



(11)

EP 4 083 530 A1

(12)

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

(43) Date of publication:
02.11.2022 Bulletin 2022/44

(21) Application number: **20905074.9**

(22) Date of filing: **23.12.2020**

(51) International Patent Classification (IPC):
F24F 11/48 ^(2018.01) **F24F 11/89** ^(2018.01)
F24F 1/0007 ^(2019.01) **F24F 1/0063** ^(2019.01)
F24F 1/0067 ^(2019.01)

(52) Cooperative Patent Classification (CPC):
F24F 1/0007; F24F 1/0063; F24F 1/0067;
F24F 11/48; F24F 11/89

(86) International application number:
PCT/JP2020/048319

(87) International publication number:
WO 2021/132413 (01.07.2021 Gazette 2021/26)

(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: **23.12.2019 JP 2019231288**

(71) Applicant: **Fujitsu General Limited**
Kawasaki-shi, Kanagawa 213-8502 (JP)

(72) Inventors:
• **MOCHIZUKI Kentaro**
Kawasaki-shi, Kanagawa 213-8502 (JP)
• **FUJITA Kazuyuki**
Kawasaki-shi, Kanagawa 213-8502 (JP)

(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(54) **AIR CONDITIONER**

(57) There is provided an air conditioner in which, in an indoor unit where a plurality of heat exchangers is arranged, sterilization is carried out at low cost, and it is only required that one temperature sensor is provided in one of the indoor heat exchangers. Setting is performed such that different amounts of refrigerants according to a difference between the amount of air passing through a first heat exchanger (14A) and the amount of air passing through a second heat exchanger (14B) are caused to flow thereto and the second heat exchanger (14B) includes a temperature sensor (26a), and the first heat exchanger (14A) and the second heat exchanger (14B) are heat-sterilized by causing the first heat exchanger (14A) and the second heat exchanger (14B) to function as condensers and increasing the temperature to a predetermined temperature.

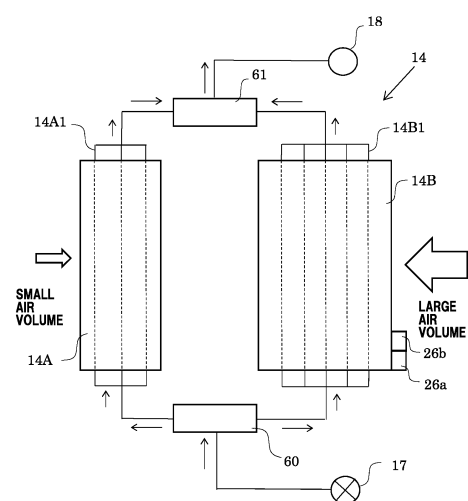


FIG.2

EP 4 083 530 A1

Description

Technical Field

[0001] The present invention relates to an indoor unit of an air conditioner.

Background Art

[0002] When an air conditioner performs a cooling operation, the moisture in the air in an indoor unit causes condensation on fins of an indoor heat exchanger, and therefore the humidity around the indoor heat exchanger increases, so that dust is likely to be attached to the indoor heat exchanger. When the dust is continuously attached to the indoor heat exchanger, there is a problem that various germs (including mold) grow and a foul odor is generated.

[0003] As an air conditioner, an air conditioner of a ceiling-embedded type (hereinafter referred to as "ceiling-embedded air conditioner") is mentioned in which an outdoor unit installed outdoors and an indoor unit installed in an air-conditioned room are connected by a refrigerant pipe, and which is installed behind the ceiling as the indoor unit. In recent years, it has been desired to increase the heat exchange capacity as the ceiling-embedded air conditioner.

[0004] As the ceiling-embedded air conditioner for increasing the heat exchange capacity, PTL 1 illustrated in FIG. 4 discloses an indoor unit of a ceiling-embedded air conditioner 100A including, inside a housing 10 having an air blowout port 14b arranged on the front surface side and an air suction port 14a arranged on the back surface side, a first heat exchanger 20A as an indoor heat exchanger arranged closer to the front surface side, a second heat exchanger 20B, which is also an indoor heat exchanger, arranged closer to the back surface side, a sirocco fan 30 arranged between the first heat exchanger 20A and the second heat exchanger 20B, a drain pan 40 arranged under each of the first heat exchanger 20A and the second heat exchanger 20B and collecting condensation water attached to the first heat exchanger 20A and the second heat exchanger 20B, and a blowout guide 50 connecting a blowout ventilation path 33b and the air blowout port 14b to guide air blown out from the blowout ventilation path 33b of the sirocco fan 30 to the air blowout port 14b, in which a first space S1 to which the air suction port 14a is opened is formed between the second heat exchanger 20B and a back surface plate 12, a third space S3 is formed between the first heat exchanger 20A and a front surface plate 11, and a second space S2 connected to the first space S1 and the third space S3 is formed between the drain pans 40 and a bottom surface plate 14.

[0005] In the case of the indoor unit having a structure in which the plurality of heat exchangers is arranged as in the air conditioner disclosed in PTL 1, the first heat exchanger 20A, the second heat exchanger 20B, and the sirocco fan 30 need to be housed in a limited space

of the housing 10. Therefore, the distance of a ventilation path from the air suction port 14a to the first heat exchanger 20A via the second space S2 and the third space S3 and the distance of a ventilation path from the air suction port 14a to the second heat exchanger 20B via the first space S1 are not equal to each other, and the distance of the ventilation path from the air suction port 14a to the first heat exchanger 20A via the second space S2 and the third space S3 is longer than the distance of the ventilation path from the air suction port 14a to the second heat exchanger 20B via the first space S1.

