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(54) CONDENSATION MODULE, DRYING MODULE AND ALL-IN-ONE WASHER DRYER

(57) A condensation module, a drying module and an all-in-one washer dryer. The condensation module comprises: a casing (1) and a condenser (3) arranged in the casing (1); an air inlet (11) arranged in one side of the casing (1); an air outlet (12) arranged in the opposite side of the casing (1); and a flow disturbing component (22) arranged on the inner wall of the casing (1). An airflow passage is formed among the inner wall of the casing (1), the flow disturbing component (22) and the condenser (3), so as to enable high-temperature wet airflows to be in full contact with the condenser (3). In the condensation module, the flow disturbing component (22) arranged on the inner wall of the casing (1) can prevent airflows from directly flowing towards the air outlet (12) along the inner wall of the casing (1), and the airflow passage is formed among the inner wall of the casing (1), the flow disturbing component (22) and the condenser (3), so as to enable the high-temperature wet airflows to be in full contact with the condenser (3), thereby improving condensation and dehumidification efficiency.

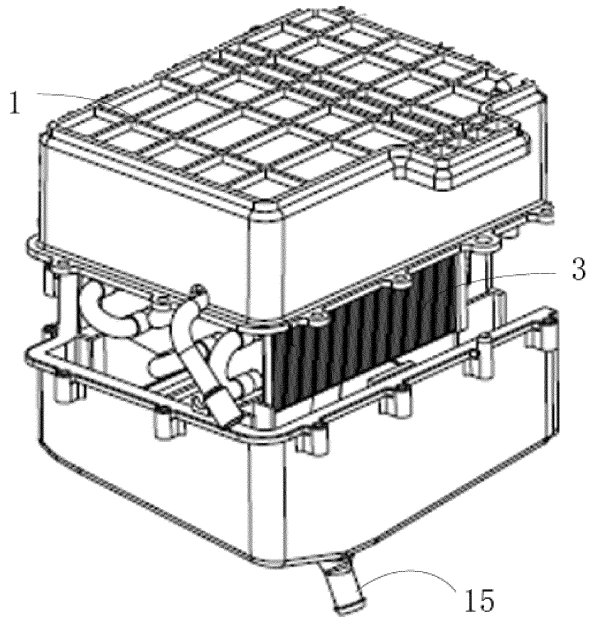

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of washing machines, and more particularly, to a condensing module, a drying module, and a washer-dryer machine.

BACKGROUND OF THE INVENTION

[0002] In a drying system of an existing washer-dryer machine, methods for condensing hot and humid air flow include: using a dedicated refrigerating device (including an evaporator and a condenser) for condensing hot and humid air flow, and directly spraying condensed water to the hot and humid air flow. The former one achieves a good condensation effect, but the dedicated refrigeration device has a high cost. The latter one has shortcomings that a large amount of moisture is remained in the air flow and the dehumidification and drying efficiency is low.

SUMMARY OF THE INVENTION

[0003] The purpose of the present invention is to provide a condensing module, a drying module, and a washer-dryer machine, to solve problems in the prior art that a dedicated refrigerating device has a high cost, whereas condensing hot and humid air flow by directly spraying condensed water to the hot and humid air flow has shortcomings that a large amount of moisture is remained in the air flow and the dehumidification and drying efficiency is low.

[0004] To solve the above technical problems, according to some embodiments, the present invention provides a condensing module, including:

a housing and a condenser disposed in the housing for condensing high-temperature humid air flow entering the housing;
an air inlet provided at one side of the housing for allowing external high-temperature humid air flow to enter the housing;
an air outlet provided at the other opposite side of the housing for discharging low-temperature dry air flow obtained after condensation by the condenser; and
a spoiler disposed on an inner wall of the housing, where an air flow passage is formed by the inner wall of the housing, the spoiler, and the condenser so that the high-temperature humid air flow is in sufficient contact with the condenser.

[0005] Further, the spoiler is at least one baffle or protrusion extending inward from the inner wall of the housing.

[0006] Further, a length direction of the baffle is consistent with an end face of the air inlet or an end face of the air outlet .

[0007] Further, the baffle is close to the air outlet and between the inner wall of the housing and the condenser.

[0008] Further, the baffle is close to the air inlet and between the inner wall of the housing and the condenser.

[0009] Further, the condensing module further includes a cold source inlet, a cold source outlet, and a condensed water discharging port.

[0010] The cold source inlet is connected to an external cold source for providing a cold source to the condenser.

[0011] The cold source outlet is connected to a water discharging port of a drum for discharging the cold source in the condenser.

[0012] The condensed water discharging port is provided at the bottom of the housing for discharging condensed water obtained by condensing the high-temperature humid air flow.

[0013] The housing includes an upper housing and a lower housing, one of which has a connecting end face provided with an annular groove, and the other of which has a connecting end face provided with an annular protrusion adapted to the annular groove.

[0014] A sealing gasket is disposed in the annular groove.

[0015] Further, at least one retaining rib is disposed on a bottom wall and/or a side wall of the lower housing, and/or at a junction between the bottom wall and the side wall of the lower housing.

[0016] The at least one retaining rib is configured to clamp the condenser in the lower housing with an outer periphery of the condenser spaced apart from the side wall and the bottom wall.

[0017] Further, the bottom wall of the lower housing is provided with a flow guiding groove or is funnel-shaped and is connected to the condensed water discharging port.

[0018] Further, at least one first fastening portion is disposed at an outer side of the upper housing.

[0019] At least one second fastening portion corresponding to the at least one first fastening portion is disposed at an outer side of the lower housing.

[0020] The first fastening portion is screwed to the second fastening portion.

[0021] Further, the condenser includes a plurality of stages of condensing pipes connected end to end in sequence.

[0022] The condensing pipe has a straight pipe section and a U-shaped pipe section connected to an adjacent straight pipe section. A first-stage condensing pipe is connected to the cold source inlet, and the last-stage condensing pipe is connected to the cold source outlet.

[0023] Further, the condenser further includes fins. The straight pipe section is at least partially embedded in the fins.

[0024] Further, the plurality of stages of condensing pipes substantially have a tendency of being arranged from the air inlet side to the air outlet side.

