configured as a plate heat exchanger, or even the refrigerant heat exchanger 54 may be formed of only one metal pipe, and a pipe cavity of the metal pipe forms the refrigerant passage.

[0049] In some embodiments, as shown in FIGS. 1 and 5, the refrigerant heat exchanger 54 is configured as a microchannel heat exchanger 540, and a type of which is not limited. The microchannel heat exchanger 540 is used for the refrigerant to flow through, such that the refrigerant flowing through the microchannel heat exchanger 540 may be guided into a small streams, thus greatly increasing a specific surface area, and significantly improving a heating efficiency. In some embodi-

ments, the microchannel heat exchanger 540 includes a collecting pipe 541, and in some other embodiments, the microchannel heat exchanger 540 includes a collecting pipe 541 and a plurality of flat pipes.

[0050] Specifically, the electromagnetic induction heating member 53 may be provided on the microchannel heat exchanger 540 in any one of the above-mentioned manners, which is not limited herein. In addition to the above-mentioned manner, at least a part of the electromagnetic induction heating member 53 may be inserted between two adjacent flat pipes, which is equivalent to the above description that the strip-shaped part of the electromagnetic induction heating member 53 is inserted between the adjacent refrigerant pipes. When the electromagnetic induction heating member 53 is provided corresponding to the microchannel heat exchanger 540 in this way, various forms may be adopted, such that a surface space of the microchannel heat exchanger 540 may be fully utilized.

[0051] Specifically, there are two collecting pipes 541, which are provided on two opposite sides of the microchannel heat exchanger 540. The electromagnetic induction heating member 53 is configured as a plate and provided on one side of the microchannel heat exchanger 540. More specifically, an inlet-outlet pipe 542 is connected to each of the two collecting pipes 541, such that the refrigerant may flow into and out of the collecting pipe.

[0052] Optionally, the two collecting pipes 541 are arranged in parallel. In some examples, the microchannel heat exchanger 540 can be formed in various shapes, such as a groove shape, a square shape, or the like, and the shape of the electromagnetic induction heating member 53 should be adapted correspondingly. For example, when the microchannel heat exchanger 540 is formed into a square tube shape, the electromagnetic induction heating member 53 may also be formed into a square tube shape, and at this point, the square tube of the electromagnetic induction heating member 53 may be fitted over the square tube of the microchannel heat exchanger 540 or the square tube of the microchannel heat exchanger 540 may be fitted over the square tube of the electromagnetic induction heating member 53.

[0053] When the microchannel heat exchanger 540 includes the flat pipe connected to the collecting pipe 541, the flat pipe is provided along the shape of the microchannel heat exchanger 540, and a plurality of parallel flat pipes or one sinuous flat pipe may be provided.

[0054] Optionally, the microchannel heat exchanger 540 has a rectangular overall shape, and the electromagnetic induction heating member 53 is configured as a rectangular plate.

[0055] Further, as shown in FIGS. 1 and 14, the microchannel heat exchanger 540 further includes a microchannel base plate 543, which is located between the two collecting pipes 541, and the electromagnetic induction heating member 53 is connected to the microchannel base plate 543. Thus, the quick heating module 5 is flat as a whole, which facilitates the quick heating module to

be mounted in a narrow space.

[0056] In the embodiment of the present application, various connection modes may be adopted between the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54. For example, the electromagnetic induction heating member 53 is connected to the refrigerant heat exchanger 54 by a fastener, thus guaranteeing a tight connection therebetween. For example, solder or a soldering flake is provided between the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54, and a welding connection is performed, thus guaranteeing a tight and firm connection therebetween.

[0057] In some embodiments, a heat conducting agent layer is provided between the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54 to improve a heat transfer efficiency.

[0058] In some embodiments, the following three modes are provided:

First mode: the electromagnetic induction heating member 53 is connected to the refrigerant heat exchanger 54 by a plurality of heating-member fasteners 533.

Second mode: contact surfaces of the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54 are coated with a heat conducting agent (heat conducting silicone grease, a heat conducting sheet, or the like), and then, the electromagnetic induction heating member 53 is connected with the refrigerant heat exchanger 54 by a heating-member fastener 533.

Third mode: contact surfaces of the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54 are welded, fused and in tight contact by filling solder, and the whole contact surfaces are evenly coated with the solder.

[0059] Optionally, as shown in FIGS. 1 to 3, a plurality of heat-exchanger threaded holes 545 are defined in the microchannel heat exchanger 540, and heating-member via holes 531 are correspondingly defined in the electromagnetic induction heating member 53, and the electromagnetic induction heating member 53 is connected to the heat-exchanger threaded holes 545 by inserting the plurality of heating-member fasteners 533 through the heating-member via holes 531, such that the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54 are connected into a whole.

[0060] Further, a plurality of heat-exchanger via holes 546 are defined in the microchannel heat exchanger 540, and the microchannel heat exchanger 540 is connected into a supporting structure by inserting a plurality of heat-exchanger fasteners 547 through the heat-exchanger via holes 546. Optionally, the electromagnetic induction heating member 53 is provided with heating-member escaping holes 532 corresponding to the plurality of heat-exchanger fasteners 547 to avoid affecting a mounting

operation of the heat-exchanger fasteners 547.

[0061] In some embodiments, as shown in FIGS. 4, 5 and 14, the electromagnetic induction heating member 53 is provided between the refrigerant heat exchanger 54 and the alternating magnetic field generator 52, and directly contacts the refrigerant heat exchanger 54, thus reducing a range of the alternating magnetic field and unnecessary energy consumption.

[0062] Optionally, as shown in FIG. 15, an area of a projection of the electromagnetic induction heating member 53 on the refrigerant heat exchanger 54 is greater than half of an area of the refrigerant heat exchanger 54, thus effectively ensuring that the heat absorbed by the electromagnetic induction heating member 53 is transferred to the refrigerant heat exchanger 54.

[0063] In some embodiments, as shown in FIGS. 5 and 14, a heat insulation member 55 is provided between the alternating magnetic field generator 52 and the electromagnetic induction heating member 53, so as to prevent the heat generated by the electromagnetic induction heating member 53 from being radiated to the alternating magnetic field generator 52, thereby avoiding a fused phenomenon, ignition, disconnection, or the like, of the alternating magnetic field generator 52 after heated. In addition, a heat insulation member 55 is provided between the alternating magnetic field generator 52 and the electromagnetic induction heating member 53, thus reducing heat loss, and improving a refrigerant heating efficiency.

[0064] Optionally, a heat insulation member 55 is also provided outside the refrigerant heat exchanger 54 to reduce heat loss.

[0065] Specifically, as shown in FIG. 14, the heat insulation member 55 includes a first heat insulation member 551 and a second heat insulation member 552, the first heat insulation member 551 is provided between the refrigerant heat exchanger 54 and the supporting structure, and the second heat insulation member 552 is provided between the alternating magnetic field generator 52 and the electromagnetic induction heating member 53.

[0066] In the specific examples shown in FIGS. 5 and 14, the quick heating module 5 includes an outer protective member 50 provided outside the microchannel heat exchanger 540, the electromagnetic induction heating member 53 and the alternating magnetic field generator 52 for protection. Specifically, the outer protective member 50 includes a fixed cover 51 and a supporting plate 56, the microchannel heat exchanger 540 is connected to the supporting plate 56, and the fixed cover 51 is connected to the supporting plate 56 and covers the microchannel heat exchanger 540.

[0067] The second heat insulation member 552 is provided between the electromagnetic induction heating member 53 and the alternating magnetic field generator 52 to prevent the high-temperature electromagnetic induction heating member 53 from radiating heat to the alternating magnetic field generator 52, and the second

heat insulation member 552 tightly contacts the electromagnetic induction heating member 53 to prevent the electromagnetic induction heating member 53 from losing heat; the first heat insulation member 551 is provided between the microchannel base plate 543 of the microchannel heat exchanger 540 and the supporting plate 56 to prevent the heat of the microchannel heat exchanger 540 from contacting the supporting plate 56 and being transferred to a metal object, resulting in heat loss.

[0068] As shown in FIG. 14, the microchannel heat exchanger 540 is secured to the supporting plate 56 by inserting the heat-exchanger fastener 547 through the heat-exchanger via hole 546; the alternating magnetic field generator 52 is fixed to the fixed cover 51 which is fixed to the supporting plate 56, and at this point, the electromagnetic induction heating member 53, the microchannel heat exchanger 540 and the alternating magnetic field generator 52 have fixed relative positions.