Citation List

15 Patent Literature

[0006] PTL 1: JP 2019-203629 A

Summary of Invention

20 Technical Problem

[0007] In the air conditioner disclosed in PTL 1, the distance of the ventilation path from the air suction port 14a to the first heat exchanger 20A via the second space S2 and the third space S3 is longer than the distance of the ventilation path from the air suction port 14a to the second heat exchanger 20B via the first space S1. Therefore, the ventilation resistance of the ventilation path from the air suction port 14a to the first heat exchanger 20A via the second space S2 and the third space S3 is larger than the ventilation resistance of the ventilation path from the air suction port 14a to the second heat exchanger 20B via the first space S1, and thus the amount of air passing through the first heat exchanger 20A is smaller than the amount of air passing through the second heat exchanger 20B. As a result, the temperature of a refrigerant flowing through the first heat exchanger 20A is higher than the temperature of the refrigerant flowing through the second heat exchanger 20B, and therefore a temperature sensor for controlling the air-conditioned room to a predetermined temperature needs to be installed in each of the first heat exchanger 20A and the second heat exchanger 20B, which poses a problem that the manufacturing cost increases and the control becomes complicated.

[0008] Further, there is also a problem that a known purification means, such as an ion generator, is mentioned as a means for purifying the inside of the indoor unit, but, even when the ion generator is used for the indoor unit where the plurality of indoor heat exchangers is arranged described in PTL 1, the plurality of indoor heat exchangers cannot be sufficiently sterilized.

[0009] In view of the above-described problems, the present invention provides an air conditioner having: an outdoor unit including a compressor and a four-way valve; and an indoor unit including a plurality of indoor heat exchangers, an indoor unit fan, and a temperature

detection means configured to detect the temperature of the indoor heat exchanger and connected to the outdoor unit, the air conditioner controlling the temperature in a room where the indoor unit is installed by controlling at least the compressor, the indoor unit fan, and the four-way valve and causing the plurality of indoor heat exchangers to function as an evaporator in a case of cooling and as a condenser in a case of heating in order to set the temperature of the indoor heat exchangers to a predetermined temperature, in which the sterilization is carried out at low cost and the imbalance in the sterilization between the plurality of indoor heat exchangers can be suppressed.

Solution to Problem

[0010] One aspect of the present invention is an air conditioner having: an outdoor unit including a compressor and a four-way valve; and an indoor unit including a plurality of indoor heat exchangers, an indoor unit fan, and a temperature detection means configured to detect the temperature of the indoor heat exchanger and connected to the outdoor unit, the air conditioner controlling the temperature in a room where the indoor unit is installed by controlling at least the compressor, the indoor unit fan, and the four-way valve and causing the plurality of indoor heat exchangers to function as an evaporator in a case of cooling and as a condenser in a case of heating in order to set the temperature of the indoor heat exchangers to a predetermined temperature, in which the amount of air passing through one of the indoor heat exchangers and the amount of air passing through the other indoor heat exchanger by the ventilation by the indoor unit fan are different, setting is performed such that different amounts of refrigerants according to the air amount difference are caused to flow to the one of the indoor heat exchangers and the other indoor heat exchanger and one of the plurality of indoor heat exchangers includes the temperature detection means, and the plurality of indoor heat exchangers is heat-sterilized by heating condensation water, the condensation water being attached to the plurality of indoor heat exchangers when the indoor heat exchangers function as the evaporators, to a predetermined temperature by causing the plurality of indoor heat exchangers to function as the condenser.

Advantageous Effects of Invention

[0011] According to the present invention, there is a difference between the amount of air passing through one of the indoor heat exchangers and the amount of air passing through the other indoor heat exchanger, setting is performed such that different amounts of refrigerants according to the difference are caused to flow to one of the indoor heat exchangers and the other indoor heat exchanger and one of the plurality of indoor heat exchangers includes the temperature detection means con-

figured to detect the temperature of the indoor heat exchanger, and therefore the sterilization is carried out at low cost and the imbalance in the sterilization between the plurality of indoor heat exchangers can be suppressed.

Brief Description of Drawings

[0012]

FIG. 1 is a refrigeration circuit diagram of an indoor conditioner;

FIG. 2 is an enlarged view of indoor heat exchangers in the refrigeration circuit diagram;

FIG. 3 is a cross-sectional view of an indoor unit; and FIG. 4 is a cross-sectional view of an indoor unit of a conventional ceiling-embedded air conditioner.

Description of Embodiments

[0013] Hereinafter, an embodiment of the present invention will be described with reference to the attached drawings. The embodiment describes an air conditioner as an example in which an indoor unit is connected to an outdoor unit, two indoor heat exchangers are arranged in the indoor unit, and a cooling operation and a heating operation can be performed. It should be noted that the present invention is not limited to the embodiment described below, and can be variously altered without deviating from the gist of the present invention.

EXAMPLES

[0014] FIG. 1 schematically illustrates the configuration of a refrigeration circuit of an air conditioner 11 according to one embodiment of the present invention. The air conditioner 11 includes an indoor unit 12 and an outdoor unit 13. The indoor unit 12 is installed in an indoor space in a building, for example. Alternatively, the indoor unit 12 may be installed in a space equivalent to the indoor space. In the indoor unit 12, indoor heat exchangers 14 as heat exchangers are incorporated. In the outdoor unit 13, a compressor 15, an outdoor heat exchanger 16, an expansion valve 17, and a four-way valve 18 are incorporated. The indoor heat exchangers 14, the compressor 15, the outdoor heat exchanger 16, the expansion valve 17, and the four-way valve 18 form a refrigeration circuit 19. The outdoor unit 13 may be installed outdoors where heat exchange with the outdoor air is possible.

[0015] The refrigeration circuit 19 includes a first circulation path 21. The first circulation path 21 connects a first port 18a and a second port 18b of the four-way valve 18 to each other. The first circulation path 21 includes the compressor 15. A suction pipe 15a of the compressor 15 is connected to the first port 18a of the four-way valve 18 via a refrigerant pipe. A gas refrigerant is supplied from the first port 18a to the suction pipe 15a of the com-

pressor 15. The compressor 15 compresses a low-pressure gas refrigerant to a predetermined pressure. A discharge pipe 15b of the compressor 15 is connected to the second port 18b of the four-way valve 18 via the refrigerant pipe. The gas refrigerant is supplied from the discharge pipe 15b of the compressor 15 to the second port 18b of the four-way valve 18. The refrigerant pipe may be a copper pipe, for example.

[0016] Although the four-way valve 18 is used as a flow path switching valve, a plurality of solenoid valves may be combined instead of the four-way valve 18.

