



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

(43) Date of publication:
02.06.2021 Bulletin 2021/22

(51) Int Cl.:
F24F 13/20^(2006.01) F24F 13/24^(2006.01)

(21) Application number: **18927912.8**

(86) International application number:
PCT/JP2018/028096

(22) Date of filing: **26.07.2018**

(87) International publication number:
WO 2020/021678 (30.01.2020 Gazette 2020/05)

(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 KH MA MD TN

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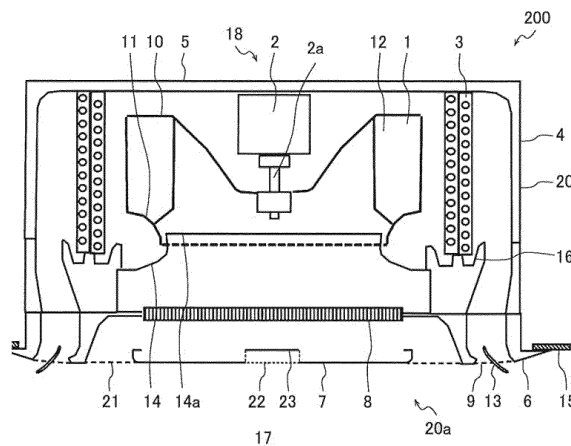
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(54) **INDOOR UNIT AND REFRIGERATION CYCLE APPARATUS**

(57) An indoor unit includes: a casing attached to an attachment surface and having an opening open to an air-conditioning target space to be air-conditioned; a panel configured to cover the opening of the casing and in which a first air inlet through which air is sucked in, a second air inlet that is positioned closer to a center of the casing than the first air inlet is to the center and through which air is sucked in, and an air outlet through which

the air sucked in through the first air inlet and the second air inlet is blown out are formed, a fan configured to move air to be sucked in through the first air inlet and the second air inlet and blown out through the air outlet; and an air guide wall provided to cover at least part of the second air inlet of the panel and configured to prevent sound within the casing from transmitting to outside of the casing via the second air inlet.

FIG. 2



Description

Technical Field

[0001] The present disclosure relates to an indoor unit including a panel having a first air inlet and a second air inlet that is provided more inward than the first air inlet, and to a refrigeration cycle device.

Background Art

[0002] For example, an indoor unit of a ceiling concealed air-conditioning device in which a suction panel as a center part is installed at a center of an air inlet provided on a lower portion of a casing has been well-known. The suction panel covers the air inlet to make an inside of the casing difficult to be visually recognized, and to insulate sound generated from the inside of the casing. As described above, the indoor unit of the air-conditioning device that reduces noise while securing designability has been proposed. However, when the suction panel is installed, an area of the air inlet is reduced, and a dead air region is generated on a surface of the suction panel on an inside of the casing due to separation of an air flow, to increase ventilation resistance. As a result, input power of a fan motor is increased to deteriorate energy saving performance.

[0003] To secure energy saving performance, Patent Literature 1 discloses a ceiling concealed indoor unit in which an auxiliary opening is provided in a suction panel provided at a center of an annular air inlet. Therefore, the indoor unit disclosed in Patent Literature 1 is expanded in a suction area, reduced in a dead air region, reduced in ventilation resistance, to prevent increase in input power of the fan motor.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2013-108716

Summary of Invention

Technical Problem

[0005] In the indoor unit disclosed in Patent Literature 1, however, since the auxiliary opening is provided to secure energy saving performance, sound generated from a fan and other components easily transmits to outside via the auxiliary opening. Accordingly, in the indoor unit disclosed in Patent Literature 1, sound insulating property of the suction panel is deteriorated, and sufficient noise reduction effect cannot be obtained.

[0006] The indoor unit of the present disclosure is made to overcome the above-described issues, and aims to provide an indoor unit and a refrigeration cycle device

that are improved in sound insulating property while securing energy saving performance.

