



(11)

EP 4 772 800 A1

(12)

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

(43) Date of publication:
08.07.2026 Bulletin 2026/28

(51) International Patent Classification (IPC):
F24F 1/22 ^(2011.01) **F24F 1/24** ^(2011.01)
F24F 11/89 ^(2018.01)

(21) Application number: **23950527.4**

(52) Cooperative Patent Classification (CPC):
F24F 1/22; F24F 1/24; F24F 11/89

(22) Date of filing: **13.12.2023**

(86) International application number:
PCT/CN2023/138545

(87) International publication number:
WO 2025/043961 (06.03.2025 Gazette 2025/10)

(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 ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

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(30) Priority: **30.08.2023 CN 202311114424**
30.08.2023 CN 202322358438 U

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(54) **ELECTRIC CONTROL BOX ASSEMBLY AND AIR CONDITIONER OUTDOOR UNIT HAVING SAME**

(57) Provided are an electric control box assembly (100) and an air conditioner outdoor unit (1000) having same. The electric control box assembly (100) comprises: an electric control box (10), the electric control box (10) defining a first cavity (14) and a heat dissipation air duct (13), the first cavity (14) being not communicated with the heat dissipation air duct (13), and the heat

dissipation air duct (13) having a heat dissipation inlet (131) and a heat dissipation outlet (132); and an electric control element (20) and a heating element (30), the electric control element (20) being arranged in the first cavity (14), and the heating element (30) being arranged in the heat dissipation air duct (13).

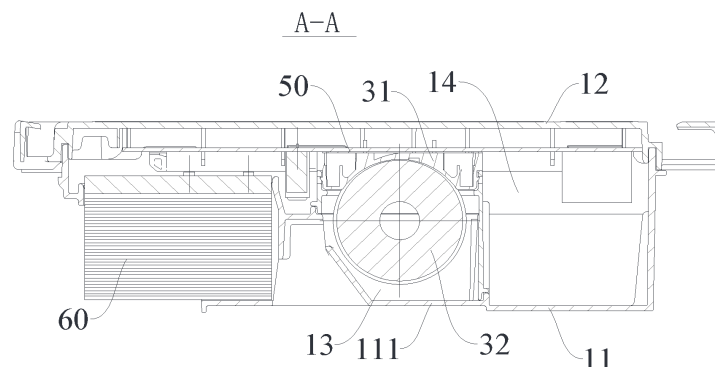


FIG. 4

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is based on and claims priorities to Chinese patent application No. 202311114424.6 and Chinese patent application No. 202322358438.4, both filed on August 30, 2023, the entire contents of which are incorporated herein by reference.

FIELD

[0002] The present disclosure relates to the field of air conditioner technologies, and more particularly, to an electric control box assembly and an air conditioner outdoor unit having same.

BACKGROUND

[0003] An electric control module in an electric control box of an air conditioner outdoor unit generates heat during operation. For cooling purposes, a typical electric control box is equipped with an air duct that is connected to an external space, which may ensure heat dissipation of an electrical component in the electric control module, facilitating cooling. However, when a fault such as refrigerant leakage occurs in the air conditioner outdoor unit, a refrigerant may also enter the electric control box along the air duct, causing damage to the electrical component inside the electric control box.

SUMMARY

[0004] The present disclosure aims to solve at least one of the above technical problems in the related art to some extent.

[0005] In view of this, the present disclosure provides an electric control box assembly, which can ensure operational safety of an electric control element, effectively preventing occurrence of a sparking incident of the electric control element caused by refrigerant leakage. Also, a heat dissipation effect on a heating element can also be ensured, preventing the heating element from malfunctioning due to overheating during normal operation. Therefore, operational safety of the electric control box assembly can be improved, further enhancing safety and reliability of an air conditioner outdoor unit.

[0006] An electric control box assembly is provided according to a first aspect of the present disclosure. The electric control box assembly is used for an air conditioner outdoor unit. The electric control box assembly includes: an electric control box defining a first cavity and a heat dissipation air duct, the first cavity being not in communication with the heat dissipation air duct, and the heat dissipation air duct having a heat dissipation inlet and a heat dissipation outlet; an electric control element disposed in the first cavity; and a heating element disposed in the heat dissipation air duct.

[0007] With the electric control box assembly according to the present disclosure, by defining, in the electric control box, the first cavity and the heat dissipation air duct which are not in communication with each other, the operational safety of the electric control element can be ensured, effectively preventing occurrence of the sparking incident of the electric control element caused by refrigerant leakage. Also, the heat dissipation effect on the heating element can also be ensured, preventing the heating element from malfunctioning due to overheating during normal operation. Therefore, the operational safety of the electric control box assembly can be improved, further enhancing the safety and reliability of the air conditioner outdoor unit.

[0008] According to an example of the present disclosure, the electric control box includes a box body and a box cover. The box body has an open side, the box cover covering the open side of the box body. The heating element and the electric control element are disposed at a side of the box cover facing the box body. The heat dissipation inlet and the heat dissipation outlet are formed at the box body.

[0009] According to an example of the present disclosure, the electric control box assembly further includes a hood plate connected to the box cover and disposed on an outer side of the heating element, the hood plate and the box body define the heat dissipation air duct.

[0010] According to an example of the present disclosure, the hood plate includes an annular portion and a baffle portion. The annular portion is connected to the box cover and extends annularly in a circumferential direction of the heating element. The baffle portion is connected to a side of the annular portion facing away from the box cover and extends in a circumferential direction of the annular portion. The box body is provided with a surrounding plate extending in the circumferential direction of the annular portion, a peripheral edge of the surrounding plate being sealingly connected to a peripheral edge of the hood plate to define the heat dissipation air duct.