[0025] Further, the plurality of stages of condensing pipes have a tendency of being arranged from an upper

side to a lower side.

[0026] Further, the plurality of stages of condensing pipes have a tendency of being arranged from an upper side to a lower side in the fins.

[0027] Further, the cold source inlet is close to the air outlet side, and the plurality of stages of condensing pipes have a greater tendency of being arranged from the air inlet side to the air outlet side.

[0028] Further, the condensing pipes span from the air outlet side to the air inlet side through at most three stages.

[0029] Further, the cold source inlet is close to the air inlet side, and the plurality of stages of condensing pipes are arranged from an upper part to a lower part of the condenser and from the air inlet side to the air outlet side.

[0030] Another aspect of the present invention provides a drying module, including a dehumidifying module and the condensing module according to any one of the above technical solutions. A vent of the dehumidifying module is connected to the air inlet of the condensing module.

[0031] Another aspect of the present invention provides a washer-dryer machine, , including the condensing module or drying module according to any one of the above technical solutions.

BRIEF DESCRIPTION OF DRAWINGS

[0032] To describe the technical solutions in the embodiments of the present invention or in a conventional technology more clearly, the accompanying drawings required for the embodiments are briefly described below. Apparently, the accompanying drawings in the following description show merely some embodiments of the present invention, and those of ordinary skill in the art may still derive other accompanying drawings from these accompanying drawings without creative efforts.

FIG. 1 is a schematic diagram of a condensing module after disassembly according to an embodiment of the present invention;

FIG. 2 is a schematic half-sectional view of a housing of a condensing module according to an embodiment of the present invention;

FIG. 3 is a schematic diagram of a drying module according to an embodiment of the present invention;

FIG. 4 is a schematic exploded view of a drying module according to an embodiment of the present invention;

FIG. 5 is a three-view diagram of a condenser according to an embodiment of the present invention; and

FIG. 6 is a three-view diagram of a condenser according to another embodiment of the present utility model.

Reference numerals:

[0033] 1-housing; 101-upper housing; 102-lower housing; 11-air inlet; 12-air outlet; 15-condensed water discharging port; 22-spoiler; 21-retaining rib; 3-condenser; 31-cold source inlet; 32-cold source outlet; 33-fin; 35-condensing pipe; 351-straight pipe section; 352-U-shaped pipe section; 5-dehumidifying module.

DETAILED DESCRIPTION

[0034] At present, in a washer-dryer machine in the prior art, a dedicated refrigerating device has a high cost, whereas condensing hot and humid air flow by directly spraying condensed water to the hot and humid air flow has shortcomings that a large amount of moisture is remained in the air flow and the dehumidification and drying efficiency is low.

[0035] To solve the above problems, as shown in FIG. 1 and FIG. 2, an embodiment of the present invention provides a condensing module, including a housing 1, a condenser 3 disposed in the housing 1 for condensing high-temperature humid air flow entering the housing 1, an air inlet 11 provided at one side of the housing 1 for allowing external high-temperature humid air flow to enter the housing 1, an air outlet 12 provided at the other opposite side of the housing 1 for discharging low-temperature dry air flow obtained after condensation by the condenser 3, and a spoiler 22 disposed on an inner wall of the housing 1. An air flow passage is formed by the inner wall of the housing 1, the spoiler 22, and the condenser 3 so that the high-temperature humid air flow is in sufficient contact with the condenser 3.

[0036] In this embodiment, the external high-temperature humid air flow enters the housing 1 through the air inlet 11, and is condensed by the condenser to obtain the low-temperature dry air flow, which is discharged through the air outlet 12. In an existing condensing module, when no spoiler is disposed, a housing of the condensing module is tightly attached to a condenser. In this manner, a condensation effect of an outer side of the condenser 3 is not fully utilized. Alternatively, the housing is spaced apart from the condenser. In this case, a part of air flow directly flows out through the air outlet 12 along a gap between an inner wall of the housing and the condenser without effective condensation and dehumidification. In the present application, the spoiler 22 disposed on the inner wall of the housing 1 can prevent air flow from directly flowing to the air outlet 12 along the inner wall of the housing. The air flow passage is formed by the inner wall of the housing 1, the spoiler 22, and the condenser 3 so that the high-temperature humid air flow is in sufficient contact with the condenser 3.

[0037] In an embodiment of the present invention, the spoiler 22 is at least one baffle or protrusion extending inward from the inner wall of the housing 1. The baffle can directionally restrict a flow path of air flow so that the air flow can flow along a preset path. The protrusion on the

inner wall of the housing 1 can generate air flow turbulence so that the air flow irregularly moves. In this way, the air flow is in more sufficient contact with the condenser 3.

[0038] In an embodiment of the present invention, a length direction of the baffle is consistent with an end face of the air inlet 11 or an end face of the air outlet 12. To disturb the air flow, the baffle needs to be disposed on the flow path of the air flow and prevent the air flow from flowing in a straight line, which is equivalent to horizontally placing the baffle on the flow path of the air flow along the inner wall of the housing. In this way, the air flow flows to the condenser 3 and is then in sufficient contact with the condenser 3. The arrows in FIG. 2 indicate a flow direction of the air flow.

[0039] In an embodiment of the present invention, the baffle is close to the air outlet 12 and between the inner wall of the housing 1 and the condenser 3. When no baffle is disposed at a position close to the air outlet 12, the air flow in the housing 1 is directly discharged through the air outlet 12 along the inner wall of the housing 1 without being condensed by the condenser 3. After the baffle is disposed, the air flow at the air outlet 12 first passes through the condenser 3 and is then discharged. In this way, the condensation efficiency is improved. For the same reason, the baffle is close to the air inlet 11 and between the inner wall of the housing 1 and the condenser 3. In this way, the air flow can also be in sufficient contact with the condenser 3.

[0040] In an embodiment of the present invention, the condensing module further includes a cold source inlet 31 and a cold source outlet 32. The cold source inlet 31 is connected to an external cold source for providing a cold source to the condenser 3. The cold source outlet 32 is connected to a water discharging port of a drum for discharging the cold source in the condenser 3.