[0017] The refrigeration circuit 19 further includes a second circulation path 22. The second circulation path 22 connects a third port 18c and a fourth port 18d of the four-way valve 18 to each other. In the second circulation path 22, the outdoor heat exchanger 16, the expansion valve 17, and the indoor heat exchangers 14 are installed in order from the third port 18c side. The outdoor heat exchanger 16 exchanges thermal energy between a passing refrigerant and the surrounding air. The indoor heat exchangers 14 exchange thermal energy between a passing refrigerant and the surrounding air.

[0018] In FIG. 1, the indoor heat exchangers 14 are illustrated as one unit, but the indoor heat exchangers 14 contain two heat exchangers of a first heat exchanger 14A and a second heat exchanger 14B as described later in the description of FIG. 2.

[0019] In the outdoor unit 13, an air blowing fan 23 is incorporated. The air blowing fan 23 blows air to the outdoor heat exchanger 16. The air blowing fan 23 generates an air flow according to the rotation of an impeller, for example. The airflow passes through the outdoor heat exchanger 16 by the action of the air blowing fan 23. The outdoor air passes through the outdoor heat exchanger 16 and exchanges heat with a refrigerant. The heat-exchanged cold or warm airflow is blown out from the outdoor unit 13. The flow rate of the airflow passing there-through is adjusted according to the rotational speed of the impeller.

[0020] In the indoor unit 12, a sirocco fan 24 as an indoor unit fan is incorporated. The sirocco fan 24 blows air to the indoor heat exchangers 14. The sirocco fan 24 generates an air flow according to the rotation of the impeller. The indoor air is sucked into the indoor unit 12 by the action of the sirocco fan 24. The indoor air passes through the indoor heat exchangers 14 and exchanges heat with a refrigerant. The heat-exchanged cold or warm airflow is blown out from the indoor unit 12. The flow rate of the airflow passing therethrough is adjusted according to the rotational speed of the impeller.

[0021] When a cooling operation is carried out in the refrigeration circuit 19, the four-way valve 18 connects the second port 18b and the third port 18c to each other and connects the first port 18a and the fourth port 18d to each other. Therefore, a high temperature and high pressure refrigerant is supplied to the outdoor heat exchanger 16 from the discharge pipe 15b of the compressor 15. The refrigerant circulates through the outdoor heat ex-

changer 16, the expansion valve 17, and the indoor heat exchangers 14 in order. The outdoor heat exchanger 16 dissipates heat from the refrigerant to the outside air. In the expansion valve 17, the refrigerant is decompressed to low pressure. The decompressed refrigerant adsorbs heat from the surrounding air in the indoor heat exchangers 14. Cold air is generated. The cold air is blown into the interior space by the action of the air blowing fan 24.

[0022] When a heating operation is carried out in the refrigeration circuit 19, the four-way valve 18 connects the second port 18b and the fourth port 18d to each other and connects the first port 18a and the third port 18c to each other. A high temperature and high pressure refrigerant is supplied from the compressor 15 to the indoor heat exchangers 14. The refrigerant circulates through the indoor heat exchangers 14, the expansion valve 17, and the outdoor heat exchanger 16 in order. The indoor heat exchangers 14 dissipate heat from the refrigerant to the surrounding air. Warm air is generated. The warm air is blown into the interior space by the action of the sirocco fan 24. In the expansion valve 17, the refrigerant is decompressed to low pressure. The decompressed refrigerant adsorbs heat from the surrounding air in the outdoor heat exchanger 16. Thereafter, the refrigerant returns to the compressor 15. The maximum temperature of the indoor heat exchangers 14 during the heating operation is 53°C.

[0023] The air conditioner 11 includes a temperature sensor 26a and a humidity sensor 26b. The temperature sensor 26a is connected to the indoor heat exchangers 14. The temperature sensor 26a measures the temperatures of the indoor heat exchangers 14. The temperature sensor 26a outputs a temperature signal including temperature information of the measured temperatures. The humidity sensor 26b is installed in the indoor unit 12. The humidity sensor 26b measures the relative humidity in the indoor unit 12. The humidity sensor 26b outputs a humidity signal including humidity information of the measured humidity.

[0024] The air conditioner 11 includes a control unit 27. The control unit 27 is formed on a control board (not illustrated) incorporated in the outdoor unit 13, for example. To the control unit 27, the four-way valve 18, the expansion valve 17, and the compressor 15 in the outdoor unit 13 are electrically connected by separate signal lines. Similarly, to the control unit 27, a drive motor of the sirocco fan 24, the temperature sensor 26a, and the humidity sensor 26b in the indoor unit 12 are electrically connected by separate signal lines. The control unit 27 controls the operations of the four-way valve 18, the expansion valve 17, and the compressor 15 in the outdoor unit 13 and the sirocco fan 24 in the indoor unit 12 based on the temperature signal from the temperature sensor 26a or the humidity signal from the humidity sensor 26b. As a result of such control, the cooling operation, the heating operation, or the heat sterilization operation of the air conditioner 11 is realized as described later. The control unit 27 can change the air volume of the cold air

or the warm air by controlling the operation of the sirocco fan 24 during the cooling operation or the heating operation based on an operation signal input into the indoor unit 12 from a remote controller.

[0025] FIG. 3 schematically illustrates a cross section of the indoor unit 12 according to one embodiment. The indoor unit 12 is an indoor unit of a ceiling-embedded air conditioner and is installed behind a ceiling 100 in a room. The indoor unit 12 is entirely surrounded by a housing 30. The housing 30 is a box type having a front surface plate 31, a back surface plate 32, a top surface plate 33, a bottom surface plate 36 having an air suction port 34 and an air blowout port 35, a left side surface plate (not illustrated) provided on the deep side of the paper surface of FIG. 3, and a right side surface plate (not illustrated) provided on the front side of the paper surface of FIG. 3, in which the air suction port 34 is arranged on the back surface plate 32 side and the air blowout port 35 is arranged closer to the front surface plate 31 side than the air suction port 34. The lower surface of the bottom surface plate 36 is exposed indoors, and therefore the lower surface has a design (not illustrated) required as a decorative plate.