[0011] According to an example of the present disclosure, the surrounding plate includes a side plate portion and a top plate portion. The side plate portion extends in the circumferential direction of the annular portion and abuts with the baffle portion in the circumferential direction of the annular portion. The top plate portion is connected to an end of the side plate portion away from the box cover and sealingly connected to the baffle portion.

[0012] According to an example of the present disclosure, the electric control box assembly further includes an electric control board disposed at the side of the box cover facing the box body, the electric control element and the heating element being disposed at the electric control board.

[0013] According to an example of the present disclosure, the electric control box assembly further includes a heat dissipation member disposed at an outer side of the first cavity and an outer side of the heat dissipation air duct, the heat dissipation member being connected to the

electric control board and configured to dissipate heat from the electric control board.

[0014] According to an example of the present disclosure, the heat dissipation inlet faces the heat dissipation member and is in communication with the heat dissipation member. The heat dissipation outlet faces away from the heat dissipation member.

[0015] According to an example of the present disclosure, the heating element includes a base and a heating body disposed at the base, the base being fixedly connected to the electric control board.

[0016] According to an example of the present disclosure, the box body is connected to the box cover by a snap-fit engagement and/or via a fastener.

[0017] According to an example of the present disclosure, the heating element is a PFC inductor.

[0018] An air conditioner outdoor unit is provided according to a second aspect of the present disclosure. The outdoor unit includes a housing, a fan impeller, and the electric control box assembly according to a first aspect of the present disclosure. The fan impeller and the electric control box assembly are disposed in the housing.

[0019] In the air conditioner outdoor unit according to the present disclosure, by disposing the electric control box assembly according to the first aspect above, overall performance of the air conditioner outdoor unit can be improved.

[0020] Additional aspects and advantages of the present disclosure will be provided at least in part in the following description, or will become apparent at least in part from the following description, or can be learned from practicing of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

FIG. 1 is a schematic view of an air conditioner outdoor unit according to an embodiment of the present disclosure.

FIG. 2 is a schematic view of an electric control box assembly according to an embodiment of the present disclosure.

FIG. 3 is a schematic view of an electric control box assembly according to an embodiment of the present disclosure, viewed from another perspective.

FIG. 4 is a sectional view taken along line A-A shown in FIG. 3.

FIG. 5 is a partial schematic view of an electric control box assembly according to an embodiment of the present disclosure.

FIG. 6 is a sectional view of an electric control box assembly according to an embodiment of the present disclosure, viewed from another perspective.

Reference numerals:

[0022]

air conditioner outdoor unit 1000;
electric control box assembly 100;
electric control box 10; box body 11; surrounding plate 111; side plate portion 1111; top plate portion 1112; box cover 12; heat dissipation air duct 13; heat dissipation inlet 131; heat dissipation outlet 132; first cavity 14;
electric control element 20;
heating element 30; base 31; heating body 32;
hood plate 40; electric control board 50; heat dissipation member 60;
housing 200; fan impeller 300.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0023] Embodiments of the present disclosure will be described in detail below with reference to examples thereof as illustrated in the accompanying drawings, throughout which same or similar elements, or elements having same or similar functions, are denoted by same or similar reference numerals. The embodiments described below with reference to the drawings are illustrative, and are intended to explain, rather than limiting, the present disclosure.

[0024] Various embodiments or examples for implementing different structures of the present disclosure are provided below. In order to simplify the description of the present disclosure, components and arrangements of specific examples are described herein. Of course, these specific examples are merely for the purpose of illustration, rather than limiting the present disclosure. Further, the same reference numerals and/or reference letters may appear in different examples of the present disclosure for the purpose of simplicity and clarity, instead of indicating a relationship between different embodiments and/or the discussed arrangements. In addition, the present disclosure provides examples of various specific processes and materials. However, applications of other processes and/or use of other materials are conceivable for those of ordinary skill in the art.

[0025] An air conditioner outdoor unit 1000 according to an embodiment in a second aspect of the present disclosure is briefly described with reference to FIG. 1. The air conditioner outdoor unit 1000 includes an electric control box assembly 100 according to an embodiment in a first aspect of the present disclosure.

[0026] As illustrated in FIG. 1, the air conditioner outdoor unit 1000 according to the second aspect of the present disclosure includes a housing 200, a fan impeller 300, and the electric control box assembly 100 according to the first aspect of the present disclosure. The fan impeller 300 and the electric control box assembly 100 are disposed in the housing 200.

[0027] The electric control box assembly 100 according to the embodiment in the first aspect of the present disclosure is described below with reference to FIG. 2 to FIG. 6.

[0028] As illustrated in FIG. 2 to FIG. 5, the electric

control box assembly 100 according to the embodiment in the first aspect of the present disclosure is used for an air conditioner outdoor unit 1000. The electric control box assembly 100 includes an electric control box 10, an electric control element 20 and a heating element 30. The electric control box 10 defines a first cavity 14 and a heat dissipation air duct 13. The first cavity 14 is not in communication with the heat dissipation air duct 13. The heat dissipation air duct 13 has a heat dissipation inlet 131 and a heat dissipation outlet 132. The electric control element 20 is disposed in the first cavity 14. The heating element 30 is disposed in the heat dissipation air duct 13.

[0029] In an exemplary embodiment of the present disclosure, an accommodation cavity may be formed in the electric control box 10. The accommodation cavity may be configured to accommodate the electric control element 20 and the heating element 30. The electric control box 10 can provide a mounting space and protection for the electric control element 20 and the heating element 30. Also, the electric control element 20 and the heating element 30 can be integrated into the electric control box 10, increasing aesthetics and integration of the electric control box assembly 100.