[0041] In this embodiment, the cold source continuously enters the condenser 3 through the cold source inlet 31 so that the high-temperature humid air flow in the housing 1 is condensed to obtain the low-temperature dry air flow. The cold source is discharged through the water discharging port of the drum connected to the cold source outlet 32 of the condenser 3. The condensing module further includes a condensed water discharging port 15 provided at the bottom of the housing 1 for discharging condensed water obtained by condensing the high-temperature humid air flow. The condenser 3 condenses the high-temperature humid air flow so that moisture in the air flow condenses to obtain the condensed water. Optionally, the condensed water discharging port 15 may also be connected to the water discharging port of the drum to discharge the condensed water.

[0042] In an embodiment of the present invention, the housing includes an upper housing 101 and a lower housing 102, one of which has a connecting end face provided with an annular groove, and the other of which has a connecting end face provided with an annular protrusion adapted to the annular groove. A sealing gasket is disposed in the annular groove.

[0043] In this embodiment, the annular groove is provided on the connecting end face of the upper housing 101 or the lower housing 102 of the condensing module. The sealing gasket is pressed into the annular groove through the annular protrusion adapted to the annular groove. The connecting end faces of the upper housing 101 and the lower housing 102 are sealed through pressing fit

[0044] In an embodiment of the present invention, as shown in FIG. 2, at least one retaining rib 21 is disposed on a bottom wall and a side wall of the lower housing 102. The at least one retaining rib 21 is configured to clamp the condenser 3 in the lower housing 102 with the condenser 3 spaced apart from the side wall and the bottom wall. Optionally, at least one retaining rib 21 is further disposed on a top wall and a side wall of the upper housing 101 for clamping the condenser 3 in the upper housing 101. In this way, the condenser 3 is spaced apart from the side wall and the bottom wall of the lower housing 102 so that the air flow can flow between a wall surface of the housing and the condenser 3, and a structure of the condensing module has high stability and can adapt to vibration of a drum and a frame of a washer-dryer machine.

[0045] In an embodiment of the present invention, the bottom wall of the lower housing 102 is provided with a flow guiding groove connected to the condensed water discharging port 15. The flow guiding groove can make droplets of the condensed water converge into water flow which can be discharged through the condensed water discharging port 15 in time. Condensed water can be prevented from accumulating at the bottom of the lower housing 102 and the air flow can be prevented from carrying moisture again. In another embodiment, the bottom wall of the lower housing 102 is funnel-shaped. A lowermost opening of the funnel forms a water discharging port.

[0046] In an embodiment of the present invention, at least one first fastening portion is disposed at an outer side of the upper housing 101. At least one second fastening portion corresponding to the at least one first fastening portion is disposed at an outer side of the lower housing 102. The first fastening portion is screwed to the second fastening portion.

[0047] In an embodiment of the present invention, the condensing module includes a housing 1 and a condenser 3 disposed in the housing 1 for condensing high-temperature humid air flow entering the housing 1. The condenser 3 includes a cold source inlet 31 and a cold source outlet 32 extending out of the housing 1, and a plurality of stages of condensing pipes 35 connected end to end in sequence. The condensing pipe 35 has a straight pipe section 351 and a U-shaped pipe section 352 connected to an adjacent straight pipe section 351. A first-stage condensing pipe 35 is connected to the cold source inlet 31. The last-stage condensing pipe 35 is connected to the cold source outlet 32. The cold source inlet 31 serves as a coolant inlet of a main body of the condenser. The cold source outlet 32 serves as a coolant

outlet of the main body of the condenser. An air inlet 11 is provided at one side of the housing 1 for allowing external high-temperature humid air flow to enter the housing 1. An air outlet 12 is provided at the other side of the housing 1 for discharging low-temperature dry air flow obtained after condensation by the condenser 3.

[0048] In this embodiment, the external high-temperature humid air flow enters the housing 1 of the condensing module through the air inlet 11 and is condensed by the condenser 3 in the housing 1 to obtain the low-temperature dry air flow, which is discharged through the air outlet 12, to cool and dehumidify the high-temperature humid air flow. An external refrigerant enters through the cold source inlet 31 of the condenser 3, passes through the plurality of stages of condensing pipes 35, and flows out through the cold source outlet 32. The condenser 3 has the plurality of stages of condensing pipes 35 connected end to end in sequence. The condensing pipe 35 has the straight pipe section 351 and the U-shaped pipe section 352, and can be in sufficient contact with the high-temperature humid air flow, to improve the condensation efficiency.

[0049] In an embodiment of the present invention, the condenser 3 further includes fins 33. The straight pipe section 351 is at least partially embedded in the fins 33. The fins 33 support the plurality of stages of condensing pipes 35 and serve as a mounting portion for assembly with the housing 1 of the condensing module. More importantly, the fins can guide high-temperature and high-humidity air flow to allow sufficient heat exchange between the air flow and the condensing pipes. The size and shape of the fins may be designed based on a size of the housing 1 and a laying direction of the condensing pipes 35.

[0050] In an embodiment of the present invention, as shown in FIG. 5, further, the plurality of stages of condensing pipes 35 substantially have a tendency of being arranged from the air inlet 11 side to the air outlet 12 side. Further, the plurality of stages of condensing pipes 35 have a tendency of being arranged from an upper side to a lower side.

[0051] Preferably, the plurality of stages of condensing pipes 35 are grouped stage by stage and arranged group by group from the air inlet 11 side to the air outlet 12 side. The plurality of stages of condensing pipes 35 are divided into a plurality of groups. The condensing pipes 35 in each group may be stacked and staggered stage by stage, or may be randomly arranged. In a process of condensing the high-temperature humid air flow, the closer to the air outlet 12, the lower the temperature of the air flow; the closer to the air inlet 11, the higher the temperature of the air flow; the closer to the cold source inlet 31, the lower the temperature of the condensing pipe 35; and the closer to the cold source outlet 32, the higher the temperature of the condensing pipe. Therefore, the condensing pipes 35 are arranged group by group from the air inlet 11 side to the air outlet 12 side. The high-temperature air flow is in contact with the low-temperature condensing pipes 35, and the low-temperature air flow is in contact with the high-temperature condensing pipes 35, so that there is a specific temperature difference between the air flow and the condensing pipes 35 in contact, to achieve a good condensation effect. Further, the condensing pipes 35 in each group are arranged stage by stage from the upper side to the lower side of the housing 1 so that the temperatures of the condensing pipes 35 on a plane flush with the end face of the air inlet 11 or the air outlet 12 can be approximately the same. In combination with a connection direction of the air inlet 11 and the air outlet 12, the temperature of the plurality of stages of condensing pipes 35 as a whole gradually increases from the air inlet 11 to the air outlet 12.