[0026] The first heat exchanger 14A of a flat plate shape is attached in an attitude perpendicular to the top surface plate 33 to the front surface plate 11 side of a lower surface 33a of the top surface plate 33. Further, the second heat exchanger 14B of a flat plate shape is attached similarly in an attitude perpendicular to the top surface plate 33 to the back surface plate 32 side of the lower surface 33a of the top surface plate 33. The sirocco fan 24 is arranged between the first heat exchanger 14A and the second heat exchanger 14B.

[0027] The sirocco fan 24 has a fan motor 41, an impeller 42 fixed to a rotation shaft 41a of the fan motor 41, and a fan casing 43 in which a suction port 44 communicating with the impeller 42 is formed on the side surface and a blowout ventilation path 45 facing the outer peripheral surface of the impeller 42 is formed on the lower surface.

[0028] Under each of the first heat exchanger 14A and the second heat exchanger 14B, a drain pan 40 is arranged which collects condensation water generated in each of the first heat exchanger 14A and the second heat exchanger 14B.

[0029] Inside the housing 30, a first space S1 functioning as a ventilation path is formed between the second heat exchanger 14B and the back surface plate 32 and the air suction port 34 is directly opened to the first space S1. Further, a second space S2 functioning as a ventilation path is formed also between the first heat exchanger 14A and the front surface plate 31. Further, a third space S3 functioning as a ventilation path and connected to the first space S1 and the second space S2 is formed also between the drain pans 40 and the bottom surface plate 36.

[0030] The air suction port 34 is arranged on the back surface plate 32 side of the bottom surface plate 36 and

the air blowout port 35 is arranged closer to the front surface plate 31 side than the air suction port 34 of the bottom surface plate 36. Therefore, the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A via the third space S3 and the second space S2 is longer corresponding to the third space S3 than the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B via the first space S1.

[0031] Due to the fact that the distance of the ventilation path from the air suction port 34 to the air blowout port 35 where the first heat exchanger 14A is arranged is longer than the distance of the ventilation path from the air suction port 34 to the air blowout port 35 where the second heat exchanger 14B is arranged, the ventilation resistance of the ventilation path where the first heat exchanger 14A is arranged is larger than the ventilation resistance of the ventilation path where the second heat exchanger 14B is arranged.

[0032] To the blowout ventilation path 45 of the sirocco fan 24, an upper end opening 51 of the blowout guide 50 inserted into the air blowout port 35 of the bottom surface plate 36 is connected. The blowout guide 50 is arranged such that an air guide path S4 between the upper end opening 51 and a lower end opening 52 is formed in a curved shape toward the front side in the downward direction and an opening surface 52a of the lower end opening 52 is directed to the front side of the lower surface of the front surface plate 11. The blowout guide 50 penetrates a blowout opening 53 of the drain pans 40 and the air blowout port 35 of the bottom surface plate 36, and the lower end opening 52 of the blowout guide 50 serves as the substantial air blowout port. The air suction port 34 of the bottom surface plate 36 is provided between the air blowout opening 35 and the back surface plate 12.

[0033] When the fan motor 41 of the sirocco fan 24 rotates, the indoor unit 12 sucks air into the second heat exchanger 14B via the first space S1 between the second heat exchanger 14B and the back surface plate 12 from the air suction port 34 and sucks air into the first heat exchanger 14A via the second space S2 between the bottom surface plate 36 and the drain pans 40 and the third space S3 between the front surface plate 31 and the first heat exchanger 14A. Then, the air sucked into the sirocco fan 24 after being heat-exchanged with a refrigerant in the first heat exchanger 14A and the second heat exchanger 14B is blown out toward the lower front side of the front surface plate 31 from the blowout ventilation path 45 of the fan casing 43 via the air guide path S4 of the blowout guide 50.

[0034] The air sucked into the housing 30 from the air suction port 34 by the operation of the sirocco fan 24 flows while being divided to the first heat exchanger 14A side and the second heat exchanger 14B side. However, the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A is longer than the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B, and therefore, due

to the influence of the ventilation resistance, the amount of the air sucked into the first heat exchanger 14A is smaller than the amount of the air sucked into the second heat exchanger 14B.

[0035] Next, the structure of the indoor heat exchangers 14 of this embodiment is schematically illustrated using FIG. 2.

[0036] In the refrigeration circuit 19, the indoor heat exchangers 14 are connected between the four-way valve 18 and the expansion valve 17 such that the first heat exchanger 14A and the second heat exchanger 14B are in parallel with each other, and are connected to a refrigerant pipe from the expansion valve 17 via a distributor 60 and are connected to a refrigerant pipe from the four-way valve 18 via a header 61. The distributor 60 has a function of diverting a refrigerant flowing from the expansion valve 17 to the first heat exchanger 14A and the second heat exchanger 14B or has a function of merging the refrigerants flowing from the first heat exchanger 14A and the second heat exchanger 14B and causing the merged refrigerant to the expansion valve 17. The header 61 has a function of merging the refrigerants flowing from the first heat exchanger 14A and the second heat exchanger 14B and causing the merged refrigerant to the four-way valve 18 or has a function of diverting a refrigerant flowing from the four-way valve 18 to the first heat exchanger 14A and the second heat exchanger 14B.

[0037] Each of the first heat exchanger 14A and the second heat exchanger 14B has a plurality of paths as a pipe through which a plurality of refrigerants flows. In this embodiment, the first heat exchanger 14A has three paths 14A1 and the second heat exchanger 14B has five paths 14B1.

[0038] Therefore, the amount of refrigerants flowing through the first heat exchanger 14A and the amount of refrigerants flowing through the second heat exchanger 14B are different, and the amount of refrigerants flowing through the second heat exchanger 14B is larger than the amount of refrigerants flowing through the first heat exchanger 14A.

[0039] The number of the paths 14A1 possessed by the first heat exchanger 14A and the number of the paths 14B1 possessed by the second heat exchanger 14B are determined according to a difference between the amount of air sucked into the first heat exchanger 14A and the amount of air sucked into the second heat exchanger 14B by the sirocco fan 24. In this embodiment, the amount of air sucked into the first heat exchanger 14A is smaller than the amount of air sucked into second heat exchanger 14B, and therefore the number of the paths 14A1 in the first heat exchanger 14A is reduced to be smaller than the number of the paths 14B1 in the second heat exchanger 14B.