[0069] In the embodiment of the present application, the structure of the alternating magnetic field generator 52 may be implemented in various ways known in the prior art. For example, in some examples, a permanent magnet is driven to rotate by a mechanical structure, such that the permanent magnet generates an alternating magnetic field on the electromagnetic induction heating member 53. For another example, in some examples, a coil is used instead of the permanent magnet to rotate, such that a magnetic field generated by the coil is converted into an alternating magnetic field on the electromagnetic induction heating member 53. In still other examples, a coil is combined with a permanent magnet to increase the intensity and stability of the alternating magnetic field.

[0070] In some embodiments, as shown in FIGS. 5, 6, and 13, the alternating magnetic field generator 52 is configured as a coil disk, and the principle of generating an alternating magnetic field by the coil disk is known in the prior art and will not be repeated herein. When the coil disk generates an alternating current, the electromagnetic induction heating member 53 generates heat, such that the magnetic density is high, and the alternating magnetic field is quite stable. The refrigerant heat exchanger 54 may adopt a structure of any heat exchanger known in the prior art, and the arrangement of the coil disk in most solutions of the present application may not influence the structure of the refrigerant heat exchanger 54; that is, a manufacturer may directly purchase a heat exchanger known in the market, and can assemble the quick heating module 5 by mounting the coil disk and the electromagnetic induction heating member 53 on the heat exchanger.

[0071] Specifically, the coil disk is provided on one side of the refrigerant heat exchanger 54, and when the quick heating module 5 operates, the coil disk remains fixed, such that the quick heating module 5 is quite easy to assemble.

[0072] In some embodiments, in order to ensure that the magnetic field generated at the electromagnetic in-

duction heating member 53 has a sufficiently large intensity after the coil disk is powered on, the coil disk and the electromagnetic induction heating member 53 have a distance of 1-20 mm. It may be understood that if the coil disk is over close to the electromagnetic induction heating member 53, the heat generated by the electromagnetic induction heating member 53 tends to be radiated to the coil disk, thereby causing a certain hidden danger to a use safety of the coil disk. If the coil disk is too far from the electromagnetic induction heating member 53, a magnetic flux is prone to leakage, and an electromagnetic conversion utilization rate is lower.

[0073] In some embodiments, as shown in FIG. 16, an overlapping area of orthographic projections of the coil disk and the electromagnetic induction heating member 53 on the refrigerant heat exchanger 54 at least accounts for half of an area of an orthographic projection of the electromagnetic induction heating member 53 on the refrigerant heat exchanger 54. As shown in FIGS. 15 and 16, at least half of a peripheral area S2 of the electromagnetic induction heating member 53 falls within a peripheral orthographic projection area S1 of the coil disk. Here, with an extension plane of the refrigerant heat exchanger 54 as a reference plane, the above-mentioned orthographic projection refers to a forward projection on the reference plane.

[0074] It may be understood that, under the premise of generating a same density of magnetic flux lines, the less the overlapping area of the orthographic projections of the coil disk and the electromagnetic induction heating member 53, the greater the power required by the coil disk. Since the electromagnetic induction heating member 53 is configured to transfer heat to the refrigerant heat exchanger 54, with the extension plane of the refrigerant heat exchanger 54 as the reference plane, the overlapping area of the orthographic projections of the coil disk and the electromagnetic induction heating member 53 is not less than half of the orthographic projection area of the electromagnetic induction heating member 53, which may effectively reduce power consumption of the coil disk, increase an energy utilization rate, and reduce the magnetic flux leakage.

[0075] In some embodiments, as shown in FIGS. 6 to 9, the coil disk includes a coil support 521 and a wire body 522 wound on the coil support 521, and two ends of the wire body 522 serve as wiring terminals 5221. Here, the wire body 522 is wound on the coil support 521, such that the wire body 522 is conveniently wound, and the coil disk is conveniently mounted and positioned in the quick heating module 5.

[0076] Certainly, in other embodiments of the present application, the coil disk may have other structural forms; for example, the coil disk may not include the coil support 521, the wire body 522 may be directly wound on the electromagnetic induction heating member 53, and even in some cases where the space is limited, the wire body 522 may be directly wound on the refrigerant heat exchanger 54.

[0077] In some embodiments, the wire body 522 is wound on the coil support 521 in a certain shape through a plurality of turns, and then the wire body 522 is shaped on the coil support 521 by a fastening operation, a binding operation, a plastic coating operation, or the like, so as to avoid wire looseness, or the like.

[0078] Optionally, the wire body 522 is made of an enameled wire, such that a cost is low. The wire body 522 is wound on the coil support 521 in a shape of a loop, a kidney, or the like, which is the simplest winding form.

[0079] In a specific example, as shown in FIGS. 8 to 10, the coil support 521 is substantially rectangular, the wire body 522 is wound into a flat annular coil, and the coil disk has a rectangular plate shape on the whole, and is provided on one side of the electromagnetic induction heating member 53, and therefore has a large surface superposed with the projection of the electromagnetic induction heating member 53, and does not occupy too much space.

[0080] Optionally, as shown in FIGS. 9 to 11, a wire slot 5212 is defined in the coil support 521, and the wire body 522 is clamped in the wire slot 5212, such that the wire body 522 may be fixed and restricted, which greatly reduces the probability of a wire looseness; in addition, the wire body 522 is restrained by the wire slot 5212, such that the coil disk has a neater and more attractive appearance, and is not easy to tear and break during transportation and assembly. Specifically, the wire slot 5212 has a shape consistent with the final shape of the wound wire body 522, and may be configured as an annular slot, a kidney-shaped slot, or the like.

[0081] Optionally, the coil support 521 is provided with a wire pressing hook 5213 configured to lock the wiring terminal 5221, such that the wiring terminal 5221 of the wire body 522 has a fixed position, which facilitates a wire connection.

[0082] In some embodiments, as shown in FIG. 9, the coil disk includes a magnetic strip 523, and the magnetic strip 523 is provided on the coil support 521. The arrangement of the magnetic strip 523 may change a shape of the electromagnetic field at a periphery of the coil disk, such that more energy is concentrated on a side where the electromagnetic induction heating member 53 is provided, thereby improving an energy utilization efficiency.

[0083] Further, an extension line of the magnetic strip 523 is perpendicular to a tangent line of the wire body 522 at an intersection with the extension line. According to the features of the magnetic field of the coil, such an arrangement of the magnetic strip 523 facilitates expansion of an influence range of the magnetic strip 523, thereby further causing more energy to be concentrated on the side where the electromagnetic induction heating member 53 is provided.

[0084] Optionally, as shown in FIGS. 9 and 12, the coil support 521 is provided with a magnetic-strip fixing groove 5211 configured to limit the magnetic strip 523, such that the magnetic strip 523 can be conveniently assembled and positioned.

[0085] In some embodiments, as shown in FIGS. 8 and 9, the coil disk includes a voltage resistant sheet 524 provided on the coil holder 521 and located on a side of the wire body 522 facing the electromagnetic induction heating member 53. The arrangement of the voltage resistant sheet 524 further constrains the wire body 522, making the coil disk more flat on the whole. Optionally, the voltage resistant sheet 524 is configured as a mica sheet or other similar material sheets.

[0086] In the embodiment of the present application, in order to guarantee the use safety of the coil disk and reduce the magnetic flux leakage, the coil disk and the electromagnetic induction heating member 53 have an optimal distance of 1-20 mm. The distance may be kept in various ways; a fixed-distance spacing block may be directly connected between the coil disk and the electromagnetic induction heating member 53, and the distance may also be kept indirectly. Specifically, the refrigerant heat exchanger 54 and the coil disk are both connected to the outer protective member 50 to maintain the distance between the coil disk and the electromagnetic induction heating member 53.

[0087] A specific structure of the quick heating module 5 and a manner of maintaining the above-described distance according to one embodiment will be described below with reference to FIGS. 6 to 18.

[0088] As shown in FIG. 9, the coil disk includes a coil support 521, a wire body 522, a magnetic strip 523 and a voltage resistant sheet 524.

[0089] As shown in FIGS. 10 to 12, the coil support 521 has a front surface and a rear surface, FIG. 11 shows the front surface of the coil support 521, FIG. 12 shows the rear surface of the coil support 521, and the wire body 522 is wound on the front surface of the coil support 521.

[0090] Specifically, as shown in FIGS. 10 and 11, the coil support 521 is configured as a nonmetallic support having a kidney shape or an oval shape. The front surface of the coil support 521 is provided with a wire slot 5212, the wire slot 5212 has a racetrack shape, a plurality of turns of wire slots are provided and arranged layer by layer from inside to outside, and each turn of wire slot 5212 has a kidney shape or an ellipse shape. The wire body 522 is provided along the wire slot 5212, such that the wire body 522 has a multi-turn form to form the coil.