Solution to Problem

[0007] An indoor unit according to one embodiment of the present disclosure includes: a casing attached to an attachment surface and having an opening open to an air-conditioning target space to be air-conditioned; a panel configured to cover the opening of the casing and having a first air inlet through which air is sucked in, a second air inlet that is positioned closer to a center of the casing than the first air inlet is to the center and through which air is sucked in, an air outlet through which the air sucked in through the first air inlet and the second air inlet is blown out, a fan configured to move air to be sucked in through the first air inlet and the second air inlet and blown out through the air outlet; and an air guide wall provided to cover at least part of the second air inlet of the panel and configured to prevent sound within the casing from transmitting to outside of the casing via the second air inlet. Advantageous Effects of Invention

[0008] According to the embodiment of the present disclosure, since the air guide wall is provided on the second air inlet, it is possible to prevent sound within the casing from transmitting to the outside of the casing via the second air inlet. Therefore, even when the second air inlet is provided in the panel to reduce ventilation resistance and to secure energy saving performance, it is possible to improve sound insulating property. In other words, the indoor unit can improve sound insulating property while securing energy saving performance.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a bottom view illustrating an indoor unit 200 according to Embodiment 1 of the present disclosure.

[Fig. 2] Fig. 2 is a side perspective view illustrating the indoor unit 200 according to Embodiment 1 of the present disclosure.

[Fig. 3] Fig. 3 is a side perspective view illustrating an indoor unit 200a according to a first modification of Embodiment 1 of the present disclosure.

[Fig. 4] Fig. 4 is a side perspective view illustrating an indoor unit 200b according to a second modification of Embodiment 1 of the present disclosure.

[Fig. 5] Fig. 5 is a bottom view illustrating an indoor unit 200c according to a third modification of Embodiment 1 of the present disclosure.

[Fig. 6] Fig. 6 is a side perspective view illustrating an indoor unit 201 according to a fourth modification of Embodiment 1 of the present disclosure.

[Fig. 7] Fig. 7 is a side perspective view illustrating an indoor unit 200d according to Embodiment 2 of the present disclosure.

[Fig. 8] Fig. 8 is a side perspective view illustrating an indoor unit 200e according to Embodiment 3 of the present disclosure.

[Fig. 9] Fig. 9 is a side perspective view illustrating an indoor unit 200f according to a modification of Embodiment 3 of the present disclosure.

[Fig. 10] Fig. 10 is a circuit diagram illustrating a refrigeration cycle device 1000 according to Embodiment 4 of the present disclosure.

Description of Embodiments

Embodiment 1.

[0010] Some embodiments of an indoor unit and a refrigeration cycle device according to the present disclosure are described with reference to drawings. Fig. 1 is a bottom view illustrating an indoor unit 200 according to Embodiment 1 of the present disclosure, and Fig. 2 is a side perspective view illustrating the indoor unit 200 according to Embodiment 1 of the present disclosure. The indoor unit 200 is the indoor unit 200 of, for example, a packaged air-conditioning device. As illustrated in Fig. 1 and Fig. 2, the indoor unit 200 includes a casing 20, a panel 25, wind direction plates 13, a heat exchanger 3, a drain pan 16, a filter 8, a fan 18, a bell mouth 14, and an air guide wall 23.

(Casing 20)

[0011] The casing 20 is attached to an attachment surface 15 such as a ceiling surface, and has a bottomed square cylindrical shape. The casing 20 includes a rectangular casing top plate 5 disposed on a back side of the attachment surface 15, and four casing side plates 4 extending from respective four sides of the casing top plate 5 toward an air-conditioning target space 17 to be air-conditioned. An opening 20a is provided on a side facing the casing top plate 5. As described above, in Embodiment 1, the indoor unit 200 of a ceiling concealed air-conditioning device in which the casing 20 is concealed on the back side of the attachment surface 15 is illustrated.

(Panel 25)

[0012] The panel 25 covers the opening 20a of the casing 20, and includes a decorative panel 6 and a suction panel 7. The panel 25 is made of, for example, a sheet metal or a resin. The decorative panel 6 is, for example, a rectangular frame-shaped part detachably attached to the casing 20, and covers an edge portion of the opening 20a of the casing 20. A hole extending in a longitudinal direction is provided at each of end portions on long sides of the decorative panel 6. Note that the decorative panel 6 is substantially flush with the attachment surface 15. The suction panel 7 is, for example, a rectangular frame-shaped part that is disposed inside the frame-shaped

decorative panel 6 and is detachably attached to the decorative panel 6, and covers a center portion of the opening 20a of the casing 20. A surface of the suction panel 7 facing toward the air-conditioning target space 17 is substantially horizontal.