[0040] Therefore, even when the two indoor heat exchangers 14 are provided as in this embodiment in order to increase the heat exchange capacity and the amount of air flowing through the first heat exchanger 14A and

the amount of air flowing through the second heat exchanger 14B are different, the imbalance between the temperature of the refrigerants flowing through the first heat exchanger 14A and the temperature of the refrigerants flowing through the second heat exchanger 14B can be improved by determining the number of the paths 14A1 constituting the first heat exchanger 14A and the number of the paths 14B1 constituting the second heat exchanger 14B according to the difference between the amount of air flowing through the first heat exchanger 14A and the amount of air flowing through the second heat exchanger 14B.

[0041] Thus, when the heat exchangers 14A, 14B are heat-sterilized, each of the heat exchangers 14A, 14B can be set to a predetermined temperature (for example, 55°C).

[0042] In this embodiment, the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A is longer than the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B. Thus, the ventilation resistance of the ventilation path from the air suction port 34 to the first heat exchanger 14A is larger than the ventilation resistance of the ventilation path from the air suction port 34 to the second heat exchanger 14B, but the ventilation resistance is affected by not only the length of the ventilation path but the cross-sectional area of the ventilation path, the internal shape of the ventilation path, the friction coefficient of the internal surface of the ventilation path, or the like.

[0043] Therefore, in a case where, even when the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A is equal to the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B, the cross-sectional area of the ventilation path from the air suction port 34 to the first heat exchanger 14A is smaller than the cross-sectional area of the ventilation path from the port 34 to the second heat exchanger 14B, for example, the ventilation resistance of the ventilation path from the air suction port 34 to the first heat exchanger 14A is larger than the ventilation resistance of the ventilation path from the air suction port 34 to the second heat exchanger 14B. Therefore, by reducing the number of the paths 14A1 in the first heat exchanger 14A to be smaller than the number of the paths 14B1 in the second heat exchanger 14B, the imbalance between the temperature of the refrigerants flowing through first heat exchanger 14A and the temperature of the refrigerants flowing through second heat exchanger 14B can be achieved.

[0044] More specifically, the number of the paths 14A1 constituting the first heat exchanger 14A and the number of the paths 14B1 constituting the second heat exchanger 14B may be determined according to the ventilation resistance of the ventilation path from the air suction port 34 to the first heat exchanger 14A and the ventilation resistance of the ventilation path from the air suction port 34 to the second heat exchanger 14B. When determining

the number of the paths 14A1 constituting the first heat exchanger 14A and the number of the paths 14B1 constituting the second heat exchanger 14B, the ventilation resistance of the ventilation path from each of the indoor heat exchangers 14A, 14B to the air blowout port 35 also affects the amount of air sucked into each of the indoor heat exchangers 14A, 14B, and therefore it is necessary to consider the ventilation resistance of the ventilation path from the air suction port 34 to the air blowout port 35 including the ventilation path from each of the indoor heat exchangers 14A, 14B to the air blowout port 35.

[0045] The indoor heat exchangers 14 contain the two heat exchangers of the first heat exchanger 14A and the second heat exchanger 14B, but the temperature sensor 26a measuring the temperature of the indoor heat exchangers 14 and the humidity sensor 26b measuring the humidity of the indoor heat exchangers 14 do not need to be attached to each of the first heat exchanger 14A and the second heat exchanger 14B, and may be attached to either the first heat exchanger 14A or the second heat exchanger 14B. The reason therefor is as follows. In this embodiment, the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A and the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B are different, but the number of the paths 14A1 constituting the first heat exchanger 14A and the number of the paths 14B1 constituting the second heat exchanger 14B are determined according to the difference. Therefore, the imbalance between the temperature of the refrigerants flowing through the first heat exchanger 14A and the temperature of the refrigerants flowing through the second heat exchanger 14B is hard to occur, which eliminates the necessity of attaching the temperature sensor 26a to each of the first heat exchanger 14A and the second heat exchanger 14B.

[0046] In this embodiment, the temperature sensor 26a and the humidity sensor 26b are arranged on the lower side of the surface on the first space S1 side of the second heat exchanger 14B as illustrated in FIG. 3. This is because the first space S1 is directly opened to the air suction port 34, and therefore, when the temperature sensor 26a is arranged on the lower side of the surface on the first space S1 side of the second heat exchanger 14B, the air suction port 34 can be easily inspected when the temperature sensor 26a and the humidity sensor 26b are maintained and inspected.

[0047] The air conditioner 11 of this embodiment performs a heat sterilization operation of heating condensation water, the condensation water being attached to the first heat exchanger 14A and the second heat exchanger 14B by causing the first heat exchanger 14A and the second heat exchanger 14B to function as evaporators by an cooling operation, by increasing the temperatures of the refrigerants flowing through the first heat exchanger 14A and the second heat exchanger 14B to a temperature within a temperature range different from that during a heating operation by causing the first heat exchang-

er 14A and the second heat exchanger 14B to function as condensers and controlling the rotational speed of the sirocco fan 24.

[0048] The heat sterilization operation is an operation of moist heat sterilizing bacteria and mold in the condensation water, without aiming at indoor temperature control, by heating, without evaporating, the condensation water generated on the surfaces of the first heat exchanger 14A and the second heat exchanger 14B by driving the sirocco fan 24 at a rotational speed lower than the rotational speed in the case of a heating operation to increase the temperatures of the refrigerants flowing through the first heat exchanger 14A and the second heat exchanger 14B to a temperature within a temperature range (e.g., 55 to 59°C) different from that of the heating operation.

[0049] In the case of the heating operation, the rotational speed of the sirocco fan 24 is about 500 rpm to 1000 rpm, but, in the case of the heat sterilization operation, the rotational speed of the sirocco fan 24 is, for example, about 200 rpm. By reducing the rotational speed of the sirocco fan 24 to be smaller than that in the case of the heating operation to increase the pressure of the high pressure side refrigerant, the temperatures of the first heat exchanger 14A and the second heat exchanger 14B can be maintained at 55°C to 59°C.