[0091] Specifically, as shown in FIGS. 10 and 11, the coil support 521 is provided with a heat dissipation opening 5214, and a part of the heat dissipation opening 5214 is superposed with the wire slot 5212, and the arrangement of the heat dissipation opening 5214 may prevent the wire body 522 from being overheated. Specifically, the heat dissipation opening 5214 is provided on the front surface of the coil support 521 and penetrates through the coil support 521 in a thickness direction. Advantageously, a plurality of heat dissipation openings 5214 are provided in an extending direction of the wire slot 5212, and each wire slot 5212 is connected with the plural wire slots 5212 provided in inner and outer layers.

[0092] More specifically, as shown in FIG. 11, the coil

support 521 is provided with a wire pressing protrusion 5215 extending above the wire slot 5212, and the wire pressing protrusion 5215 is pressed on the wire body 522.

[0093] In addition, as shown in FIG. 12, a magnetic-strip fixing groove 5211 is defined in the rear surface of the coil support 521, and the magnetic strip 523 is fitted in the magnetic-strip fixing groove 5211. The coil support 521 is provided with a calendered protrusion 5216 extending above the magnetic-strip fixing groove 5211.

[0094] Specifically, a plurality of magnetic-strip fixing grooves 5211 are provided, and some of the magnetic-strip fixing grooves 5211 are provided in a length direction of the coil support 521, and some of the magnetic-strip fixing grooves 5211 are provided in a width direction of the coil support 521.

[0095] More specifically, as shown in FIG. 10, a fool-proof block 5217 is provided on one side of the coil support 521 to prevent a reverse mounting phenomenon.

[0096] Specifically, the coil support 521 is provided with a wire pressing hook 5213 configured to press a wiring terminal 5221 of the wire body 522. As shown in FIG. 9, two wire pressing hooks 5213 are provided.

[0097] Specifically, as shown in FIG. 10, four corners of the coil support 521 are provided with fixing lugs 5218, and each fixing lug 5218 is provided with a support fixing hole 5219.

[0098] As shown in FIG. 9, to adapt to the wire slot 5212, the wire body 522 has to be made into a kidney-shaped or oval winding shape, and is limited and fixed by the plurality of wire pressing protrusions 5215 formed using a calendering process and added on the front surface of the coil support 521. The wiring terminal 5221 of the wire body 522 is buckled and pressed tightly by the wire pressing hook 5213.

[0099] The plural magnetic strips 523 are provided in the magnetic-strip fixing grooves 5211 and limited and fixed by the plurality of calendered protrusions 5216 formed using a calendering process and added on the rear surface of the coil support 521. The magnetic strip 523 is fixed to the coil support 521 by a bonding connection.

[0100] The voltage resistant sheet 524 is configured as a mica sheet with a certain thickness, has a shape fitted with the coil support 521, may also have a kidney shape or an oval shape, and is stuck to the front surface of the coil support 521.

[0101] As shown in FIGS. 13 and 14, the quick heating module 5 includes a supporting plate 56, a heat insulation member 54, a refrigerant heat exchanger 54, a coil disk, and a fixed cover 5 which are sequentially provided. The heat insulation member 55 includes a first heat insulation member 551 and a second heat insulation member 552, the first heat insulation member 551 is provided between the supporting plate 56 and the refrigerant heat exchanger 54, and the second heat insulation member 552 is provided between the refrigerant heat exchanger 54 and the coil disk.

[0102] The coil disk and the plate-shaped refrigerant

heat exchanger 54 have an inter-disk distance $h=1-20$ mm which has the following implementations.

[0103] First implementation: as shown in FIG. 14, the coil support 521 is fixed to four fixing columns 511 of the fixed cover 51 through the support fixing holes 5219 at the four corners, and the fixed cover 51 is fastened to a fixing hole 561 of the supporting plate 56 by a fixing clip 512. Then, external fixing screws sequentially penetrate through mounting holes 513 to be screwed into mounting threaded holes 562 of the supporting plate 56.

[0104] The refrigerant heat exchanger 54 is directly screwed on the supporting plate 56, such that the refrigerant heat exchanger 54, the electromagnetic induction heating member 53 and the coil disk have fixed distances, and the coil disk and the plate-shaped refrigerant heat exchanger 54 have an inter-disk distance $h=1-20$ mm.

[0105] Second implementation: as shown in FIGS. 17 and 18, legs 525 are provided on two sides of the coil disk, and after the electromagnetic induction heating member 53 is fastened to the refrigerant heat exchanger 54, the coil disk is fastened to the refrigerant heat exchanger 54 by the leg 525, such that the coil disk and the plate-shaped refrigerant heat exchanger 54 have an inter-disk distance $h=1-20$ mm.

[0106] An air conditioner 1000 according to an embodiment of the present application is described below with reference to FIGS. 5 and 19.

[0107] The air conditioner 1000 according to the embodiment of the present application, as shown in FIG. 19, includes: a compressor 4 and the quick heating module 5 according to the above-mentioned embodiment of the present application, and the structure of the quick heating module 5 will not be described here. The refrigerant passage of the refrigerant heat exchanger 54 is connected with a discharge port of the compressor 4; that is, the quick heating module 5 is configured to quickly heat air discharged from the compressor 4.

[0108] Other configurations (for example, the compressor 4, an outdoor heat exchanger, or the like) and operations of the air conditioner 1000 according to the embodiment of the present application are known to those skilled in the art and will not be described in detail herein.

[0109] An exhaust side of the compressor 4 is provided with one quick heating module 5. The heating heat generated by the electromagnetic induction heating member 53 is transferred to the microchannel heat exchanger 540 by the alternating magnetic field generator 52, and the refrigerant comes into circulating and flowing contact with an inner wall of the refrigerant passage of the microchannel heat exchanger 540 to perform heat exchange and heat transfer, so as to obtain the heat quickly, thereby quickly increasing a temperature of the refrigerant.

[0110] Specifically, a heating time of the electromagnetic induction heating member 53 is set to be a period of time when the air conditioner is started, and a heating function of the electromagnetic induction heating member 53 is stopped after the air conditioner is started to

generate heat stably, such that the air conditioner 1000 may be started to generate heat quickly in a low-temperature environment, so as to meet the user's low-temperature quick heating requirement.

[0111] In addition, when an air-conditioner outdoor unit 100 is required to operate in a defrosting mode, the quick heating module 5 may be connected between the compressor 4 and the outdoor heat exchanger 3, such that the temperature of the refrigerant discharged from the compressor may be higher, and a defrosting effect on the air-conditioner outdoor unit 100 may be better.

[0112] In this way, not only the heating function of the refrigerant, uniform heating and simple processing technology are achieved, but also the complete isolation of electricity from the refrigerant is realized, thereby realizing the quick heating effect when the air conditioner is started in a low-temperature environment.

[0113] In the air conditioner 1000 according to the embodiment of the present application, the exhaust side of the compressor 4 is provided with the above-mentioned quick heating module 5, such that the air discharged from the compressor 4 is heated quickly, thus meeting the requirement of quick heating after the air conditioner 1000 is started in winter. The electromagnetic induction heating member 53 is provided on the refrigerant heat exchanger 54, and the alternating magnetic field generator 52 is provided for the electromagnetic induction heating member 53, such that the electromagnetic induction heating member 53 generates the heat under the action of electromagnetic induction to heat the refrigerant in the refrigerant heat exchanger 54, and the electricity may be separated from the refrigerant, thus reducing the process requirement and the machining difficulty of the refrigerant heat exchanger 54 and avoiding the electrical safety problems, such as the dry heating phenomenon of the electric heating portion, the line breakdown, or the like.

[0114] In an embodiment, the air conditioner 1000 is configured as a split type air conditioner, and includes an indoor unit and the air-conditioner outdoor unit 100, and the quick heating module 5 is provided in the air-conditioner outdoor unit 100. As shown in FIG. 19, an air-conditioner outdoor unit 100 includes an enclosure 1, a middle partition 2, an outdoor heat exchanger 3, an outdoor fan, a compressor 4, and a quick heating module 5.

[0115] A mounting cavity is defined in the enclosure 1, and the middle partition 2 is provided in the mounting cavity and divides the mounting cavity into a left fan chamber 11 and a right mechanical chamber 12. A front panel 14 is provided on a front side of the mounting cavity, and an air outlet is defined on the front panel 14 corresponding to the fan chamber 11, and a mesh cover 13 covers the air outlet. The outdoor fan and the outdoor heat exchanger 3 are mounted in the fan chamber 11, and an air inlet is defined on a rear side of the outdoor heat exchanger 3. The compressor 4 is mounted at a lower portion of the mechanical chamber 12, and an electric control component 7 is mounted at an upper portion

of the mechanical chamber 12 and controls electric components, such as the outdoor fan, the compressor, or the like, to be turned on and off.