[0013] In the opening 20a of the casing 20, portions between the decorative panel 6 and the suction panel 7 serve as first air inlets 21, and the first air inlets 21 are openings through which air of the air-conditioning target space 17 is sucked in. Further, in the opening 20a of the casing 20, an inside of the frame-shaped suction panel 7 serves as a second air inlet 22, and the second air inlet 22 is also an opening through which the air of the air-conditioning target space 17 is sucked in. In other words, the second air inlet 22 is positioned closer to a center of the casing 20 than each of the first air inlets 21 is to the center. Further, in the opening 20a of the casing 20, the holes along the edge portions on the long sides of the decorative panel 6 serve as air outlets 9, and the air outlets 9 are openings through which the air sucked in through the first air inlets 21 and the second air inlet 22 is blown out. Note that, in Embodiment 1, the case where the number of first air inlets 21 is two is illustrated; however, the number of first air inlets 21 may be one or three or more. In addition, the case where the number of second air inlets 22 is one is illustrated; however, the number of second air inlets 22 may be two or more. Moreover, the case where the number of air outlets 9 is two is illustrated; however, the number of air outlets 9 may be one or three or more. For example, four air outlets 9 may be provided as holes along edge portions of four sides of the decorative panel 6.

(Wind Direction Plate 13)

[0014] The wind direction plates 13 are provided in the respective air outlets 9, and adjust directions of the air blown out from the respective air outlets 9.

(Heat Exchanger 3)

[0015] The heat exchanger 3 is provided in an air duct that connects the first air inlets 21 and the second air inlet 22 to the air outlets 9 on an outside of the fan 18 in a radial direction, and exchanges heat of the air sucked in through the first air inlets 21 and the second air inlet 22 with refrigerant. For example, the heat exchanger 3 is a fin-and-tube heat exchanger 3 including a plurality of fins (not illustrated) and a plurality of heat transfer tubes (not illustrated). The plurality of fins are arranged with predetermined intervals in a horizontal direction, and the plurality of heat transfer tubes penetrate through the plurality of fins. The heat transfer tubes are connected to an outdoor unit 100 (see Fig. 10) by a gas pipe 300 and a liquid pipe 400. Thus, the cooled refrigerant or the heated refrigerant is supplied to the heat exchanger 3 from the outdoor unit 100. The drain pan 16 is provided below the heat exchanger 3, and receives dew condensation water

generated when the air of the air-conditioning target space 17 is cooled by the heat exchanger 3.

(Filter 8)

[0016] The filter 8 is provided between the suction panel 7 and the fan 18, and removes dust from the air sucked in through the first air inlets 21 and the second air inlet 22. An outer shape of the filter 8 is smaller than an outer shape of the suction panel 7, and the filter 8 is hidden in a planar view from below the indoor unit 200. As a result, when a user or another person visually confirms the indoor unit 200 from below, the filter 8 is invisible through the first air inlets 21.

(Fan 18)

[0017] The fan 18 is provided at a center inside the casing 20, and forms a flow the air that is sucked in through the first air inlets 21 and the second air inlet 22 and blown out through the air outlets 9. The fan 18 includes a fan motor 2, a shaft 2a, and a centrifugal fan 1. The fan motor 2 is supported on a bottom surface of the casing top plate 5, and rotationally drives the centrifugal fan 1. The shaft 2a is a rotary shaft extending downward from the fan motor 2. The centrifugal fan 1 is, for example, a turbo fan, and includes a main plate 10, a plurality of blades 12, and a side plate 11. The main plate 10 includes a boss that is fixed with the shaft 2a. The side plate 11 forms the air duct. The blades 12 are rotated by rotational driving of the fan motor 2. The centrifugal fan 1 sucks air into the casing 20 through the first air inlets 21 and the second air inlet 22, and blows out the sucked air to indoors as the air-conditioning target space 17 through the air outlets 9.