[0050] The air conditioner 11 of this embodiment heat-sterilizes the first heat exchanger 14A and the second heat exchanger 14B by heating the condensation water, the condensation water being attached to the first heat exchanger 14A and the second heat exchanger 14B when the first heat exchanger 14A and second heat exchanger 14B function as evaporators, at 55 to 59°C, which is a temperature range different from that in the heating operation by causing the first heat exchanger 14A and the second heat exchanger 14B to function as condensers. Therefore, the sterilization can be carried out at low cost without providing a dedicated device and the sterilization can be performed even when the inside of the indoor unit 12 is in a high humidity state.

[0051] Further, even when the distance of the ventilation path from the air suction port 34 to the first heat exchanger 14A and the distance of the ventilation path from the air suction port 34 to the second heat exchanger 14B are different, the number of the paths 14A1 constituting the first heat exchanger 14A and the number of the paths 14B1 constituting the second heat exchanger 14B are determined according to the difference. Therefore, the imbalance between the temperature of the refrigerants flowing through the first heat exchanger 14A and the temperature of the refrigerants flowing through the second heat exchanger 14B can be suppressed even in the heat sterilization operation state, and thus the imbalance in the sterilization of the first heat exchanger 14A and the second heat exchanger 14B can be suppressed.

[0052] The description above is given with reference to the limited number of embodiments, but the scope of the present invention is not limited to thereto, and mod-

ifications of the embodiment based on the disclosure above are obvious to those skilled in the art.

Reference Signs List

[0053]

11	air conditioner
13	outdoor unit
12	indoor unit
14	indoor heat exchanger
14A	first heat exchanger
14B	second heat exchanger
14A1, 14B1	path
24	sirocco fan
26a	temperature sensor
33	housing
34	air suction port
35	air blowout port
40	drain pan
S1	first space
S2	second space
S3	third space
S4	air guide path
45	blowout ventilation path

Claims

1. An air conditioner comprising:

an outdoor unit including a compressor and a four-way valve; and
 an indoor unit including a plurality of indoor heat exchangers, an indoor unit fan, and a temperature detection means configured to detect a temperature of the indoor heat exchanger and connected to the outdoor unit,
 the air conditioner controlling a temperature in a room where the indoor unit is installed by controlling at least the compressor, the indoor unit fan, and the four-way valve and causing the plurality of indoor heat exchangers to function as an evaporator in a case of cooling and as a condenser in a case of heating in order to set the temperature of the indoor heat exchangers to a predetermined temperature, wherein
 an amount of air passing through one of the indoor heat exchangers and an amount of air passing through another indoor heat exchanger by ventilation by the indoor unit fan are different, setting is performed such that different amounts of refrigerants according to the air amount difference are caused to flow to the one of the indoor heat exchangers and the another indoor heat exchanger and one of the plurality of indoor heat exchangers includes the temperature detection means, and

the plurality of indoor heat exchangers is heat-sterilized by heating condensation water, the condensation water being attached to the plurality of indoor heat exchangers when the indoor heat exchangers function as the evaporators, to a predetermined temperature by causing the plurality of indoor heat exchangers to function as the condenser.

2. The air conditioner according to claim 1, wherein the indoor unit includes:

a housing having an air suction port and an air blowout port and having a plurality of ventilation paths in parallel with each other between the air suction port and the air blowout port;
 at least one of the indoor heat exchangers arranged in each of the plurality of ventilation paths; and
 the indoor unit fan configured to guide air sucked from the air suction port to the air blowout port via each of the plurality of ventilation paths, ventilation resistance of one of the ventilation paths is larger than ventilation resistance of another ventilation path, and
 an amount of a refrigerant flowing through the one of the indoor heat exchangers arranged in the one of the ventilation paths is set to be smaller than the amount of the refrigerant flowing through another indoor heat exchanger arranged in the another ventilation path according to magnitude of the ventilation resistance.

3. The air conditioner according to claim 2, wherein

the housing is a box type having a front surface plate, a back surface plate, a top surface plate, a bottom surface plate, a left side surface plate, and a right side surface plate,
 the bottom surface plate has the air blowout port arranged on a side of the front surface plate and the air suction port arranged on a side of the back surface plate,
 the plurality of indoor heat exchangers contains a first heat exchanger as the one indoor heat exchanger attached closer to the front surface plate side in the housing and a second heat exchanger as the another indoor heat exchanger attached closer to the back surface plate side,
 the indoor unit fan has a blowout ventilation path and is arranged between the first heat exchanger and the second heat exchanger,
 a drain pan arranged under each of the first heat exchanger and the second heat exchanger and configured to collect condensation water attached to the first heat exchanger and the second heat exchanger is provided,
 a blowout guide configured to connect the blow-

out ventilation path and the air blowout port to guide air blown out from the blowout ventilation path of the indoor unit fan to the air blowout port is provided,

a first space to which the air suction port is opened is formed between the second heat exchanger and the back surface plate, a second space is formed between the first heat exchanger and the front surface plate, and a third space connecting the first space and the second space is formed between the drain pans and the bottom surface plate, and the first heat exchanger and the second heat exchanger are arranged such that ventilation resistance of a ventilation path from the air suction port to the first heat exchanger via the third space and the second space is larger than ventilation resistance of a ventilation path from the air suction port to the second heat exchanger via the first space.

4. The air conditioner according to claim 3, wherein the temperature detection means is arranged on a lower side and on a side of the first space of the second heat exchanger.