[0052] In an embodiment of the present invention, as shown in FIG. 6, further, the plurality of stages of condensing pipes 35 have a tendency of being arranged from an upper side to a lower side in the fins. Further, the cold source inlet 31 is close to the air outlet 12 side, and the plurality of stages of condensing pipes have a greater tendency of being arranged from the air inlet 11 side to the air outlet 12 side.

[0053] Optionally, the plurality of stages of condensing pipes 35 are grouped stage by stage and arranged group by group from the upper side to the lower side of the housing 1. Further, the condensing pipes 35 in each group are arranged stage by stage from the air inlet 11 side to the air outlet 12 side. In this embodiment, the condensing pipes 35 in an upper layer has a lower temperature, and those in a lower layer has a higher temperature, which is less effective in comparison with the embodiment shown in FIG. 5, but still ensures that the temperature of the plurality of stages of condensing pipes 35 as a whole gradually increases from the air inlet 11 to the air outlet 12, to ensure that there is a specific temperature difference between the air flow and the condensing pipe 35 in contact. The dimensions in FIG. 5 and FIG. 6 are for the purpose of making drawings only. Specific dimensions are not limited in the present application.

[0054] In an embodiment of the present invention, the condensing pipes span from the air outlet 12 side to the air inlet 11 side through at most three stages. Optionally, one stage of condensing pipes may be defined as one U-shaped pipe section connected with one or two straight pipe sections.

[0055] In an embodiment of the present invention, the cold source inlet 31 is close to the air outlet 12 side. Further, the cold source outlet 32 is close to the air outlet 12 side and is provided on the side wall of the housing 1. The temperature of air flow at the air outlet 12 is low so that the air flow interacts with a part of a refrigerant just entering the condensing module to further cool the air flow about to flow out of the condenser housing. The cold source outlet 32 of the condenser 3 is provided on the side wall or bottom wall of the housing 1, and the cold source inlet 31 is provided at an upper part of the side wall of the housing 1, so that the cold source flows under the action of gravity to save a refrigerant transmission cost.

[0056] In some other embodiments, the cold source inlet 31 may be close to the air inlet 11 side of the housing, and the cold source outlet 32 may be close to the air outlet 12 side of the housing, so that the condensing pipes 35 can be generally arranged in an alternate manner from the air inlet 11 side to the air outlet 12 side of the housing 1. After the high-temperature and high-humidity air flow enters through the air inlet 11 of the housing 1, heat exchange is first carried out between the air flow and at least one low-temperature condensing pipe so that the temperature of the air flow decreases and the temperature of the refrigerant increases. As the air flow flows toward the air outlet 12 side of the housing 1, the temperature of the air flow further decreases and the temperature of the refrigerant further increases until equilibrium may be reached at some point. Certainly, preferably, it is optimal that the temperature of the refrigerant is approximately equal to the temperature of the cooled air flow when an equilibrium is reached; that is, when the cooled air flow reaches the air outlet 12 of the housing, the temperature of the refrigerant is approximately equal to the temperature of the cooled air flow. In practice, to save space, make fuller use of the condenser, and reduce costs, the air outlet 12 of the housing 1 is reached by the cooled air flow before an equilibrium is reached; that is, when the temperature of the air flow is still decreasing, the air outlet 12 of the housing 1 is reached already by the cooled air flow.

[0057] Another aspect of the present invention provides a drying module, including a dehumidifying module 5 and the condensing module according to any one of the above technical solutions. A vent of the dehumidifying module 5 is connected to the air inlet 11 of the condensing module. The dehumidifying module 5 may be a heating module for heating an intermediate medium with moisture adsorbed to discharge high-temperature humid air flow, or may directly blow high-temperature air flow to a drum holding the objects to be dried.

[0058] Another aspect of the present invention provides a washer-dryer machine, including the condensing module or drying module according to any one of the above technical solutions, and thus having all the advantages and beneficial effects of the condensing module or drying module in the above technical solutions.

[0059] It should be understood that the above specific embodiments of the present invention are only used to illustrate or explain the principles of the present invention, and should not constitute any limitation to the present invention. Therefore, any modifications, equivalent substitutions, improvements, etc. made without departing from the spirit and scope of the present invention should be included within the protection scope of the present invention. Furthermore, the appended claims of the present invention are intended to cover all changes and modifications that fall within the scopes and boundaries of the appended claims, or equivalents of such scopes and boundaries.

Claims

1. A condensing module, comprising:

   a housing (1) and a condenser (3) disposed in the housing (1) for condensing high-temperature humid air flow entering the housing (1);
   an air inlet (11) provided at one side of the housing (1) for allowing external high-temperature humid air flow to enter the housing (1);
   an air outlet (12) provided at the other opposite side of the housing (1) for discharging low-temperature dry air flow obtained after condensation by the condenser (3); and
   a spoiler (22) disposed on an inner wall of the housing (1); wherein
   an air flow passage is formed by the inner wall of the housing (1), the spoiler (22), and the condenser (3) so that the high-temperature humid air flow is in sufficient contact with the condenser (3).

2. The condensing module according to claim 1, wherein the spoiler (22) is at least one baffle or protrusion extending inward from the inner wall of the housing (1).

3. The condensing module according to claim 2, wherein a length direction of the baffle is consistent with an end face of the air inlet (11) or an end face of the air outlet (12).

4. The condensing module according to claim 2, wherein the baffle is close to the air outlet (12) and between the inner wall of the housing (1) and the condenser (3).

5. The condensing module according to claim 2, wherein the baffle is close to the air inlet (11) and between the inner wall of the housing (1) and the condenser (3).