[0030] The first cavity 14 is formed as a sealed space. The electric control element 20 is disposed in the first cavity 14, which can effectively prevent impurities such as dust and rainwater from entering the first cavity 14 and thus damaging the electric control element 20. Also, when the air conditioner outdoor unit 1000 experiences abnormal conditions such as refrigerant leakage, a refrigerant can also be effectively prevented from entering the first cavity 14 and causing a sparking incident of the electric control element 20, effectively preventing the air conditioner outdoor unit 1000 from catching a fire caused by the refrigerant leakage. Therefore, overall safety of the air conditioner outdoor unit 1000 can be improved.

[0031] The heat dissipation air duct 13 can guide an airflow and define a flow direction of the airflow. The heat dissipation air duct 13 has the heat dissipation inlet 131 and the heat dissipation outlet 132. The heating element 30 is disposed in the heat dissipation air duct 13. When the air conditioner outdoor unit 1000 is in operation, the airflow may enter the heat dissipation duct through the heat dissipation inlet 131, and then perform heat exchange with the heating element 30 in the heat dissipation air duct 13 to cool the heating element 30. The heat-exchanged airflow is discharged through the heat dissipation outlet 132, in such a manner that the heating element 30 may not malfunction due to overheating during normal use. Therefore, operational safety of the heating element 30 and safety and reliability of the electric control box assembly 100 can be improved.

[0032] With the electric control box assembly 100 according to the embodiments of the present disclosure, by defining, in the electric control box 10, the first cavity 14 and the heat dissipation air duct 13 which are not in communication with each other, operational safety of the electric control element 20 can be ensured, effectively

preventing occurrence of the sparking incident of the electric control element 20 caused by refrigerant leakage. Also, a heat dissipation effect on the heating element 30 can also be ensured, preventing the heating element 30 from malfunctioning due to overheating during normal operation. Therefore, operational safety of the electric control box assembly 100 can be improved, further enhancing safety and reliability of the air conditioner outdoor unit 1000.

[0033] According to some embodiments of the present disclosure, as illustrated in FIG. 2 and FIG. 4, the electric control box 10 includes a box body 11 and a box cover 12. The box body 11 has an open side. The box cover 12 covers the open side of the box body 11. The heating element 30 and the electric control element 20 are disposed at a side of the box cover 12 facing the box body 11. The heat dissipation inlet 131 and the heat dissipation outlet 132 are formed at the box body 11. The box body 11 has the accommodation cavity. The accommodation cavity may accommodate the heating element 30 and the electric control element 20 in the electric control box. The box cover 12 covers the open side of the box body 11 to prevent dust and other impurities from entering, improving safety of the electric control box assembly 100.

[0034] For example, as illustrated in FIG. 1, when the electric control box assembly 100 is disposed at the air conditioner outdoor unit 1000, the box cover 12 is disposed above the box body 11. That is, the heating element 30 and the electric control element 20 are placed upside down. In this way, the heating element 30 and the electric control element 20 can be protected, effectively avoiding damage to the heating element 30 and the electric control element 20 caused by accumulation of water, dust, or other impurities, and further improving the operational safety of the electric control box assembly 100.

[0035] According to some embodiments of the present disclosure, as illustrated in FIG. 5, the electric control box assembly 100 further includes a hood plate 40 connected to the box cover 12 and disposed at an outer side of the heating element 30. The hood plate 40 and the box body 11 define the heat dissipation air duct 13. The hood plate 40 cooperates with the box body 11 to isolate the first cavity 14 from the heat dissipation air duct 13, ensuring sealing of the first cavity 14 and thus effectively preventing the refrigerant or other impurities from entering the first cavity 14 through the heat dissipation air duct 13 and causing damage to the electric control element 20. Therefore, safety of the electric control element 20 and safety and reliability of an entire unit can be enhanced. Also, the hood plate 40 may also be configured to isolate the heating element 30 from the electric control element 20, effectively avoiding damage to the electric control element 20 caused by overheating of the heating element 30. Therefore, the operational safety of the electric control box assembly 100 can be improved.

[0036] According to some embodiments of the present disclosure, as illustrated in FIG. 5, the hood plate 40

includes an annular portion and a baffle portion. The annular portion is connected to the box cover 12 and extends annularly in a circumferential direction of the heating element 30. The baffle portion is connected to a side of the annular portion facing away from the box cover 12 and extends in a circumferential direction of the annular portion. The box body 11 is provided with a surrounding plate 111 extending in the circumferential direction of the annular portion. A peripheral edge of the surrounding plate 111 is sealingly connected to a peripheral edge of the hood plate 40 to define the heat dissipation air duct 13.

[0037] The peripheral edge of the surrounding plate 111 is sealingly connected to the peripheral edge of the hood plate 40, which can not only define the heat dissipation air duct 13 but also completely isolate the heat dissipation air duct 13 from the first cavity 14. Also, the sealed connection between the peripheral edge of the surrounding plate 111 and the peripheral edge of the hood plate 40 can further define an airflow direction of the heat dissipation air duct 13, ensuring that the airflow flows in the circumferential direction of the heating element 30 and preventing the airflow from escaping in directions other than the heat dissipation outlet 132. In this way, a reduction in airflow passing through the heating element 30 can also be avoided, preventing a decrease in a cooling effect. Further, the cooling effect of the heating element 30 can be ensured and thus the heating element 30 can be prevented from malfunctioning due to overheating during normal use, enhancing the safety and reliability of the electric control box assembly 100.

[0038] According to some embodiments of the present disclosure, as illustrated in FIG. 6, the surrounding plate 111 includes a side plate portion 1111 and a top plate portion 1112. The side plate portion 1111 extends in the circumferential direction of the annular portion and abuts with the baffle portion in the circumferential direction of the annular portion. The top plate portion 1112 is connected to an end of the side plate portion 1111 away from the box cover 12 and sealingly connected to the baffle portion.