5

10

15

20

25

30

35

40

45

50

55

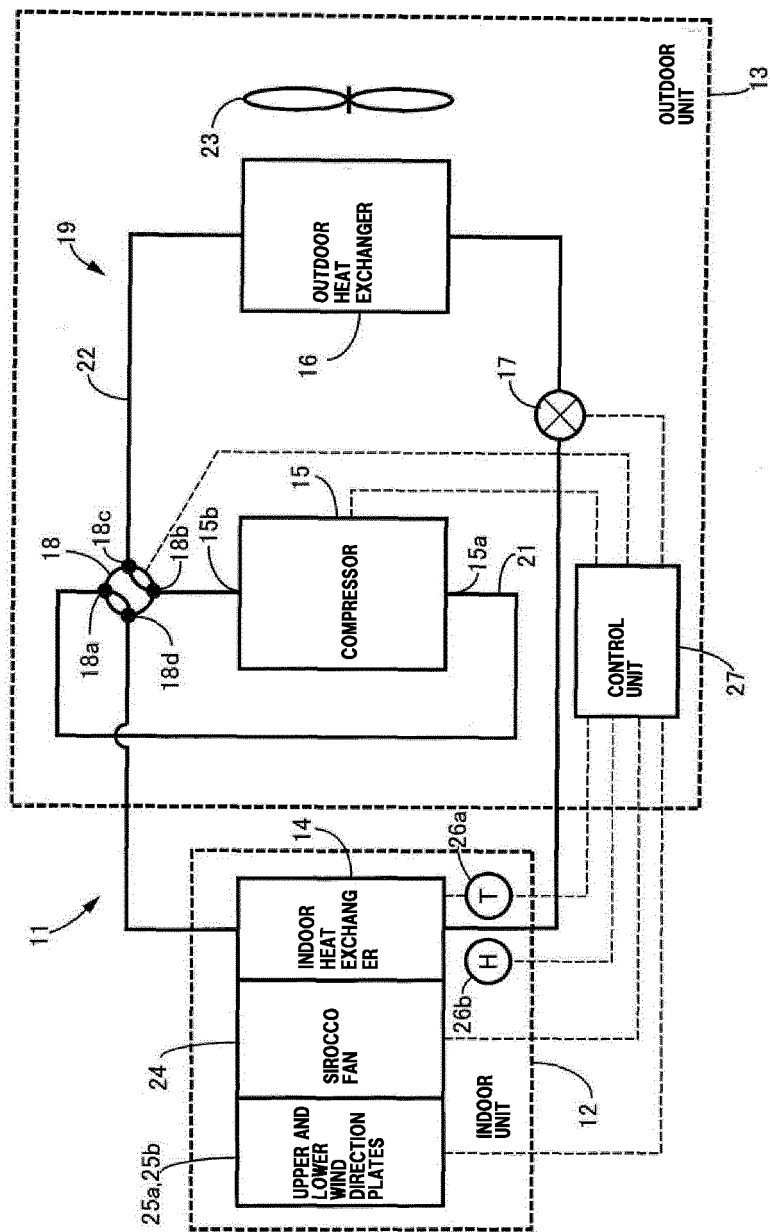


FIG.1

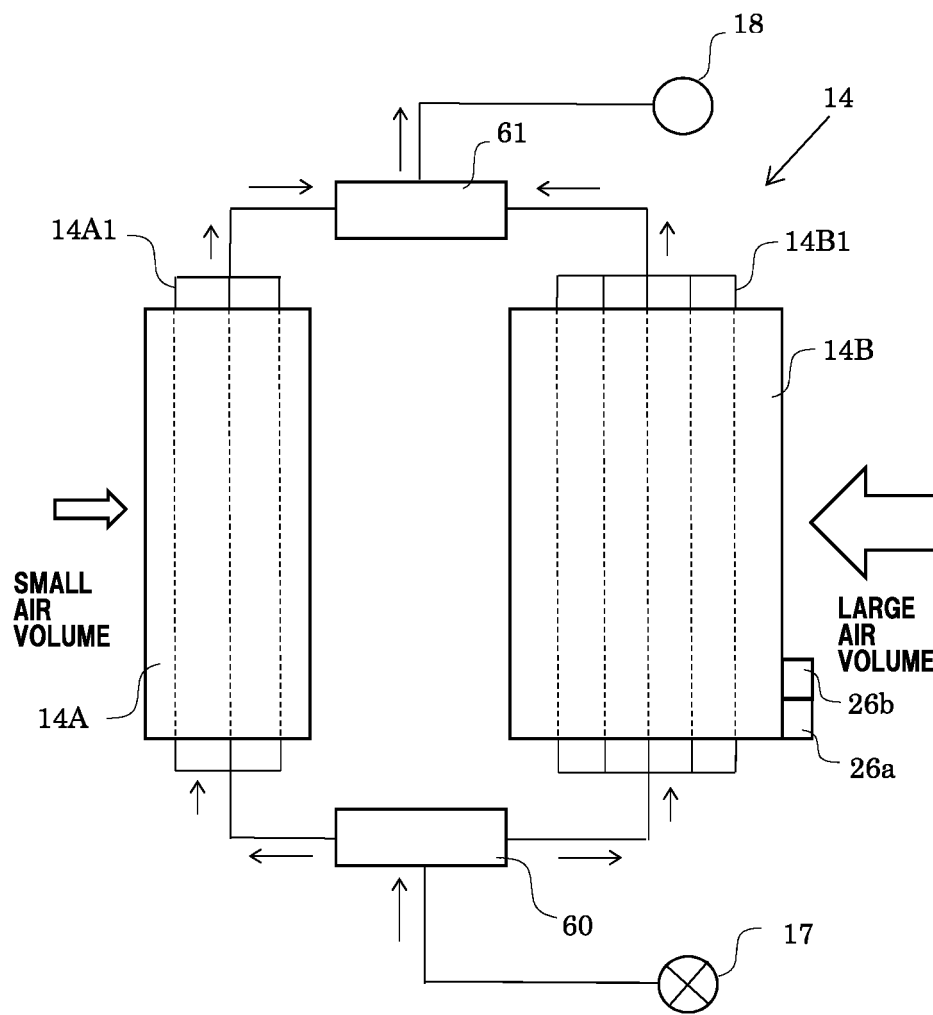


FIG.2

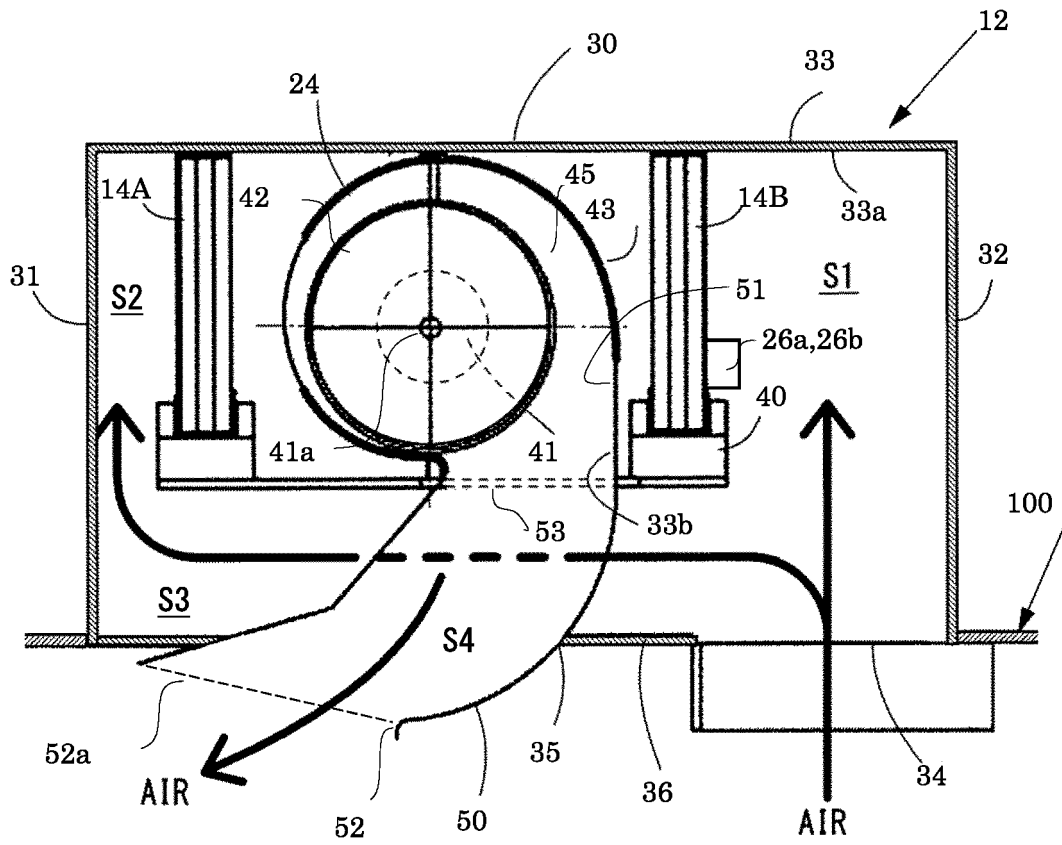


FIG.3

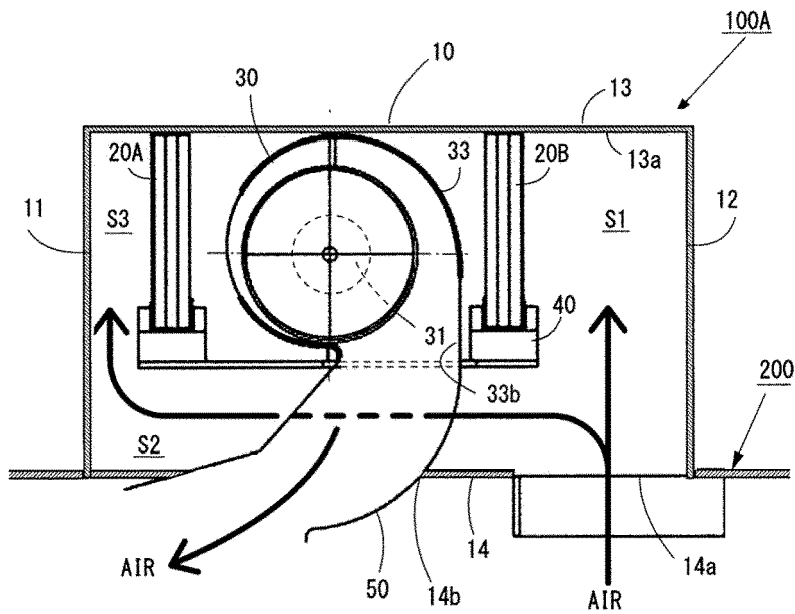


FIG.4

5	INTERNATIONAL SEARCH REPORT		International application No. PCT/JP2020/048319
10	A. CLASSIFICATION OF SUBJECT MATTER F24F 11/48 (2018.01)i; F24F 11/89 (2018.01)i; F24F 1/0007 (2019.01)i; F24F 1/0063 (2019.01)i; F24F 1/0067 (2019.01)i FI: F24F11/48; F24F1/0007; F24F1/0063; F24F1/0067; F24F11/89 According to International Patent Classification (IPC) or to both national classification and IPC		
15	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) F24F11/48; F24F11/89; F24F1/0007; F24F1/0063; F24F1/0067 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Published examined utility model applications of Japan 1922-1996 Published unexamined utility model applications of Japan 1971-2021 Registered utility model specifications of Japan 1996-2021 Published registered utility model applications of Japan 1994-2021 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
25	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
30	Y	JP 2018-119718 A (FUJITSU GENERAL LTD.) 02 August 2018 (2018-08-02) paragraphs [0010]-[0065], fig. 1-10	1-4