(Bell Mouth 14)

[0018] The bell mouth 14 is a curved-cylindrical part that is provided between the centrifugal fan 1 of the fan 18 and the suction panel 7 and is gradually reduced in diameter from an upstream toward a downstream of the air sent to the fan 18.

(Air Guide Wall 23)

[0019] The air guide wall 23 is provided to cover at least part of the second air inlet 22 and prevents sound within the casing 20 from transmitting to outside of the casing 20 via the second air inlet 22. The air guide wall 23 is attached to the suction panel 7 by, for example, a supporting part (not illustrated), and is installed to cover the second air inlet 22 in a planar view from below the indoor unit 200. The air guide wall 23 is provided at a position different in height from the suction panel 7. In Embodiment 1, the air guide wall 23 is positioned closer to the fan 18 than the suction panel 7 is to the fan 18. Note that, in Embodiment 1, the air guide wall 23 has a

width equivalent to a width (length in horizontal direction) of the second air inlet 22 in a side cross-sectional view. Accordingly, when the user or another person visually confirms the indoor unit 200 from below, the inside of the indoor unit 200 is invisible through the second air inlet 22. In other words, it is possible to enhance designability of the indoor unit 200. Further, in Embodiment 1, the air guide wall 23 has an area equivalent to an opening area of the second air inlet 22. As a result, it is possible to further improve designability of the indoor unit 200 as compared with a case where the air guide wall 23 only has the width equivalent to the width of the second air inlet 22. Furthermore, the air guide wall 23 may have the area greater than or equal to the opening area of the second air inlet 22. This makes the inside of the indoor unit 200 more difficult to be viewed.

[0020] Next, a flow of the air in the indoor unit 200 is described. When the centrifugal fan 1 is rotated, the air in the air-conditioning target space 17 is sucked into the first air inlets 21. The air from which dust is removed by the filter 8 is guided by the bell mouth 14, and is sucked into the centrifugal fan 1. In the centrifugal fan 1, the air sucked in from the lower side to the upper side is blown out to the outside in the horizontal direction and the radial direction. The blown-out air passes through the heat exchanger 3, and exchanges heat with the refrigerant and is adjusted in humidity. Thereafter, the air is changed in direction to the downward direction, and is blown out to the air-conditioning target space 17 through the air outlets 9.

[0021] According to Embodiment 1, since the air guide wall 23 is provided in the second air inlet 22, it is possible to prevent sound within the casing 20 from transmitting to the outside of the casing 20 via the second air inlet 22. Accordingly, even when the second air inlet 22 is provided on the panel 25 to reduce ventilation resistance and to secure energy saving performance, it is possible to improve sound insulating property. In other words, the indoor unit 200 can improve the sound insulating property while securing the energy saving performance.

[0022] In a case where the suction panel 7 of Embodiment 1 has not a frame shape but a flat plate shape, the suction panel 7 covers an inside opening of the frame-shaped decorative panel 6 to make the inside of the casing 20 difficult to be visually confirmed and to insulate sound generated from the inside of the casing 20. In this case, installation of the suction panel 7 reduces the area of the opening 20a. Further, a dead air region is generated on a surface of the suction panel 7 on an inside of the casing 20 due to separation of the air flow, to increase ventilation resistance. As a result, input power of the fan motor 2 may be increased to deteriorate energy saving performance. Therefore, in Embodiment 1, the frame-shaped suction panel 7 is adopted, and the second air inlet 22 inside the frame-shaped suction panel 7 is formed, which expands the suction area and reduces the dead air region. As a result, the ventilation resistance is reduced, and the input power of the fan motor 2 is pre-

vented from increasing. In this state, however, the sound generated from the fan 18 and other components may transmit to the outside via the second air inlet 22. Thus, in Embodiment 1, the air guide wall 23 is provided in the second air inlet 22, which makes it possible to prevent sound within the casing 20 from being directly radiated to the outside of the casing 20 via the second air inlet 22. As described above, in Embodiment 1, it is possible to achieve both of improvement in energy saving performance and improvement in sound insulating property.