[0039] The surrounding plate 111 is connected to the hood plate 40, to enable the heat dissipation air duct 13 to have only two ventilation openings, i.e., the heat dissipation inlet 131 and the heat dissipation outlet 132. In this way, the airflow can move only from the heat dissipation inlet 131 to the heat dissipation outlet 132, providing targeted heat dissipation for the heating element 30. Further, the cooling effect of the heating element 30 can be enhanced, and thus the heating element 30 can be prevented from malfunctioning due to overheating during normal use, enhancing the safety and reliability of the electric control box assembly 100.

[0040] For example, as illustrated in FIG. 4, a first plate portion and a second plate portion are formed at the top plate portion 1112. The first plate portion extends horizontally. An end of the second plate portion is connected to an end of the first plate portion, and another end of the

second plate portion extends towards the heating element 30 to form an angle with the first plate portion. In this way, the top plate portion 1112 can be arranged in the circumferential direction of the heating element 30, defining a movement range of the airflow and increasing a cooling area of the airflow on the heating element 30. Further, a cooling effect of the airflow on the heating element 30 can be improved.

[0041] According to some embodiments of the present disclosure, as illustrated in FIG. 5, the electric control box assembly 100 further includes an electric control board 50 disposed at the side of the box cover 12 facing the box body 11. The electric control element 20 and the heating element 30 are disposed at the electric control board 50. The electric control board 50 is an important component of the electric control box assembly 100. The electric control board 50 is composed of many unit circuits. Various input signals are processed by the electric control board 50 to control the entire air conditioner outdoor unit through an output circuit. The electric control board 50 serves as a control center of an electric control system. Also, an electrical component for controlling the air conditioner outdoor unit 1000 is mounted at the electric control board 50, to control operation of a compressor, a fan, an electric heating tape, and other air conditioning devices.

[0042] According to some embodiments of the present disclosure, as illustrated in FIG. 5, the electric control box assembly 100 further includes a heat dissipation member 60 disposed at an outer side of the first cavity 14 and an outer side of the heat dissipation air duct 13. The heat dissipation member 60 is connected to the electric control board 50 and configured to dissipate heat from the electric control board 50. The heat dissipation member 60 may perform heat conduction, which can transfer heat generated from the electric control board 50 to the heat dissipation member 60, and then the heat is dissipated from the heat dissipation member 60 into the air, completing heat dissipation of the electric control board 50 and thus improving operational safety of the electric control board 50. The heat dissipation member 60 may have various types. For example, the heat dissipation member 60 may be a heat sink.

[0043] According to some embodiments of the present disclosure, as illustrated in FIG. 6, the heat dissipation inlet 131 faces the heat dissipation member 60 and is in communication with the heat dissipation member 60. The heat dissipation outlet 132 faces away from the heat dissipation member 60. In an exemplary embodiment of the present disclosure, the heat dissipation inlet 131 and the heat dissipation member 60 are located at a side of the electric control box 10 facing a fan impeller 200. In this way, an airflow driven by the fan impeller 200 can not only perform heat exchange with the heating element 30, but also perform heat exchange with the heat dissipation member 60, achieving overall cooling of the electric control box assembly 100 and further improving the operational safety of the electric control box assembly

100.

[0044] For example, as illustrated in FIG. 6, the heat dissipation inlet 131 and the heat dissipation outlet 132 are arranged opposite to each other, which can facilitate circulation of the airflow and increase smoothness of airflow passage, improving the heat dissipation effect on the heating element 30. Therefore, safety and reliability of the heating element 30 during use can be enhanced.

[0045] According to some embodiments of the present disclosure, as illustrated in FIG. 5, the heating element 30 includes a base 31 and a heating body 32 disposed at the base 31. The base 31 is fixedly connected to the electric control board 50. The base 31 may be configured to mount the heating body 32, and also isolate the electric control board 50 from the heating body 32, effectively avoiding damage to the electric control board 50 caused by overheating of the heating body 32. Therefore, the operational safety of the electric control box assembly 100 can be improved.

[0046] In some embodiments, the base 31 is fixedly connected to the hood plate 40 by a snap-fit engagement. A plurality of protrusions are formed at the base 31. The hood plate 40 has grooves formed at a side of the hood plate 40 facing the box cover 12. The grooves are engaged with the protrusions. The grooves correspond to the protrusions in a one-to-one correspondence. In this way, convenience of mounting and disassembly of the base 31 and the hood plate 40 can be improved, enhancing convenience of mounting, disassembly, and maintenance of the electric control box assembly 100.

[0047] According to some embodiments of the present disclosure, the box body 11 is connected to the box cover 12 by a snap-fit engagement and/or via a fastener. That is, the box body 11 and the box cover 12 may be connected to each other only by the snap-fit engagement, which can improve convenience of connection and disassembly between the box body 11 and the box cover 12. Alternatively, the box body 11 and the box cover 12 may be connected to each other only via the fastener, which can increase tightness of the connection between the box body 11 and the box cover 12, improving sealing of the electric control box assembly 100. In addition, the box body 11 and the box cover 12 may also be connected to each other both by the snap-fit engagement and via the fastener, which can improve the sealing of the electric control box assembly 100 while increasing the convenience of mounting and disassembly of the electric control box assembly 100.

[0048] The snap-fit engagement may include various types, for example, a buckle engagement. The fastener also includes various types. For example, the fastener may be a bolt or a screw.