[0116] In descriptions of the present application, it should be understood that, directions or positional relationships indicated by terms "length", "width", "thickness", "upper", "lower", "front", "rear", "left", "right", "top", "bottom", "inner", "outer" etc. are based on orientations or positional relationships shown in the accompanying drawings, and they are used only for describing the present application and for description simplicity, but do not indicate or imply that an indicated device or element must have a specific orientation or be constructed and operated in a specific orientation. Therefore, it cannot be understood as a limitation on the present application. Furthermore, the feature defined with "first" and "second" may include one or more of this feature explicitly or implicitly. In the description of the present application, "a plurality of" means two or more unless otherwise stated.

[0117] In the description of the present application, it should be noted that unless specified or limited otherwise, the terms "mounted", "connected", and "coupled" and the like are broadly used, and may be, for example, fixed connections, detachable connections, or integral connections; may also be mechanical or electrical connections; may also be direct connections or indirect connections via intervening structures; may also be inner communications of two elements. The above terms can be understood by those skilled in the art according to specific situations.

[0118] The middle partition 2 here has certain strength, and is universal in the air-conditioner outdoor unit 100, and a shape and a size of the middle partition 2 are not limited, and may be adjusted according to a mounting space of the air-conditioner outdoor unit 100 and the mounting components required in the cavity. Heating cycle components of air conditioners, such as the outdoor heat exchanger 3, the compressor 4, an indoor heat exchanger, a throttling element, or the like, and heating principles are well known in the art, so they will be not repeated herein.

[0119] The electric control component 7 and the quick heating module 5 are both mounted on the middle partition 2, and the electric control component 7 is located above the quick heating module 5, and the quick heating module 5 is located above the compressor 4. It should be noted that the supporting plate 6 may be mounted on either side of the middle partition 2; that is, the quick heating module 5 may be located in the fan chamber 11 or the mechanical chamber 12, and an appropriate arrangement position may be selected as required.

[0120] The quick heating module 5 includes the alternating magnetic field generator 52, the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54, and the quick heating module 5 further includes the outer protective member 50 which is provided outside the alternating magnetic field generator 52, the electromagnetic induction heating member 53 and

the refrigerant heat exchanger 54 for protection.

[0121] Specifically, the refrigerant heat exchanger 54 may be directly and fixedly connected to the middle partition 2, and the outer protective member 50 may only include the fixed cover 51, and the fixed cover 51 covers the alternating magnetic field generator 52, the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54. Or the outer protective member 50 includes the fixed cover 51 and the supporting plate 56, and the refrigerant heat exchanger 54 is directly and fixedly connected to the supporting plate 5, and the fixed cover 51 is connected to the supporting plate 5 and covers the alternating magnetic field generator 52, the electromagnetic induction heating member 53 and the refrigerant heat exchanger 54.

[0122] In the description of the present specification, reference to "embodiments", and "examples" mean that a particular feature, structure, material, or characteristic described in connection with the embodiment or example are included in at least one embodiment or example of the present application. In the specification, the schematic expressions to the above-mentioned terms are not necessarily referring to the same embodiment or example. Furthermore, the described particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

[0123] Although embodiments of the present application have been shown and illustrated, it shall be understood by those skilled in the art that various changes, modifications, alternatives and variants without departing from the principle and idea of the present application are acceptable. The scope of the present application is defined by the claims and its equivalents.

Claims

1. A quick heating module, comprising:

a refrigerant heat exchanger defining a refrigerant passage therein;
an electromagnetic induction heating member configured to heat the refrigerant heat exchanger; and
an alternating magnetic field generator provided close to the electromagnetic induction heating member and emitting an alternating magnetic field to the electromagnetic induction heating member.

2. The quick heating module according to claim 1, wherein the electromagnetic induction heating member is provided between the refrigerant heat exchanger and the alternating magnetic field generator, and the electromagnetic induction heating member directly contacts the refrigerant heat exchanger.

3. The quick heating module according to claim 1 or 2, wherein the refrigerant heat exchanger is configured as a microchannel heat exchanger.
4. The quick heating module according to any one of claims 1 to 3, wherein the electromagnetic induction heating member is configured as a plate.
5. The quick heating module according to claim 4, wherein the electromagnetic induction heating member has a thickness less than or equal to 5 mm.
6. The quick heating module according to any one of claims 1 to 5, wherein the electromagnetic induction heating member is connected to the refrigerant heat exchanger by a fastener.
7. The quick heating module according to any one of claims 1 to 6, wherein the electromagnetic induction heating member and the refrigerant heat exchanger are provided with solder or a soldering flake therebetween and connected by welding.
8. The quick heating module according to any one of claims 1 to 7, wherein the electromagnetic induction heating member and the refrigerant heat exchanger are provided with a heat conducting agent layer therebetween.
9. The quick heating module according to any one of claims 1 to 8, wherein the alternating magnetic field generator and the electromagnetic induction heating member are provided with a heat insulation member therebetween.
10. The quick heating module according to any one of claims 1 to 9, wherein the alternating magnetic field generator is configured as a coil disk.
11. The quick heating module according to claim 10, wherein the coil disk and the electromagnetic induction heating member have a distance of 1-20 mm therebetween.
12. The quick heating module according to claim 10 or 11, wherein an overlapping area of orthographic projections of the coil disk and the electromagnetic induction heating member on the refrigerant heat exchanger at least accounts for half of an area of an orthographic projection of the electromagnetic induction heating member on the refrigerant heat exchanger.
13. The quick heating module according to any one of claims 10 to 12, wherein the coil disk comprises:
 - a coil support; and
 - a wire body wound on the coil support, two ends of the wire body serving as wiring terminals.
14. The quick heating module according to claim 13, wherein the coil disk further comprises a magnetic strip, and the magnetic strip is provided on the coil support.
15. The quick heating module according to claim 14, wherein an extension line of the magnetic strip is perpendicular to a tangent line of the wire body at an intersection with the extension line.
16. The quick heating module according to claim 14, wherein the coil support is provided with a magnetic-strip fixing groove configured to limit the magnetic strip.
17. The quick heating module according to claim 13, wherein the coil support defines a wire slot, and the wire body is clamped in the wire slot.
18. The quick heating module according to claim 13, wherein the coil support is provided with a wire pressing hook configured to lock the wiring terminal.
19. The quick heating module according to claim 13, wherein the coil support is substantially rectangular, and the wire body is wound into a flat annular coil.
20. The quick heating module according to claim 13, wherein the coil disk comprises a voltage resistant sheet provided on the coil support and located on a side of the wire body facing the electromagnetic induction heating member.
21. The quick heating module according to claim 11, wherein the electromagnetic induction heating member is provided on the refrigerant heat exchanger, the quick heating module further comprises an outer protective member, and the refrigerant heat exchanger and the coil disk are connected to the outer protective member, so as to keep a distance between the coil disk and the electromagnetic induction heating member.
22. An air conditioner, comprising: a compressor; and a quick heating module according to any one of claims 1 to 21, the refrigerant passage of the refrigerant heat exchanger being connected with a discharge port of the compressor.