[0023] In addition, the air guide wall 23 has the area greater than or equal to the opening area of the second air inlet 22, and is installed to cover the second air inlet 22 in a planar view from below the indoor unit 200. Therefore, it is possible to hide the filter 8 on which dust is accumulated. As described above, in Embodiment 1, it is possible to improve energy saving performance, sound insulating property, and designability.

(First Modification)

[0024] Fig. 3 is a side perspective view illustrating an indoor unit 200a according to a first modification of Embodiment 1 of the present disclosure. As illustrated in Fig. 3, in the first modification, the air guide wall 23 and the suction panel 7 are integrated. Therefore, in the indoor unit 200, it is possible to provide the air guide wall 23 without increasing the number of parts.

(Second Modification)

[0025] Fig. 4 is a side perspective view illustrating an indoor unit 200b according to a second modification of Embodiment 1 of the present disclosure. As illustrated in Fig. 4, in the second modification, the air guide wall 23 has a convex shape protruding toward the air-conditioning target space 17. As a result, the dead air region that may be generated on a surface of the air guide wall 23 facing toward the fan 18 can be reduced in a manner similar to reduction of the dead air region on the surface of the suction panel 7 facing toward the fan 18.

(Third Modification)

[0026] Fig. 5 is a bottom view illustrating an indoor unit 200c according to a third modification of Embodiment 1 of the present disclosure. As illustrated in Fig. 5, in the third modification, the second air inlets 22 are provided on outside in the radial direction of a bell mouth opening 14a in a downstream of the bell mouth 14. The noise generated from the fan 18 is radiated to the outside via the bell mouth opening 14a of the bell mouth 14. Therefore, when no second air inlet 22 is provided at a position corresponding to the bell mouth opening 14a, the noise radiated to the air-conditioning target space 17 does not transmit via the second air inlet 22. According to the third modification, it is possible to further suppress the noise.

(Fourth Modification)

[0027] Fig. 6 is a side perspective view illustrating an indoor unit 201 according to a fourth modification of Embodiment 1 of the present disclosure. As illustrated in Fig. 6, in the fourth modification, an air guide wall 23a has a width greater than or equal to the width of the second air inlet 22 in a side cross-sectional view. As a result, the inside of the indoor unit 200 is more difficult to be viewed.

Embodiment 2.

[0028] Fig. 7 is a side perspective view illustrating an indoor unit 200d according to Embodiment 2 of the present disclosure. Embodiment 2 is different from Embodiment 1 in that the indoor unit 200d includes a sound absorbing part 30. In Embodiment 2, the parts same as the parts in Embodiment 1 are denoted by the same reference numerals to omit description, and differences from Embodiment 1 are mainly described.

[0029] As illustrated in Fig. 7, the sound absorbing part 30 is provided on a surface of the suction panel 7 facing toward the fan 18 and on a surface of the air guide wall 23 facing toward the fan 18, and absorbs sound. The sound absorbing part 30 is, for example, a porous part. The sound absorbing part 30 is made of, for example, expanded polystyrene, and has a predetermined thickness. In Embodiment 2, the provided sound absorbing part 30 can further prevent the noise generated from the fan 18 from being radiated to the outside, as compared with a case where no sound absorbing part 30 is provided. Further, an air duct from the second air inlet 22 to the fan 18 is shaped by the thickness of the sound absorbing part 30. This prevents separation of the air flow on the surface of the air guide wall 23 facing toward the fan 18 after passage of the second air inlet 22. As a result, an effective air duct after passage of the second air inlet 22 is expanded, and ventilation resistance is reduced. Note that, in the indoor unit 200d, a part of the sound absorbing part 30 may be used as the air guide wall 23. Accordingly, in Embodiment 2, it is possible to reduce the number of parts, and to easily form a shape of the second air inlet 22.

Embodiment 3.

[0030] Fig. 8 is a side perspective view illustrating an indoor unit 200e according to Embodiment 3 of the present disclosure. Embodiment 3 is different in position of the air guide wall 23 from Embodiment 1. In Embodiment 3, the parts same as the parts in Embodiment 1 are denoted by the same reference numerals to omit description, and differences from Embodiment 1 are mainly described.