[0049] For example, as illustrated in FIG. 4, an engagement groove is further formed at the box cover 12. The box body 11 has an extension portion formed at a peripheral edge of the box body 11. The extension portion extends towards the box cover 12. The extension portion

is engaged with the engagement groove. When the electric control box assembly 100 is used for the air conditioner outdoor unit 1000, the box cover 12 is disposed above the box body 11. In this way, the box cover 12 is connected to the box body 11 via the engagement groove, which can effectively prevent impurities such as rainwater from entering the box body 11 along a connection between the box cover 12 and the box body 11 and causing damage to the electric control element 20. Therefore, the operational safety of the electric control box assembly 100 can be improved.

[0050] According to some embodiments of the present disclosure, the heating element 30 is a Power Factor Correction (PFC) inductor. The PFC inductor can improve a power factor in a circuit, reducing a reactive power in the circuit, and thus enhancing an effect of power conversion.

[0051] Further, the PFC inductor is an enameled wire, such that exposure thereof may not cause sparking, further improving the safety of the electric control box assembly 100 and enhancing safety and reliability of the entire unit.

[0052] The air conditioner outdoor unit 1000 according to the embodiment in the second aspect of the present disclosure includes a housing 200; a fan impeller 300; and the electric control box assembly 100 according to the embodiment of the first aspect of the present disclosure. The fan impeller 300 and the electric control box assembly 100 are disposed in the housing 200.

[0053] The housing 200 provides a mounting space for the fan impeller 300 and the electric control box 10. The fan impeller 300 is adapted to drive the airflow in the heat dissipation air duct 13 to flow from the heat dissipation inlet 131 to the heat dissipation outlet 132, realizing cooling of the heating element 30 of the electric control box assembly 100.

[0054] For example, as illustrated in FIG. 1, the electric control box assembly 100 is disposed obliquely above the fan impeller 300 assembly. The heat dissipation inlet 131 faces the fan impeller 300. The heat dissipation outlet 132 faces away from the fan impeller 300. In this case, when the fan impeller 300 rotates, a peripheral airflow may be driven to rotate in a circumferential direction of the fan impeller 300, driving the airflow to enter via the heat dissipation inlet 131. Also, since the heat dissipation outlet 132 faces away from the fan impeller 300, no airflow is generated at the heat dissipation outlet 132, resulting in no resistance at the heat dissipation outlet 132, which can facilitate smooth discharge of the airflow. Therefore, the heat dissipation effect on the heating element 30 can be improved.

[0055] In the air conditioner outdoor unit 1000 according to the embodiments of the present disclosure, by disposing the electric control box assembly 100 according to the embodiment of the first aspect above, overall performance of the air conditioner outdoor unit 1000 can be improved.

[0056] In the description of the present disclosure, it

should be understood that, the orientation or the position indicated by terms such as "center," "over," "below," "vertical," "horizontal," "top," "bottom," "inner," "outer," "axial," "radial," and "circumferential" should be construed to refer to the orientation and the position as shown in the drawings, and is only for the convenience of describing the present disclosure and simplifying the description, rather than indicating or implying that the pointed device or element must have a specific orientation, or be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation of the present disclosure.

[0057] In addition, the terms such as "first" and "second" are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of indicated technical features. Therefore, the features associated with "first" and "second" may explicitly or implicitly include one or more of the features. In the description of the present disclosure, "plurality" means two or more, unless otherwise specifically defined.

[0058] In the present disclosure, unless otherwise clearly specified and limited, terms, such as "mounting," "connect," "connect to," and "fixed to" should be understood in a broad sense. For example, it may be a fixed connection, a detachable connection, or an integral connection; direct connection or indirect connection through an intermediate; or internal communication of two components or the interaction relationship between two components. For those skilled in the art, specific meanings of the above-mentioned terms in the present disclosure can be understood according to specific circumstances.

[0059] In the present disclosure, unless expressly stipulated and defined otherwise, the first feature "on" or "under" the second feature may mean that the first feature is in direct contact with the second feature, or the first and second features are in indirect contact through an intermediate. Moreover, the first feature "above" the second feature may mean that the first feature is directly above or obliquely above the second feature, or simply mean that the level of the first feature is higher than that of the second feature. The first feature "below" the second feature may mean that the first feature is directly below or obliquely below the second feature, or simply mean that the level of the first feature is smaller than that of the second feature.

[0060] In the description of the present disclosure, the description with reference to the terms "one embodiment," "some embodiments," "an example," "a specific example," "some examples," etc. means that specific features, structures, materials, or characteristics described in conjunction with the embodiment(s) or example(s) are included in at least one embodiment or example of the present disclosure. In the present disclosure, any illustrative reference of the above terms does not necessarily refer to the same embodiment(s) or example(s). Moreover, the specific features, structures, materials, or characteristics as described can be combined in

any one or more embodiments or examples as appropriate. In addition, different embodiments or examples and features of different embodiments or examples described in the specification may be combined by those skilled in the art without mutual contradiction.

[0061] Although embodiments of the present disclosure have been illustrated and described, it is conceivable for those skilled in the art that various changes, modifications, replacements, and variations can be made to these embodiments without departing from the principles and spirit of the present disclosure. The scope of the present disclosure shall be defined by the claims as appended and their equivalents.

Claims

1. An electric control box assembly for an air conditioner outdoor unit, the electric control box assembly comprising:

an electric control box defining a first cavity and a heat dissipation air duct, wherein the first cavity is not in communication with the heat dissipation air duct, and wherein the heat dissipation air duct has a heat dissipation inlet and a heat dissipation outlet;
an electric control element disposed in the first cavity; and
a heating element disposed in the heat dissipation air duct.