5

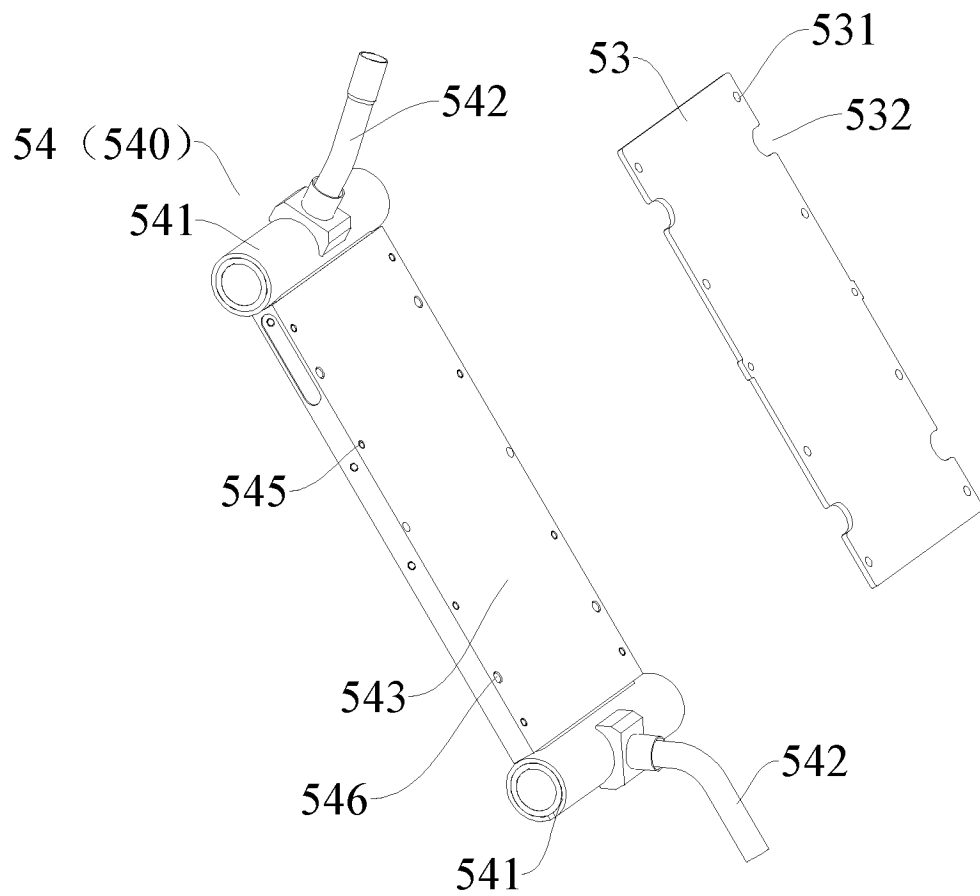


FIG. 1

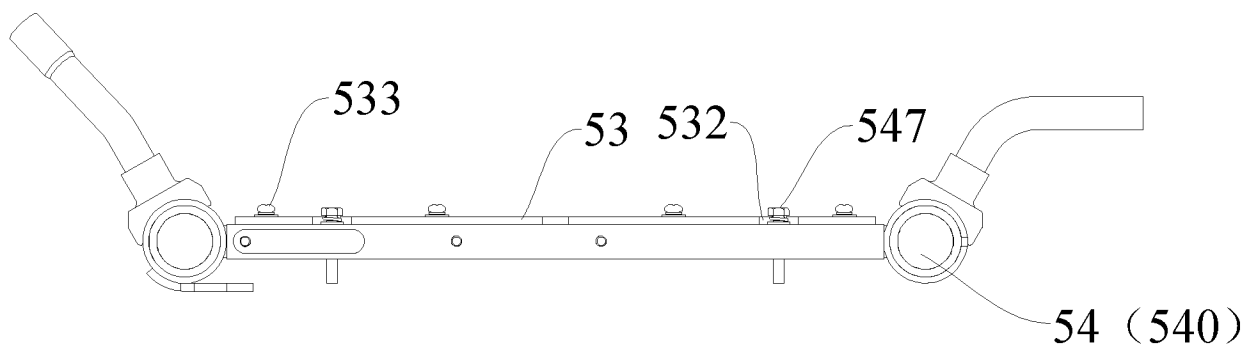


FIG. 2

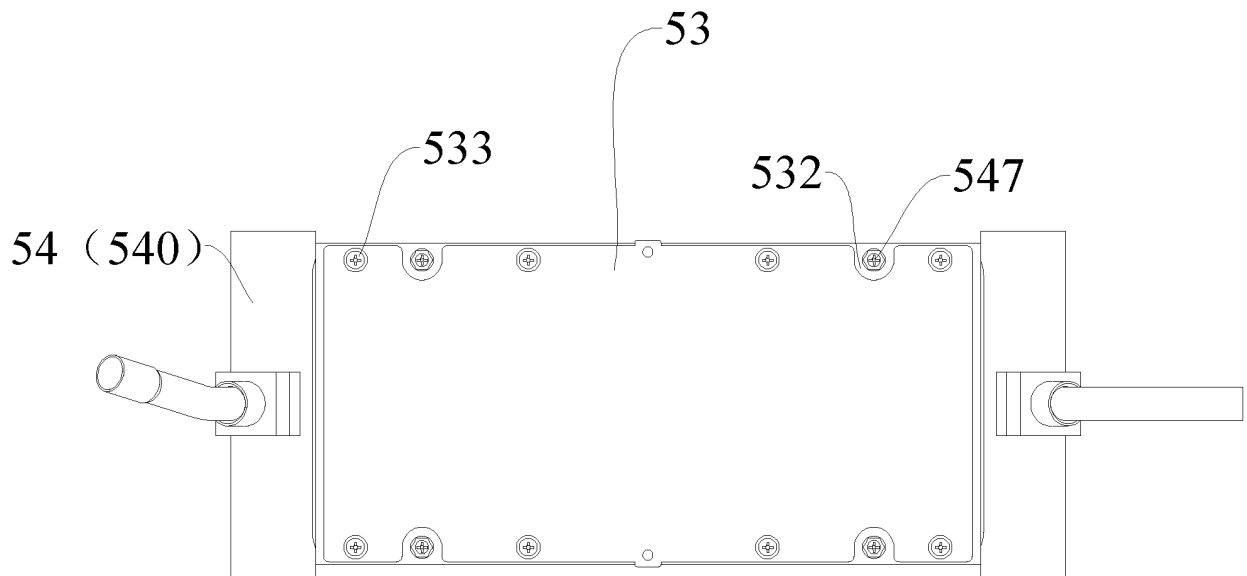


FIG. 3

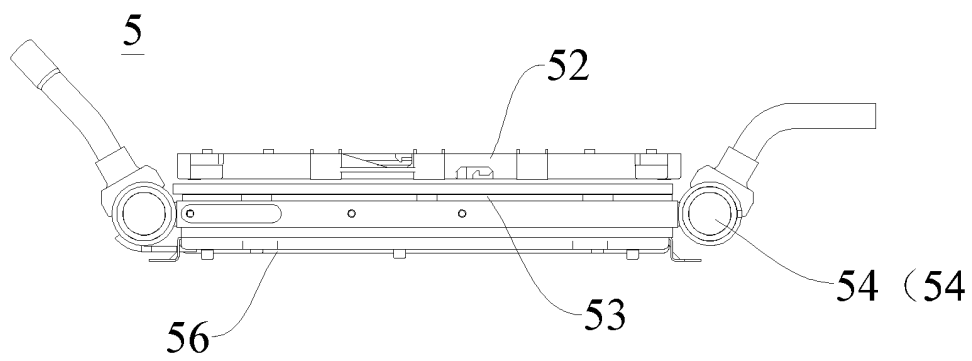


FIG. 4

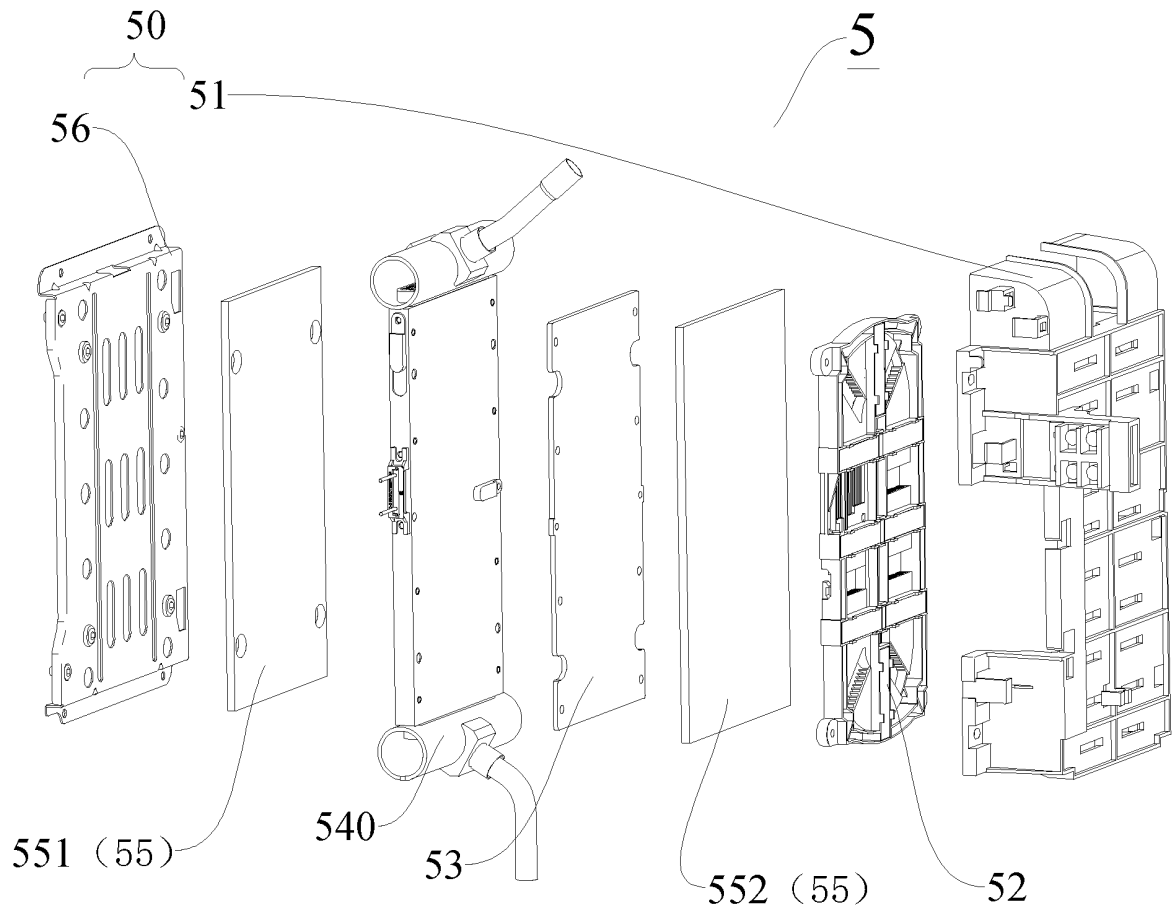


FIG. 5

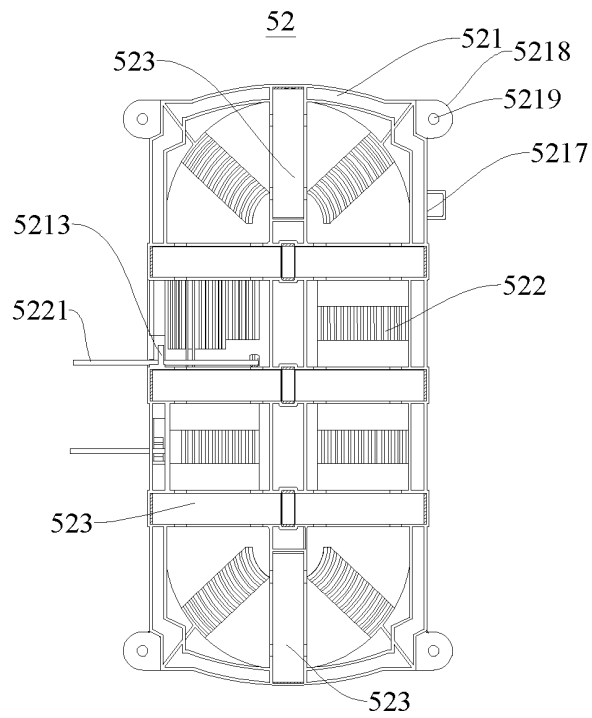


FIG. 6

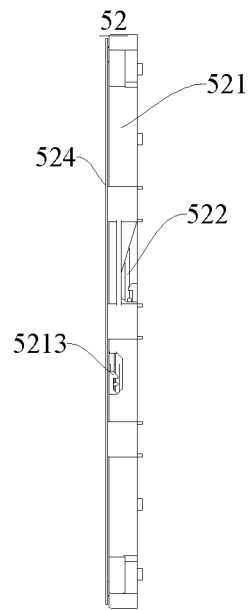


FIG. 7

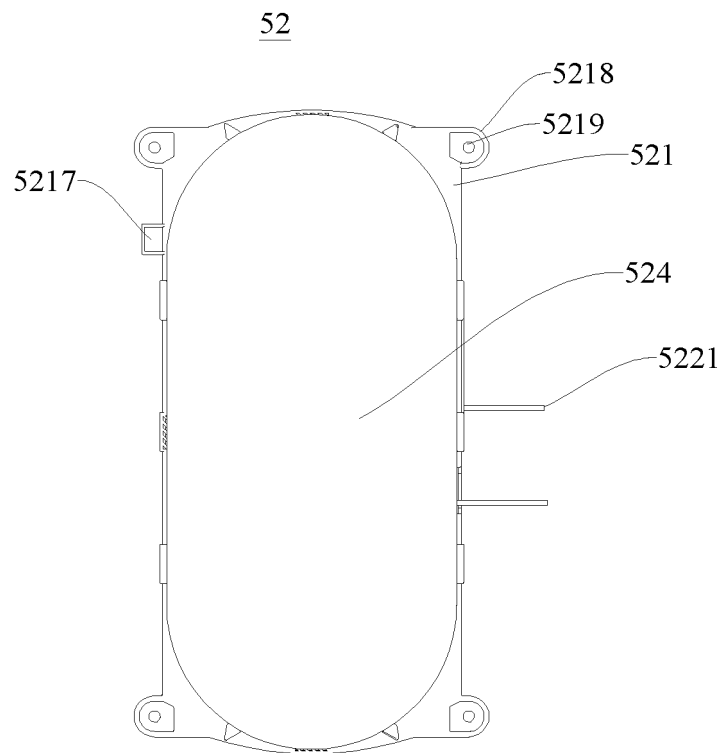


FIG. 8

52

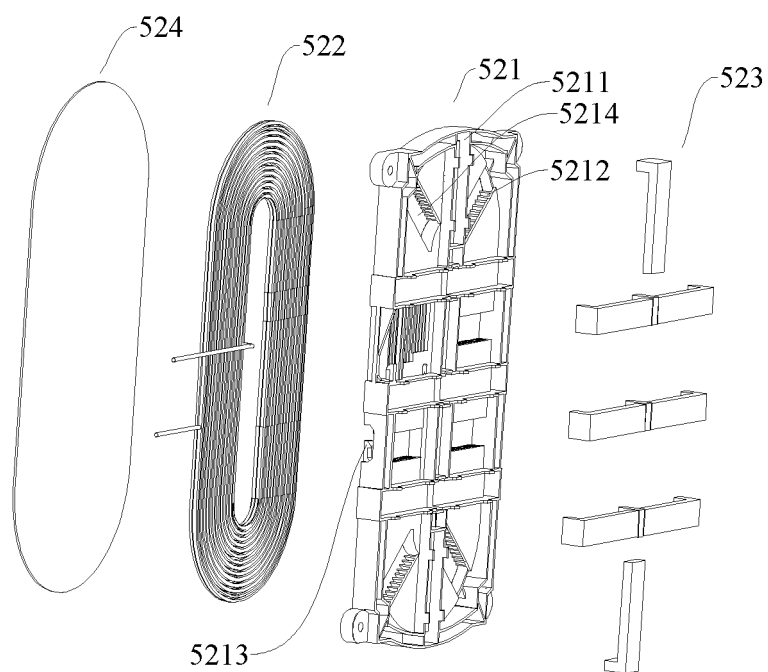


FIG. 9

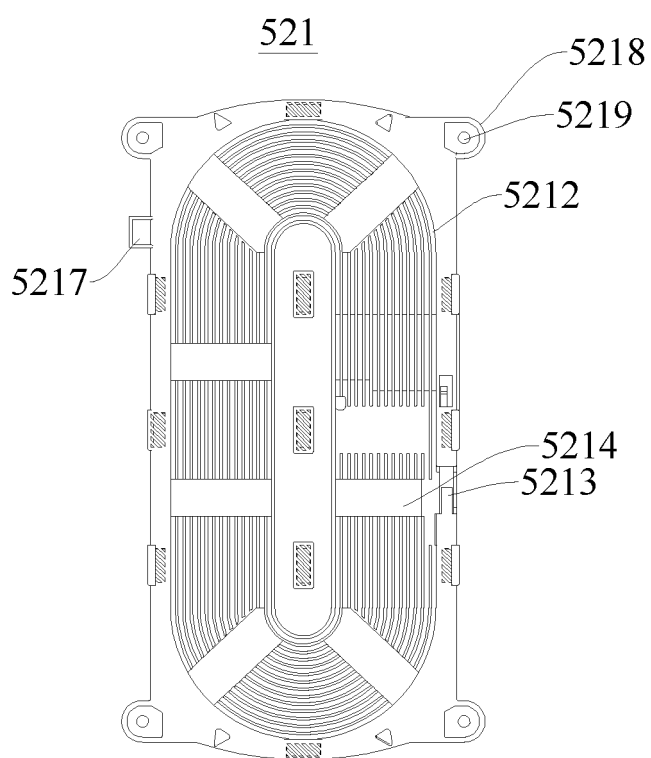


FIG. 10

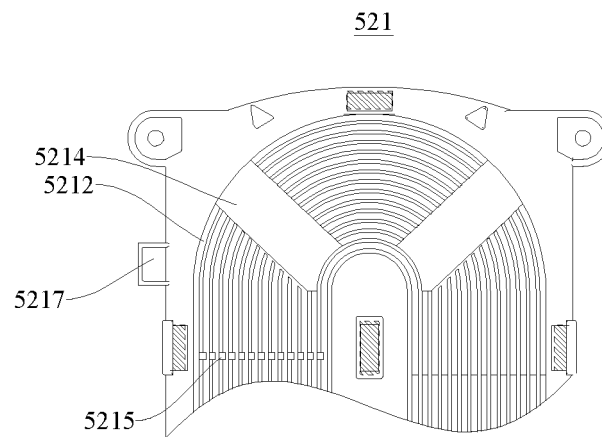


FIG. 11

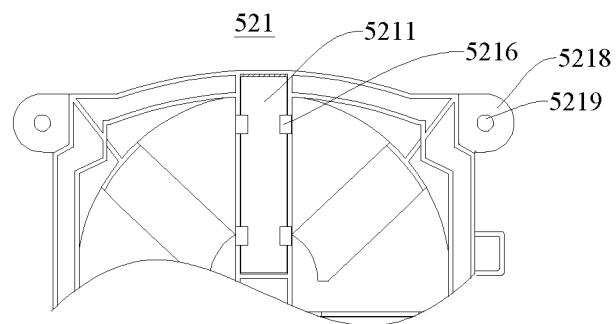


FIG. 12

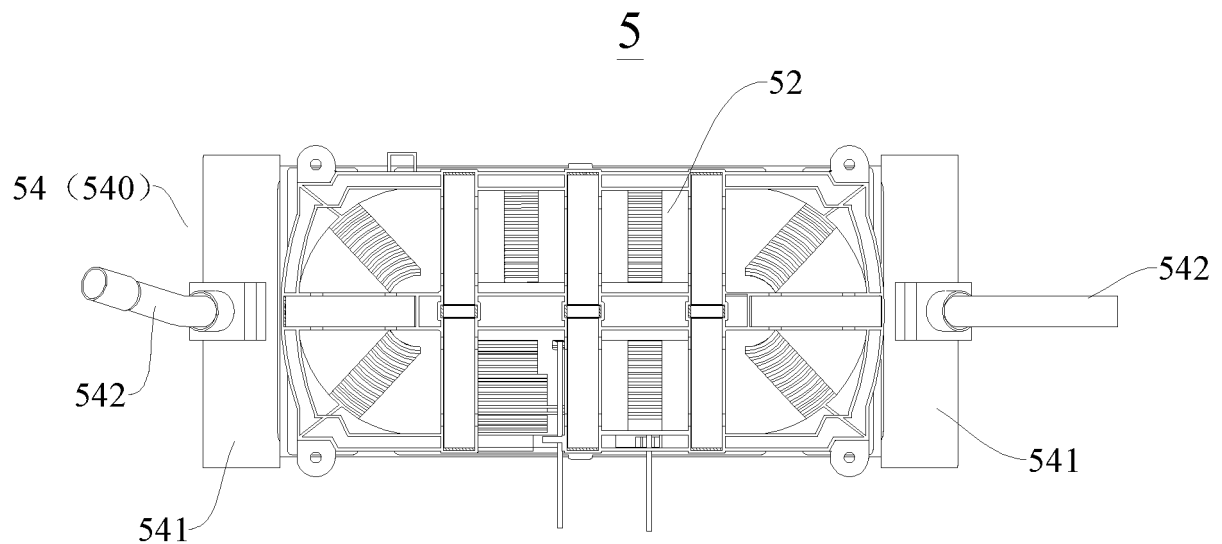


FIG. 13

5

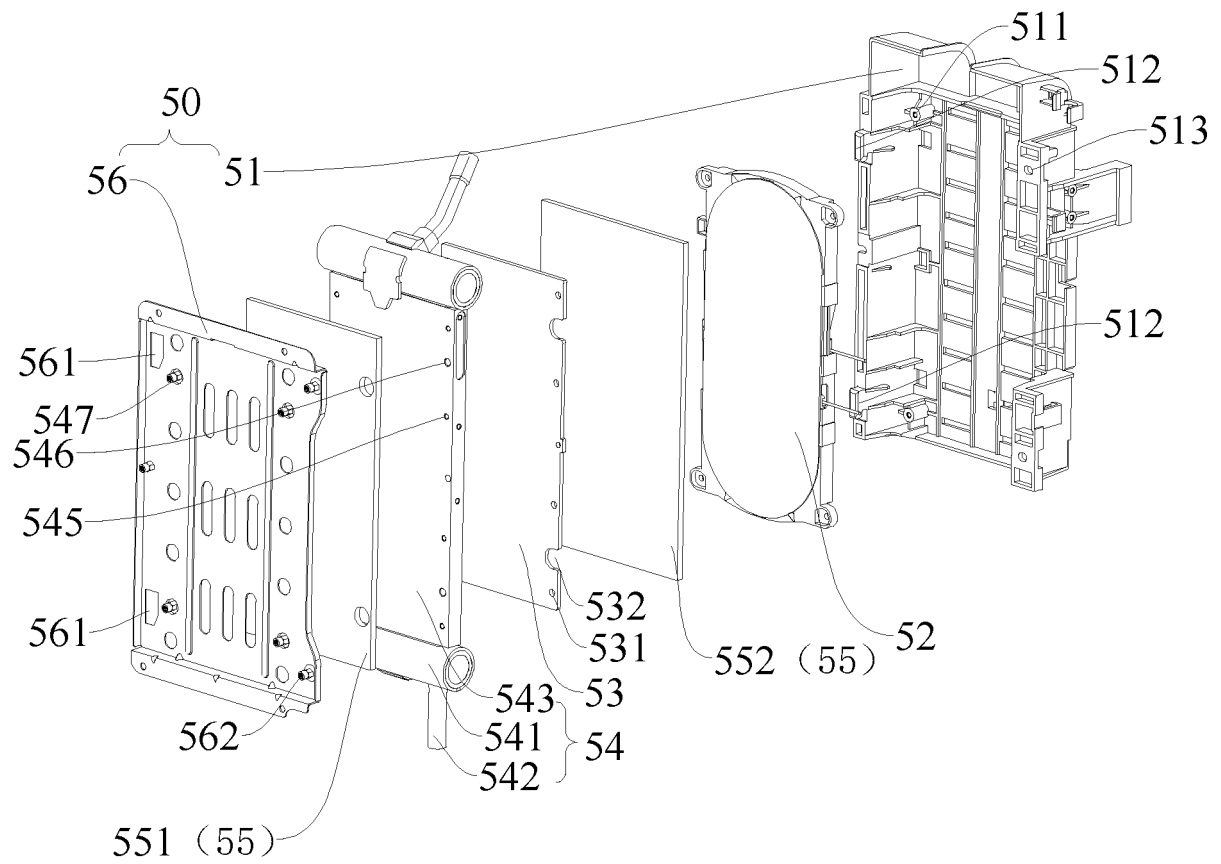


FIG. 14

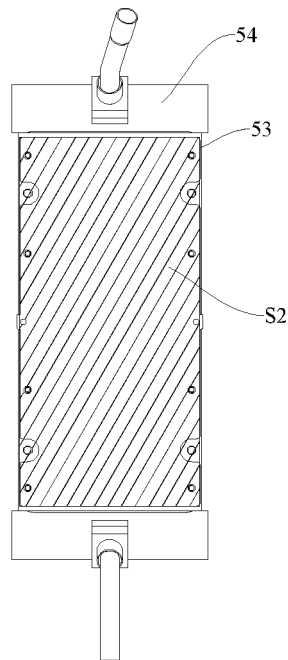


FIG. 15

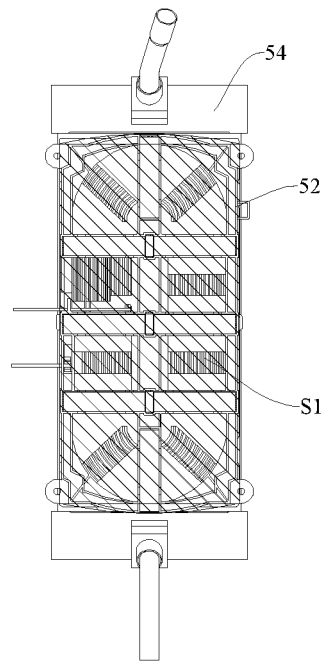


FIG. 16

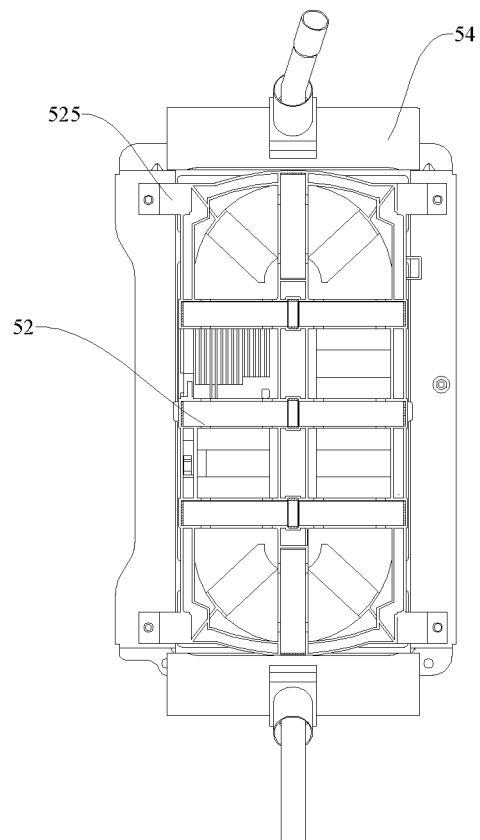


FIG. 17

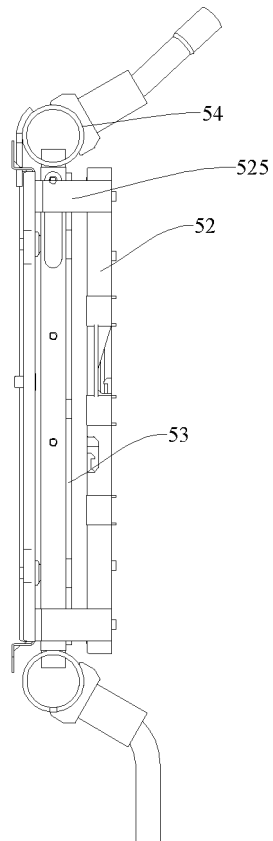


FIG. 18

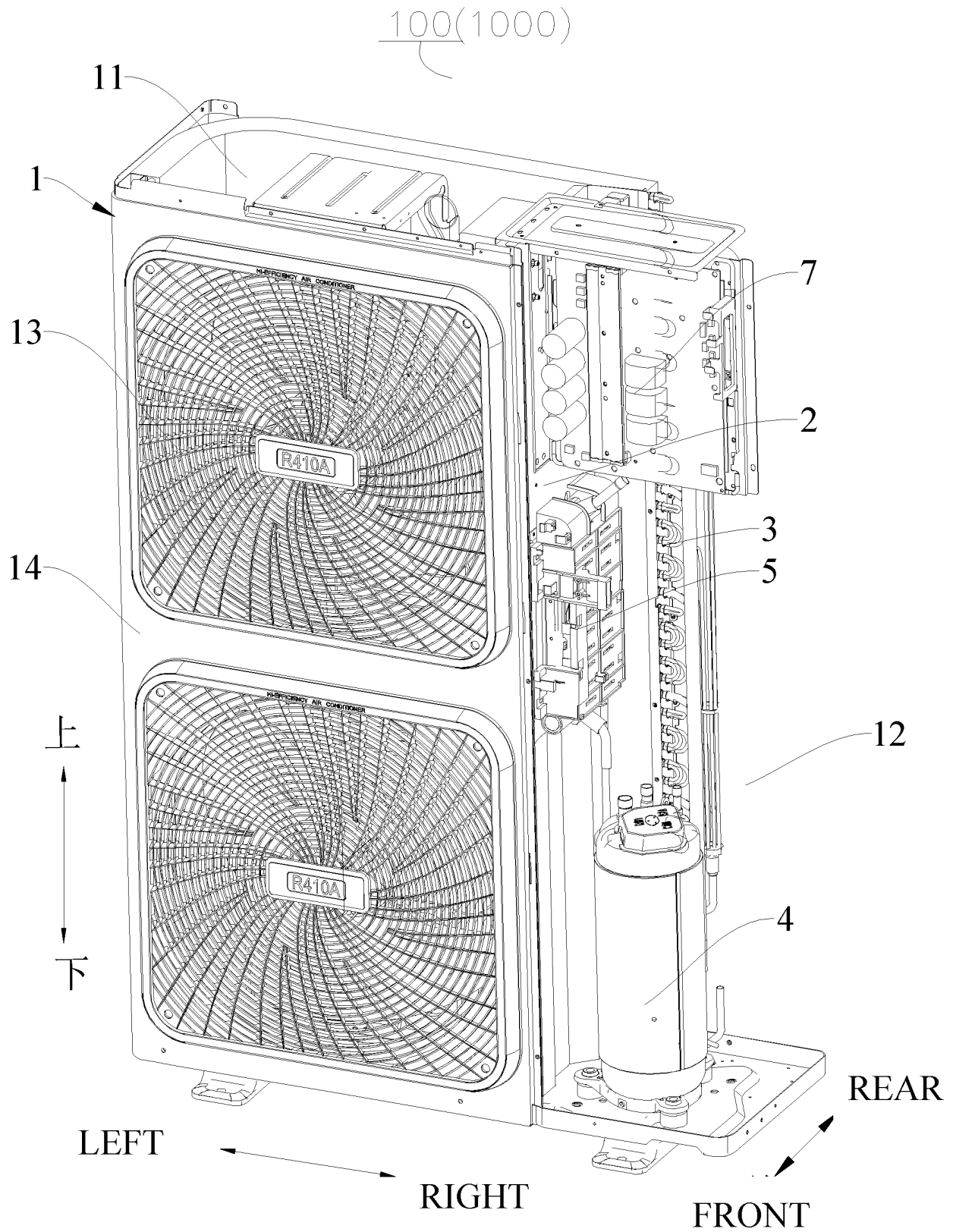


FIG. 19

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/080948

A. CLASSIFICATION OF SUBJECT MATTER H05B 6/02(2006.01)i; H05B 6/36(2006.01)i; F24F 13/00(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																		
B. FIELDS SEARCHED																		