6. The condensing module according to claim 1, further comprising a cold source inlet (31), a cold source outlet (32), and a condensed water discharging port (15); wherein

   the cold source inlet (31) is connected to an external cold source for providing a cold source to the condenser (3);
   the cold source outlet (32) is connected to a water discharging port of a drum for discharging the cold source in the condenser (3); and
   the condensed water discharging port (15) is provided at a bottom of the housing (1) for discharging condensed water obtained by condensing the high-temperature humid air flow.

7. The condensing module according to claim 6, wherein the housing comprises an upper housing (101) and a lower housing (102), one of which has a connecting end face provided with an annular groove, and the other of which has a connecting end face provided with an annular protrusion adapted to the annular groove; and
a sealing gasket is disposed in the annular groove.

8. The condensing module according to claim 7, wherein at least one retaining rib (21) is disposed on a bottom wall and/or a side wall of the lower housing (102), and/or at a junction between the bottom wall and the side wall of the lower housing (102); and
the at least one retaining rib (21) is configured to clamp the condenser (3) in the lower housing (2) with an outer periphery of the condenser (3) spaced apart from the side wall and the bottom wall.

9. The condensing module according to claim 8, wherein the bottom wall of the lower housing (102) is provided with a flow guiding groove or is funnel-shaped and is connected to the condensed water discharging port (15).

10. The condensing module according to claim 8, wherein at least one first fastening portion is disposed at an outer side of the upper housing (101);

at least one second fastening portion corresponding to the at least one first fastening portion is disposed at an outer side of the lower housing (102); and
the first fastening portion is screwed to the second fastening portion.

11. The condensing module according to claim 1, wherein the condenser (3) comprises a plurality of stages of condensing pipes (35) connected end to end in sequence; and
the condensing pipe (35) has a straight pipe section (351) and a U-shaped pipe section (352) connected to an adjacent straight pipe section (351), a first-stage condensing pipe (35) is connected to the cold source inlet (31), and the last-stage condensing pipe (35) is connected to the cold source outlet (32).

12. The condensing module according to claim 11, wherein the condenser (3) further comprises fins (33), and the straight pipe section (351) is at least partially embedded in the fins (33).

13. The condensing module according to claim 11, wherein the plurality of stages of condensing pipes (35) substantially have a tendency of being arranged from the air inlet side to the air outlet side.

14. The condensing module according to claim 13, wherein the plurality of stages of condensing pipes (35) have a tendency of being arranged from an upper side to a lower side.

15. The condensing module according to claim 11, wherein the plurality of stages of condensing pipes (35) have a tendency of being arranged from an upper side to a lower side in the fins (33).

16. The condensing module according to claim 11, wherein the cold source inlet (31) is close to the air outlet (12) side, and the plurality of stages of condensing pipes (35) have a greater tendency of being arranged from the air inlet (11) side to the air outlet side.

17. The condensing module according to claim 16, wherein the condensing pipes (35) span from the air outlet (12) side to the air inlet (11) side through at most three stages.

18. The condensing module according to claim 11, wherein the cold source inlet (31) is close to the air inlet side, and the plurality of stages of condensing pipes (35) are arranged from an upper part to a lower part of the condenser and from the air inlet side to the air outlet side.

19. A drying module, comprising a dehumidifying module (5) and the condensing module according to any one of claims 1 to 18, wherein a vent of the dehumidifying module (5) is connected to the air inlet (11) of the condensing module.

20. A washer-dryer machine, comprising the condensing module according to any one of claims 1 to 18 or the drying module according to claim 19.