2. The electric control box assembly according to claim 1, wherein the electric control box comprises a box body and a box cover, wherein:

the box body has an open side, the box cover covering the open side of the box body;
the heating element and the electric control element are disposed at a side of the box cover facing the box body; and
the heat dissipation inlet and the heat dissipation outlet are formed at the box body.

3. The electric control box assembly according to claim 2, further comprising:

a hood plate connected to the box cover and disposed on an outer side of the heating element, wherein the hood plate and the box body define the heat dissipation air duct.

4. The electric control box assembly according to claim 3, wherein the hood plate comprises:

an annular portion connected to the box cover and extending annularly in a circumferential direction of the heating element; and
a baffle portion connected to a side of the an-

nular portion facing away from the box cover and extending in a circumferential direction of the annular portion,
 wherein the box body is provided with a surrounding plate extending in the circumferential direction of the annular portion, a peripheral edge of the surrounding plate being sealingly connected to a peripheral edge of the hood plate to define the heat dissipation air duct.

5. The electric control box assembly according to claim 4, wherein the surrounding plate comprises:

a side plate portion extending in the circumferential direction of the annular portion and abutting with the baffle portion in the circumferential direction of the annular portion; and
 a top plate portion connected to an end of the side plate portion away from the box cover and sealingly connected to the baffle portion.

6. The electric control box assembly according to any one of claims 2 to 5, further comprising:
 an electric control board disposed at the side of the box cover facing the box body, wherein the electric control element and the heating element are disposed at the electric control board.

7. The electric control box assembly according to claim 6, further comprising:
 a heat dissipation member disposed at an outer side of the first cavity and an outer side of the heat dissipation air duct, wherein the heat dissipation member is connected to the electric control board and configured to dissipate heat from the electric control board.

8. The electric control box assembly according to claim 7, wherein the heat dissipation inlet faces the heat dissipation member and is in communication with the heat dissipation member, and wherein the heat dissipation outlet faces away from the heat dissipation member.

9. The electric control box assembly according to any one of claims 6 to 8, wherein the heating element comprises a base and a heating body disposed at the base, the base being fixedly connected to the electric control board.

10. The electric control box assembly according to any one of claims 2 to 9, wherein the box body is connected to the box cover by a snap-fit engagement and/or via a fastener.

11. The electric control box assembly according to any one of claims 1 to 10, wherein the heating element is a power factor correction inductor.

12. An air conditioner outdoor unit, comprising:

a housing;
 a fan impeller; and
 the electric control box assembly according to any one of claims 1 to 11, wherein the fan impeller and the electric control box assembly are disposed in the housing.