Minimum documentation searched (classification system followed by classification symbols) H05B,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) CNPAT, WPI, EPODOC, CNKI: 空调, 制冷剂, 冷媒, 加热, 加热板, 板状, 感应, 线圈, 微管, 微通道, air, condition+, cool+, medium, heat+, plate, electromagnetic, induct+, coil, micro+																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT																		
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 209861206 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0042]-[0089], and figures 1-5</td> <td>1-22</td> </tr> <tr> <td>PX</td> <td>CN 209861205 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0052]-[0134], and figures 1-14</td> <td>1-22</td> </tr> <tr> <td>PX</td> <td>CN 109982465 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs [0053]-[0129], and figures 1-14</td> <td>1-22</td> </tr> <tr> <td>X</td> <td>CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5</td> <td>1-12, 21-22</td> </tr> <tr> <td>Y</td> <td>CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5</td> <td>13-20</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 209861206 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0042]-[0089], and figures 1-5	1-22	PX	CN 209861205 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0052]-[0134], and figures 1-14	1-22	PX	CN 109982465 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs [0053]-[0129], and figures 1-14	1-22	X	CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5	1-12, 21-22	Y	CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5	13-20
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																
PX	CN 209861206 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0042]-[0089], and figures 1-5	1-22																
PX	CN 209861205 U (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 27 December 2019 (2019-12-27) description, paragraphs [0052]-[0134], and figures 1-14	1-22																
PX	CN 109982465 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 05 July 2019 (2019-07-05) description, paragraphs [0053]-[0129], and figures 1-14	1-22																
X	CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5	1-12, 21-22																
Y	CN 108759169 A (GUANGDONG MIDEA HEATING & VENTILATION EQUIPMENT CO., LTD. et al.) 06 November 2018 (2018-11-06) description, paragraphs [0041]-[0047], figure 5	13-20																
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																		
<table border="0"> <tr> <td style="vertical-align: top;"> * 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 </td> <td style="vertical-align: top;"> “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 </td> </tr> </table>	* 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																