[0031] As illustrated in Fig. 8, the air guide wall 23 is positioned closer to the air-conditioning target space 17 than the suction panel 7 is to the air-conditioning target space 17. As a result, in Embodiment 3, it is possible to further reduce the dead air region that may be generated

on the surface of the air guide wall 23 facing toward the fan 18, in addition to effects similar to the effects in Embodiment 1. Further, in Embodiment 3, it is possible to further reduce the ventilation resistance in the second air inlet 22 as compared with Embodiment 1. This makes it possible to improve energy saving performance.

(Modification)

[0032] Fig. 9 is a side perspective view illustrating an indoor unit 200f according to a modification of Embodiment 3 of the present disclosure. As illustrated in Fig. 9, in the modification, the suction panel 7 is inclined toward the fan 18 as approaching from each of the first air inlets 21 toward the second air inlet 22. In other words, a height at an end part of the suction panel 7 on a side close to each of the first air inlets 21 and a height of the air guide wall 23 can be aligned. Note that a height at an end part of the suction panel 7 on the second air inlet 22 side and the height of the air guide wall 23 are different from each other. Accordingly, it is possible to install the air guide wall 23 without changing a dimension of the indoor unit 200f in a height direction.

Embodiment 4.

[0033] Fig. 10 is a circuit diagram illustrating a refrigeration cycle device 1000 according to Embodiment 4 of the present disclosure. In Embodiment 4, the refrigeration cycle device 1000 including the indoor unit 200 of any of Embodiments 1 to 3 is described. As illustrated in Fig. 10, the refrigeration cycle device 1000 is, for example, an air-conditioning device conditioning air of the air-conditioning target space 17, and includes the outdoor unit 100 and the indoor unit 200. The outdoor unit 100 and the indoor unit 200 are connected by a gas pipe 300 through which gas refrigerant flows and a liquid pipe 400 through which liquid refrigerant or two-phase gas-liquid refrigerant flows. The outdoor unit 100 includes a compressor 101, a flow switching device 102, an outdoor heat exchanger 103, an outdoor fan 104, and an expansion unit 105. The indoor unit 200 includes the heat exchanger 3 and the fan 18.

[0034] The compressor 101, the flow switching device 102, the outdoor heat exchanger 103, the expansion unit 105, and the heat exchanger 3 are connected by the connection pipes to configure a refrigerant circuit. The compressor 101 suctions the refrigerant in a low-temperature low-pressure state, compresses the suctioned refrigerant into the refrigerant in a high-temperature high-pressure state, and discharges the refrigerant. The compressor 101 includes, for example, an inverter device, and optionally changes an operation frequency to finely change a capacity of the compressor 101. The capacity of the compressor 101 means a refrigerant feeding amount per unit time. The flow switching device 102 switches a direction in which the refrigerant flows in the refrigerant circuit, based on an instruction from a control-

ler (not illustrated), and is, for example, a four-way valve. The outdoor heat exchanger 103 exchanges heat between, for example, outdoor air and the refrigerant. The outdoor heat exchanger 103 acts as a condenser during cooling operation, and acts as an evaporator during heating operation.

[0035] The outdoor fan 104 is a device sending the outdoor air to the outdoor heat exchanger 103. The outdoor fan 104 may be, for example, the centrifugal fan 1 similar to the fan 18. The outdoor fan 104 may optionally change an operation frequency of a motor by an inverter device or other devices, to finely change a rotation speed of the centrifugal fan 1. The expansion unit 105 is a reducing valve or an expansion valve that decompresses and expands the refrigerant. The expansion unit 105 is, for example, an electronic expansion valve having an adjustable opening degree. The heat exchanger 3 exchanges heat between, for example, indoor air and the refrigerant. The heat exchanger 3 acts as an evaporator during the cooling operation, and acts as a condenser during the heating operation. The fan 18 is device sending the indoor air to the heat exchanger 3. An operation speed of the fan 18 is set by, for example, the user.