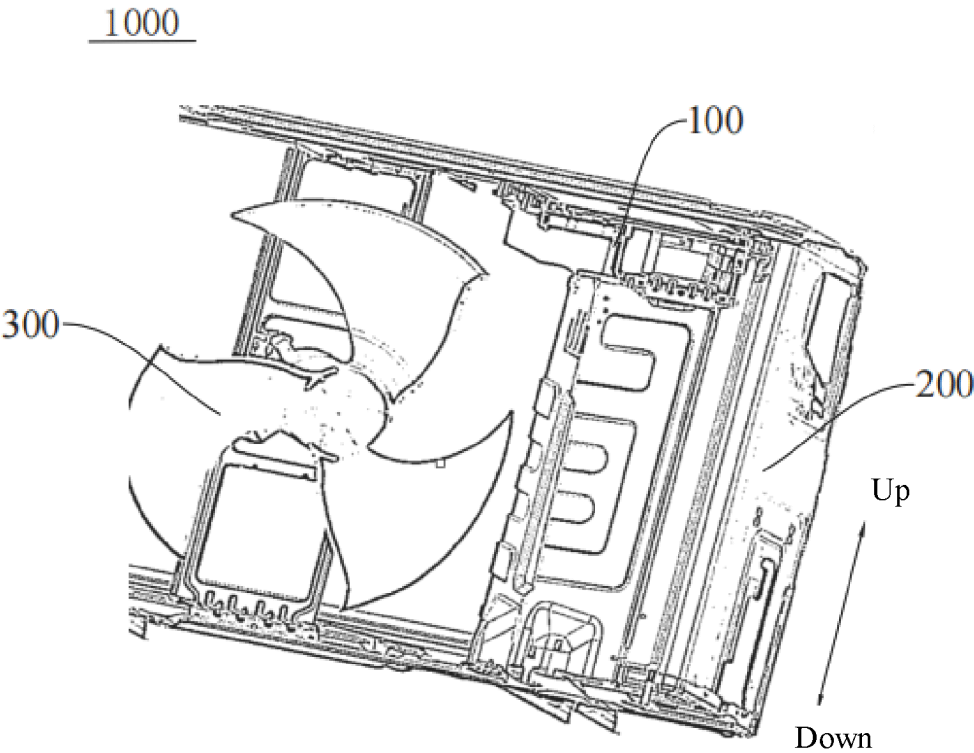


FIG. 1

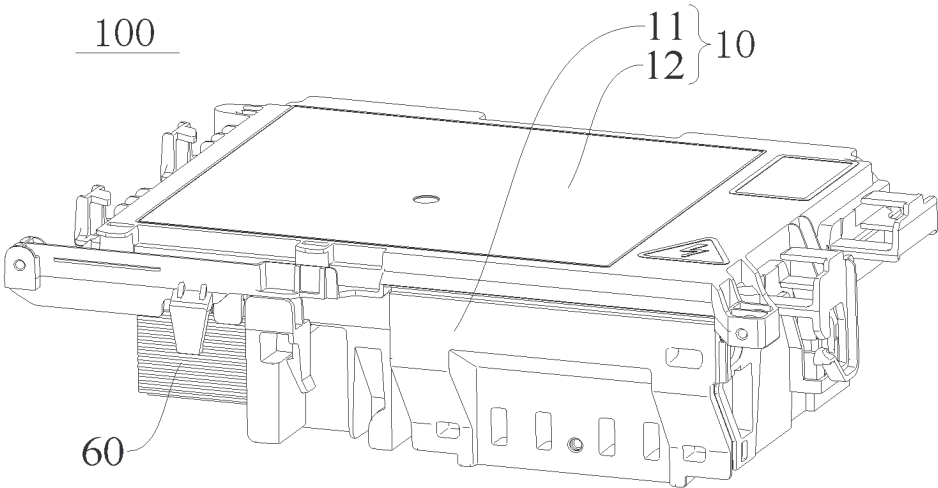


FIG. 2

100

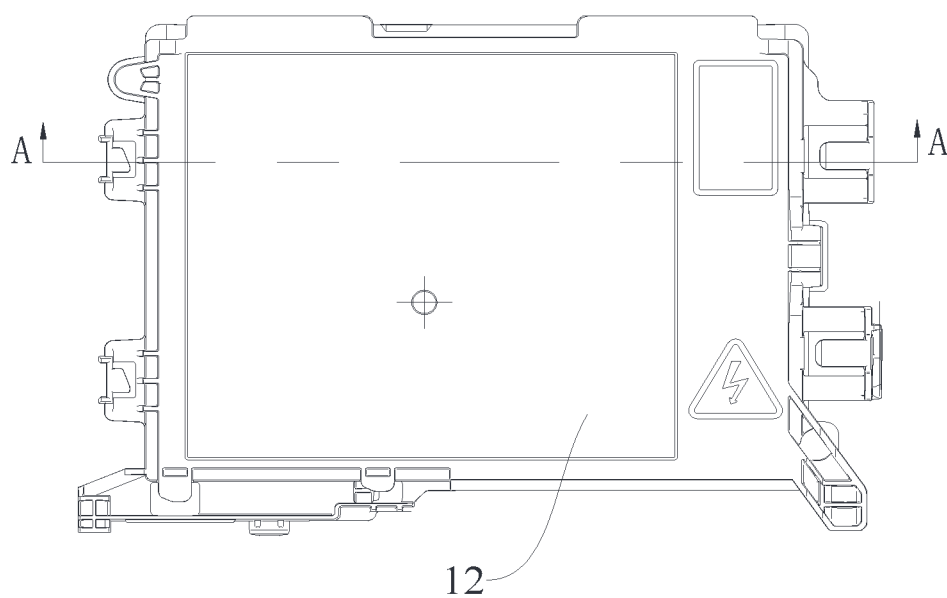


FIG. 3

A—A

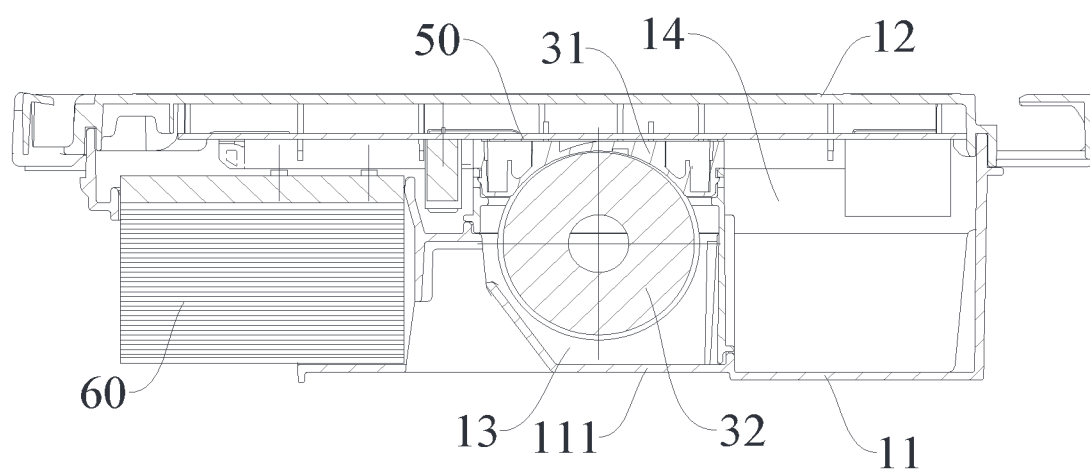


FIG. 4

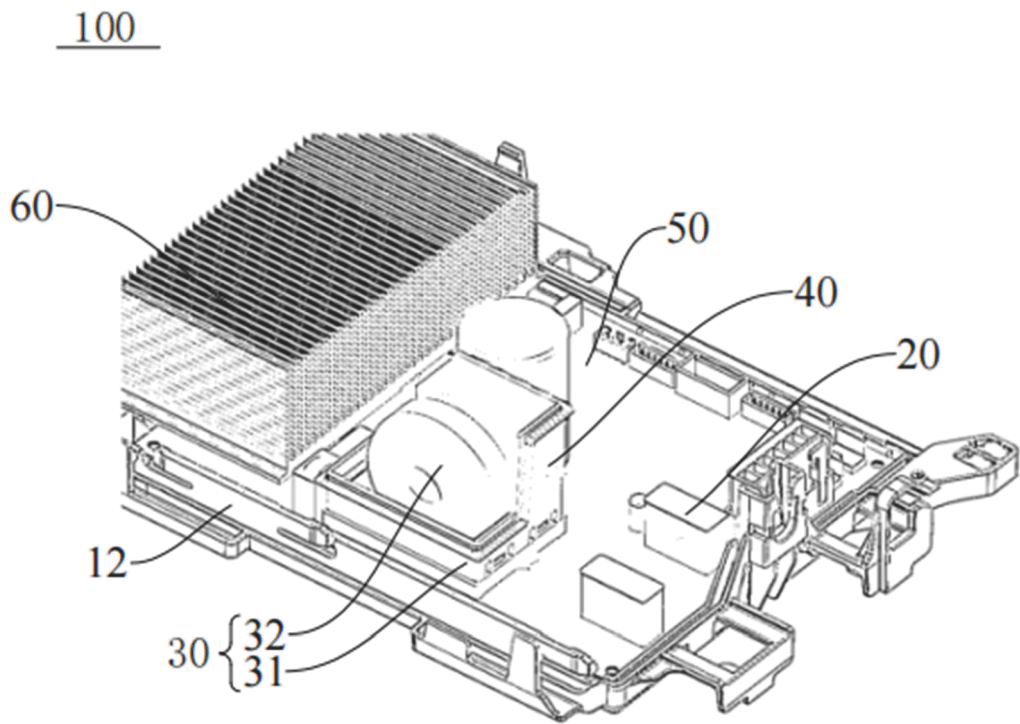


FIG. 5

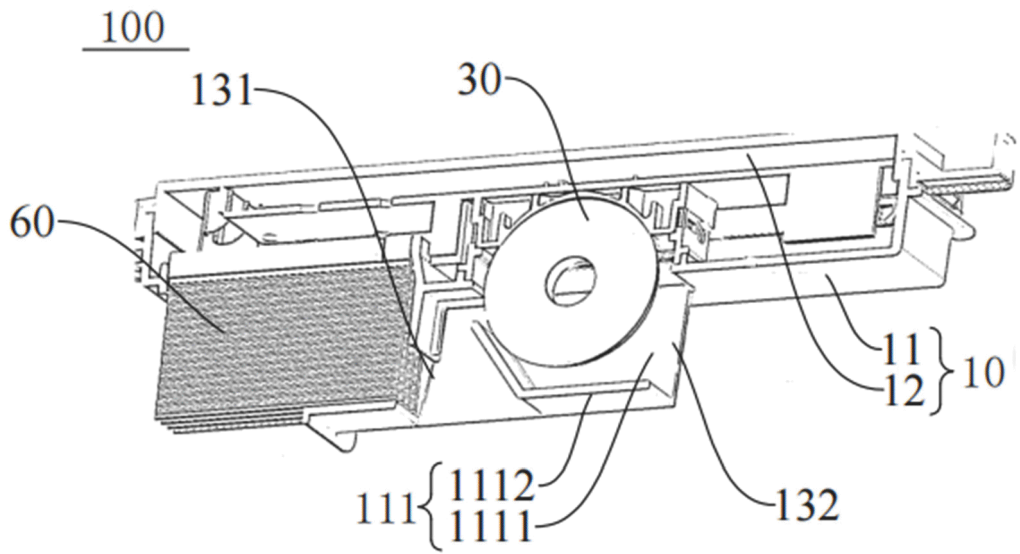


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/138545

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/22(2011.01)i; F24F1/24(2011.01)i; F24F11/89(2018.01)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)

CNXTX, ENTXT, ENTXTC, VEN, CNKI: 空调, 空气调节, 电控部件, 电控元件, 电器部件, 电器元件, 电气部件, 电气元件, 腔, 发热, 散热, 冷却, 风道, 风路, 通道, 通路, 流道, 不连通, 隔断, 独立, 打火, 火灾, 冷媒, 制冷剂, 致冷剂, 泄漏, 泄露, air w condition+, electr+, control+, box+, chest?, cas???, heat, generat+, radiat+, cool+, passage?, path?, channel?, fir???, coolant, cryogen, refrigerant, leak+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 203132008 U (GUANGDONG MIDEA ELECTRIC APPLIANCES CO., LTD.) 14 August 2013 (2013-08-14) description, paragraphs 32-56, and figures 1-4	1-12
A	CN 115342445 A (HEFEI MIDEA HEATING & VENTILATING EQUIPMENT CO., LTD. et al.) 15 November 2022 (2022-11-15) entire document	1-12
A	CN 215675536 U (GD MIDEA AIR-CONDITIONING EQUIPMENT CO., LTD.) 28 January 2022 (2022-01-28) entire document	1-12
A	CN 108076605 A (GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI) 25 May 2018 (2018-05-25) entire document	1-12

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