* 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 22 May 2020	Date of mailing of the international search report 22 June 2020																	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																	

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/080948

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 203801093 U (SICHUAN HUINENG ENERGY INVESTMENT MANAGEMENT CO., LTD.) 27 August 2014 (2014-08-27) description, paragraph [0022], and figure 1	13-20
A	CN 108759177 A (QINGDAO HAIER CO., LTD.) 06 November 2018 (2018-11-06) entire document	1-22
A	CN 203533957 U (MIDEA GROUP CO., LTD.) 09 April 2014 (2014-04-09) entire document	1-22
A	US 5334819 A (LIN, Hsiao-Chih) 02 August 1994 (1994-08-02) entire document	1-22

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/080948

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 209861206 U	27 December 2019	None	
CN 209861205 U	27 December 2019	None	
CN 109982465 A	05 July 2019	None	
CN 108759169 A	06 November 2018	CN 208458307 U	01 February 2019
		EP 3623726 A1	18 March 2020
		WO 2019242493 A1	26 December 2019
CN 203801093 U	27 August 2014	None	
CN 108759177 A	06 November 2018	None	
CN 203533957 U	09 April 2014	None	
US 5334819 A	02 August 1994	GB 2289830 A	29 November 1995
		BR 9401046 A	28 November 1995

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 201920476599 [0001]
- CN 201910277490 [0001]
- CN 201920469021 [0001]