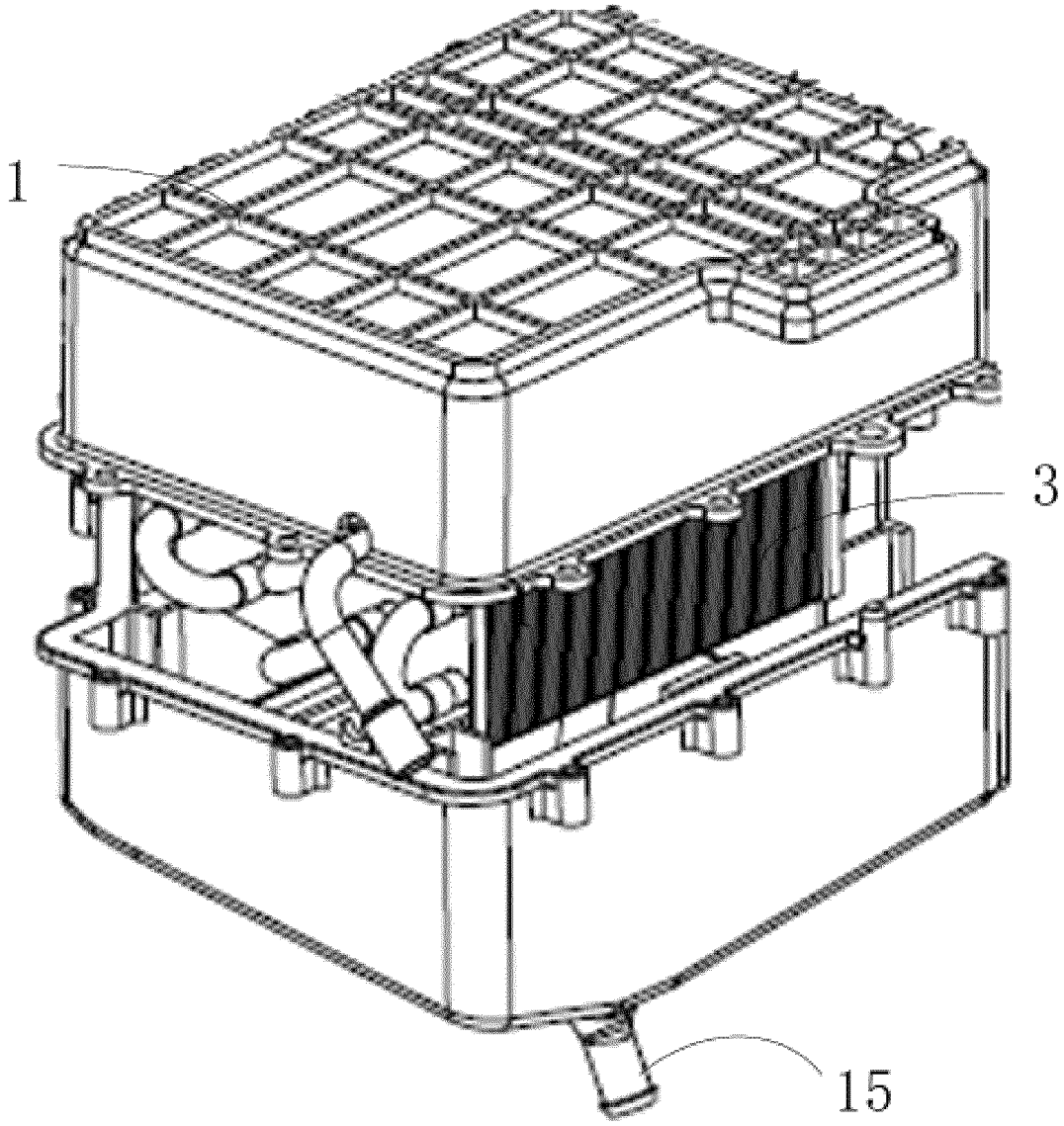

FIG. 1

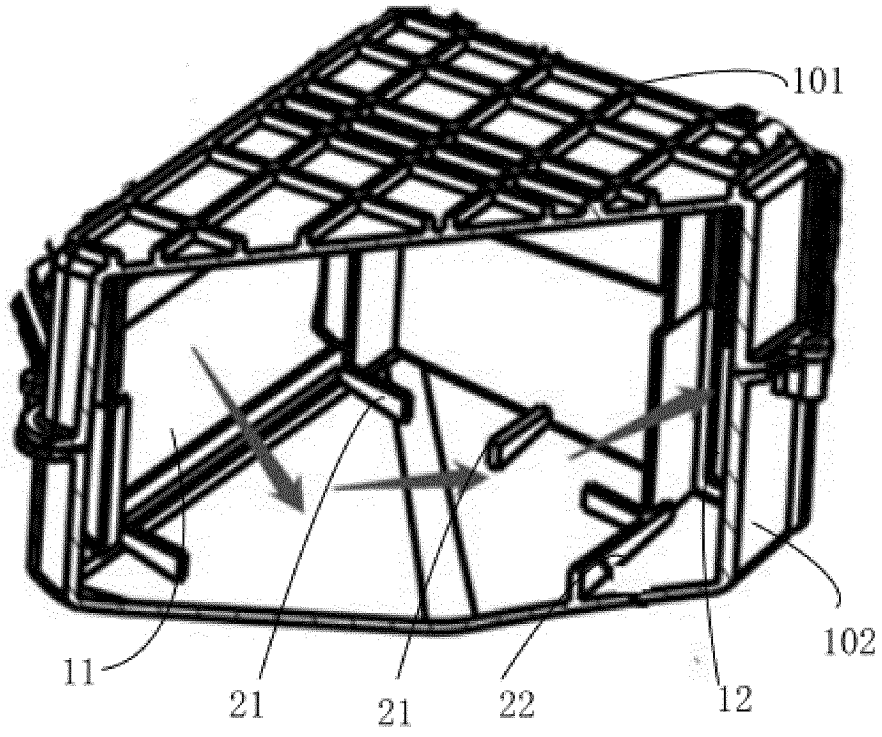

FIG. 2

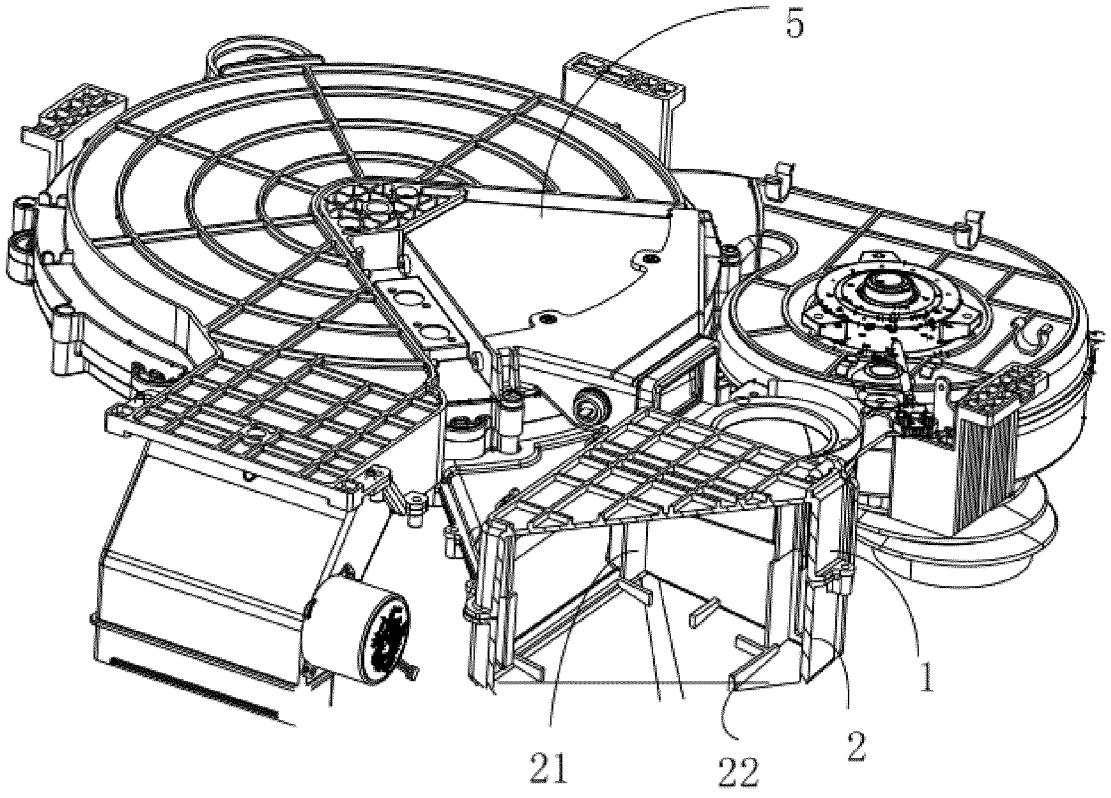

FIG. 3

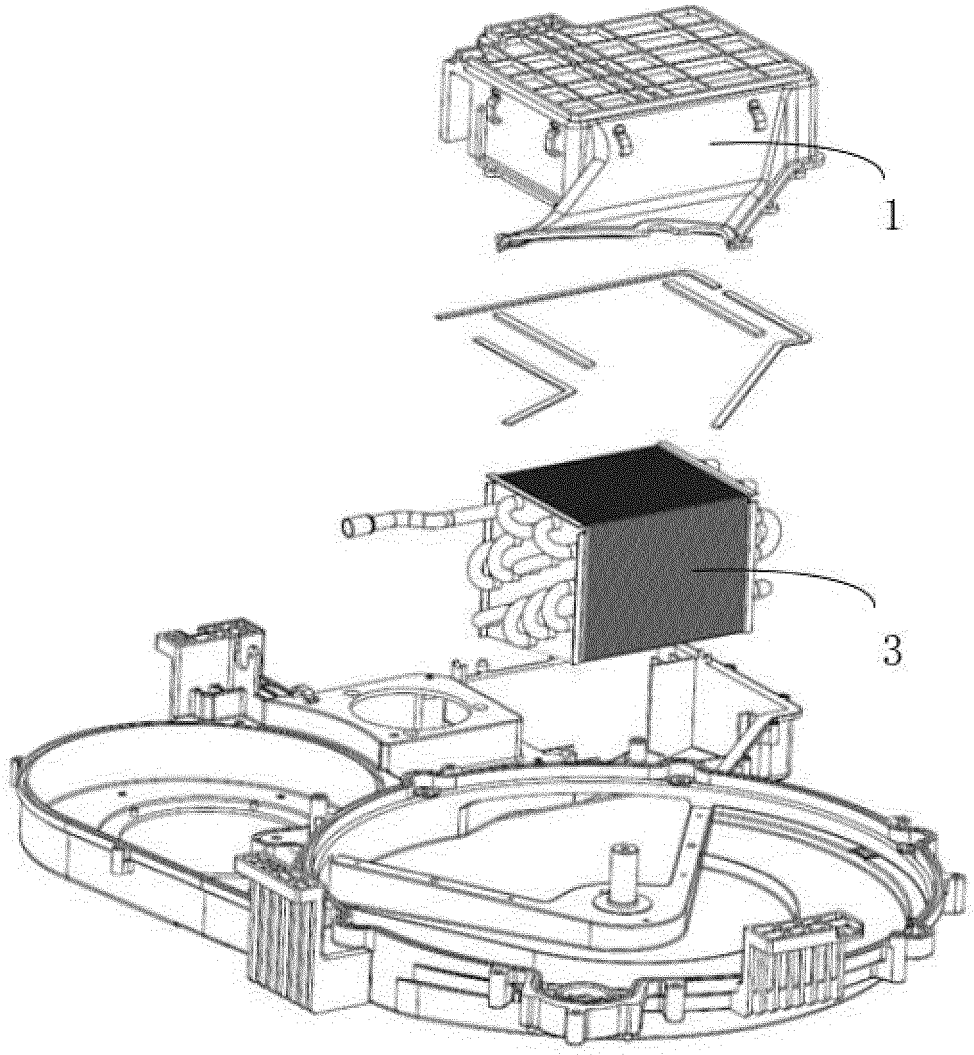

FIG. 4

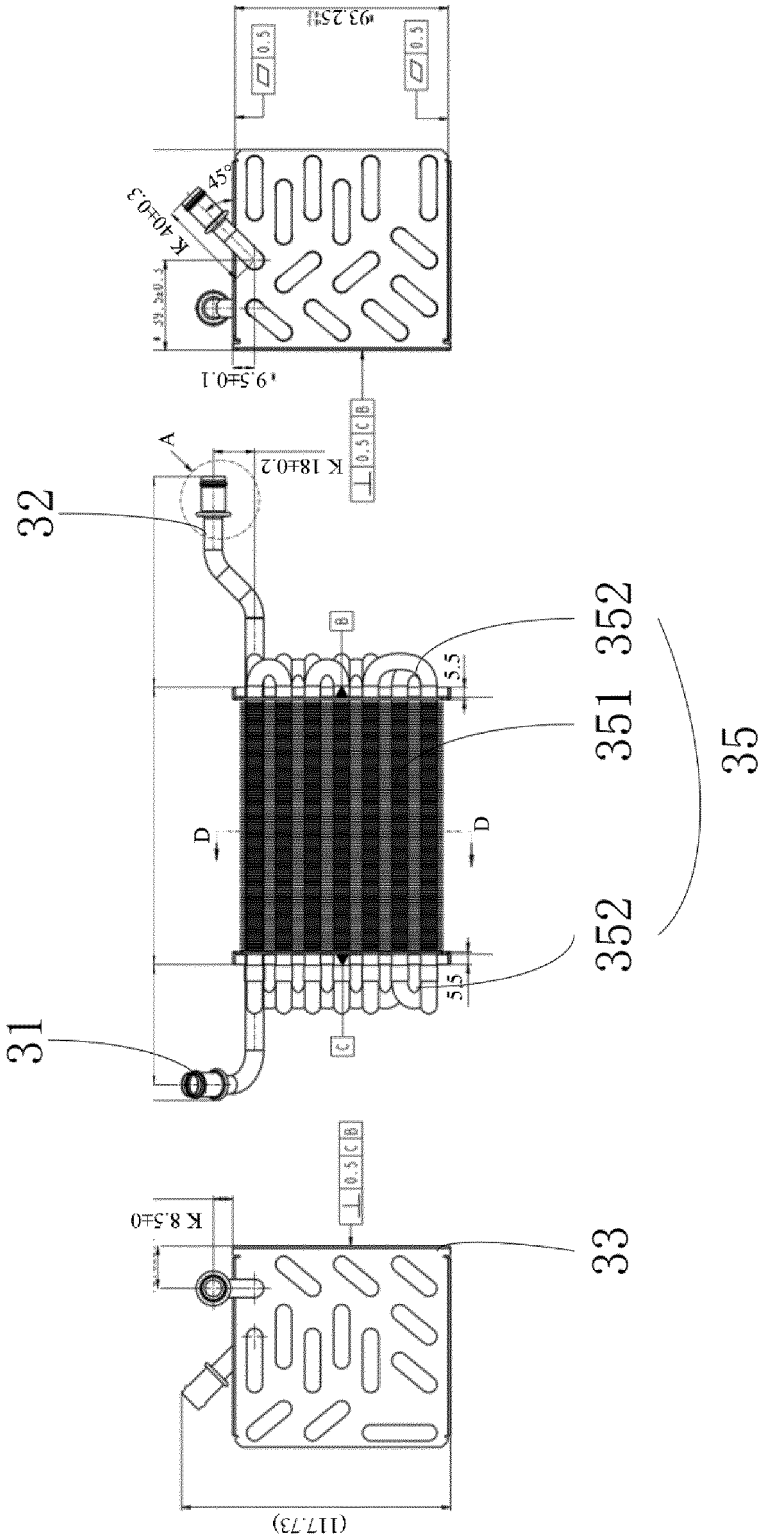

FIG. 5

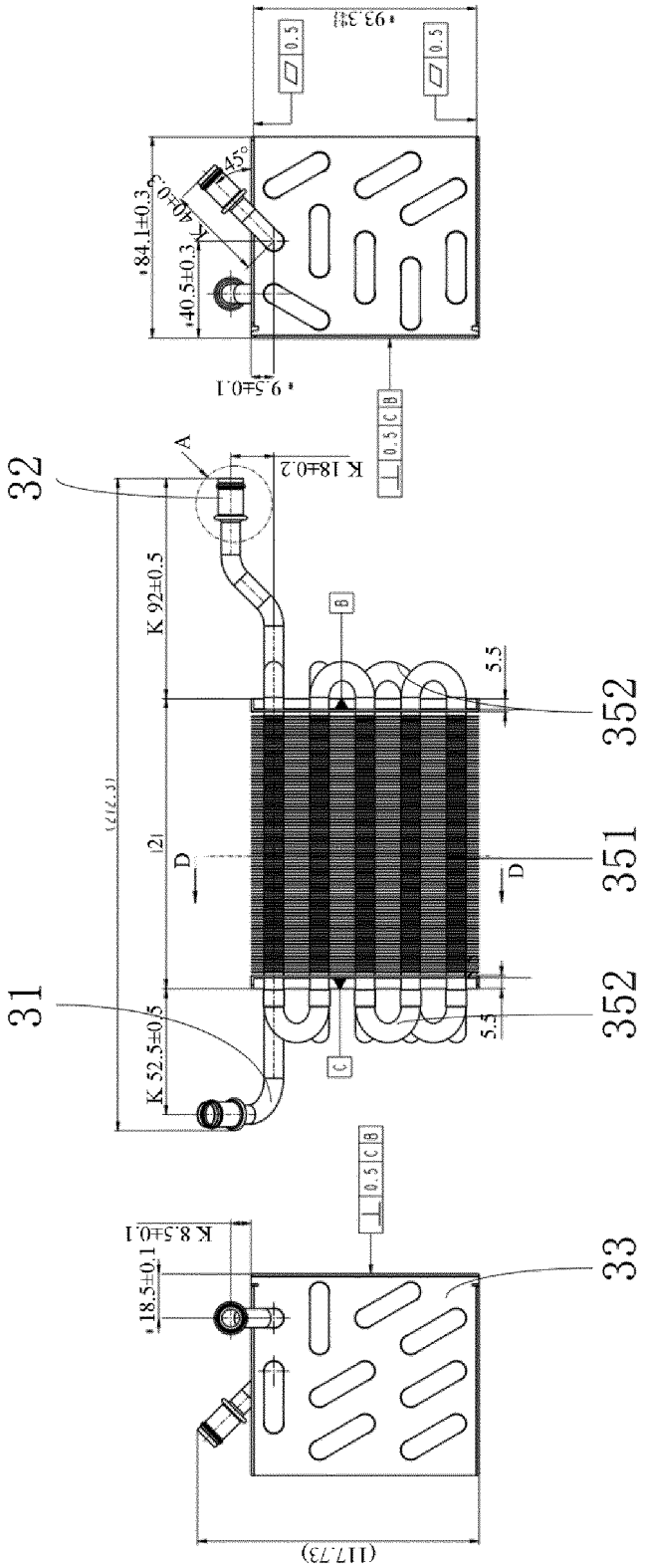
32
31
352
351
352
33
A
B
C
D
K 18±0.2
K 92±0.5
K 52.5±0.5
K 8.5±0.1
18.5±0.1
40±0.3
40.5±0.3
84.1±0.3
9.5±0.1
5.5
5.5
45°
0.5
0.5
0.5
(117.73)

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/077452

A. CLASSIFICATION OF SUBJECT MATTER

D06F58/00(2020.01)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:D06F