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"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

27 April 2024

Date of mailing of the international search report

14 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/CN2023/138545

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 115789798 A (GD MIDEA HEATING & VENTILATING EQUIPMENT CO., LTD. et al.) 14 March 2023 (2023-03-14) entire document	1-12
A	JP H10220824 A (DAIKIN INDUSTRIES, LTD.) 21 August 1998 (1998-08-21) entire document	1-12
A	JP 2004093085 A (DAIKIN INDUSTRIES, LTD.) 25 March 2004 (2004-03-25) entire document	1-12
A	JP 2016191504 A (DAIKIN INDUSTRIES, LTD.) 10 November 2016 (2016-11-10) entire document	1-12

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2023/138545

5

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Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	203132008	U	14 August 2013	None			
CN	115342445	A	15 November 2022	WO	2024041055	A1	29 February 2024
				CN	217979061	U	06 December 2022
CN	215675536	U	28 January 2022	None			
CN	108076605	A	25 May 2018	CN	207783347	U	28 August 2018
				CN	108076605	B	08 March 2024
CN	115789798	A	14 March 2023	None			
JP	H10220824	A	21 August 1998	JP	3807004	B2	09 August 2006
JP	2004093085	A	25 March 2004	JP	4269603	B2	27 May 2009
JP	2016191504	A	10 November 2016	JP	6565271	B2	28 August 2019

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202311114424 [0001]
- CN 202322358438 [0001]