35	Y	JP 2002-162052 A (DAIKIN INDUSTRIES, LTD.) 07 June 2002 (2002-06-07) paragraph [0030], fig. 2	1-4
40	Y	JP 2001-174047 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 29 June 2001 (2001-06-29) paragraphs [0028]-[0036], fig. 1	1-4
45	Y	WO 2018/159446 A1 (FUJITSU GENERAL LTD.) 07 September 2018 (2018-09-07) paragraphs [0073]-[0094]	1-4
50	☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
55	* 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 12 February 2021 (12.02.2021)		Date of mailing of the international search report 02 March 2021 (02.03.2021)
	Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan		Authorized officer Telephone No.

5	INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/JP2020/048319	
	Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
10	JP 2018-119718 A	02 Aug. 2018	(Family: none)	
	JP 2002-162052 A	07 Jun. 2002	(Family: none)	
	JP 2001-174047 A	29 Jun. 2001	(Family: none)	
	WO 2018/159446 A1	07 Sep. 2018	EP 3591306 A	
15			paragraphs [0073]- [0094]	
			EP 3591305 A	
			EP 3591307 A	
			AU 2018228986 A	
			CN 110382970 A	
20			AU 2018226755 A	
			AU 2018226754 A	
			CN 110382968 A	
			CN 110382969 A	
25				
30				
35				
40				
45				
50				
55				

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

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- JP 2019203629 A [0006]