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)

CNKI; CNABS; CNTXT; DWPI; SIPOABS: 冷凝, 蒸发, 气, 扰流, 扰动, 挡, 凸, 突 , 肋, 接触, 面积, 充分, 接触面积, 速, 慢, condens+, evaporator, air, wind, spoil???, heave?, lib?, contact???, area

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 218492092 U (SHENZHEN LUOKE INNOVATION TECHNOLOGY CO., LTD.) 17 February 2023 (2023-02-17) description, paragraphs [0028]-[0036], and figures 1-2	1-20
PX	CN 218492093 U (SHENZHEN LUOKE INNOVATION TECHNOLOGY CO., LTD.) 17 February 2023 (2023-02-17) description, paragraphs [0029]-[0045], and figures 1-3	1-20
X	CN 106551666 A (QINGDAO HAIER DISHWASHER CO., LTD.) 05 April 2017 (2017-04-05) description, paragraphs [0032]-[0052], and figures 1-6	1-20
X	CN 211395080 U (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 01 September 2020 (2020-09-01) description, paragraphs [0039]-[0048], and figures 1-6	1-20
A	CN 105648726 A (TCL HOME APPLIANCES (HEFEI) CO., LTD.) 08 June 2016 (2016-06-08) entire document	1-20

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
14 April 2023	**24 April 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/077452

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/077452

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