(Operation Mode, Cooling Operation)

[0036] Next, an operation mode of the refrigeration cycle device 1000 is described. First, the cooling operation is described. In the cooling operation, the refrigerant suctioned into the compressor 101 is compressed by the compressor 101, and is discharged in a high-temperature high-pressure gas state. The refrigerant in the high-temperature high-pressure gas state discharged from the compressor 101 flows into the outdoor heat exchanger 103 acting as a condenser through the flow switching device 102, exchanges heat with the outdoor air sent by the outdoor fan 104 in the outdoor heat exchanger 103, and is condensed and liquified. The refrigerant in a condensed liquid state flows into the expansion unit 105, and is expanded and decompressed in the expansion unit 105 into the refrigerant in a low-temperature low-pressure two-phase gas-liquid state. Thereafter, the refrigerant in the two-phase gas-liquid state flows into the heat exchanger 3 acting as an evaporator, exchanges heat with the indoor air sent by the fan 18 in the heat exchanger 3, and is evaporated and gasified. At this time, the indoor air is cooled to perform indoor cooling. The refrigerant in the low-temperature low-pressure evaporated gas state is suctioned into the compressor 101 through the flow switching device 102.

(Operation Mode, Heating Operation)

[0037] Next, the heating operation is described. In the heating operation, the refrigerant suctioned into the compressor 101 is compressed by the compressor 101, and is discharged in a high-temperature high-pressure gas state. The refrigerant in the high-temperature high-pres-

sure gas state discharged from the compressor 101 flows into the heat exchanger 3 acting as a condenser through the flow switching device 102, exchanges heat with the indoor air sent by the fan 18 in the heat exchanger 3, and is condensed and liquified. At this time, the indoor air is heated to perform indoor heating. The refrigerant in the condensed liquid state flows into the expansion unit 105, and is expanded and decompressed by the expansion unit 105 into the refrigerant in a low-temperature low-pressure two-phase gas-liquid state. Thereafter, the refrigerant in the two-phase gas-liquid state flows into the outdoor heat exchanger 103 acting as an evaporator, exchanges heat with the outdoor air sent by the outdoor fan 104 in the outdoor heat exchanger 103, and is evaporated and gasified. The refrigerant in a low-temperature low-pressure evaporated gas state is suctioned into the compressor 101 through the flow switching device 102.

[0038] As described above, the fan 18 of any of Embodiments 1 to 3 is used as the outdoor fan 104 to configure the outdoor unit 100, which makes it possible to realize the outdoor unit 100 with high efficiency.

[0039] Note that the indoor unit 200 may be the indoor unit 200 of the refrigeration cycle device 1000, for example, the indoor unit 200 of an air-conditioning device. Alternatively, the indoor unit 200 may be an air-sending device not including the heat exchanger 3. As described above, the indoor unit 200 is applicable to various kinds of devices, facilities, etc. each including the fan 18. Moreover, in the above-described embodiments, the case where the fan 18 is a turbo fan is illustrated; however, the fan 18 may be other fans such as a sirocco fan, a propeller fan, and a cross-flow fan.

Reference Signs List

[0040] 1 centrifugal fan 2 fan motor 2a shaft 3 heat exchanger 4 casing side plate 5 casing top plate 6 decorative panel 7 suction panel 8 filter 9 air outlet 10 main plate 11 side plate 12 blade 13 wind direction plate 14 bell mouth 14a bell mouth opening 15 attachment surface 16 drain pan 17 air-conditioning target space to be air-conditioned 18 fan 20 casing 20a opening 21 first air inlet 22 second air inlet 23 air guide wall 23a air guide wall 25 panel 30 sound absorbing part 100 outdoor unit 101 compressor 102 flow switching device 103 outdoor heat exchanger 104 outdoor fan 105 expansion unit 200, 200a, 200b, 200c, 200d, 200e, 200f indoor unit 201 indoor unit 300 gas pipe 400 liquid pipe 1000 refrigeration cycle device

Claims

1. An indoor unit comprising:

a casing attached to an attachment surface and having an opening open to an air-conditioning target space to be air-conditioned;

a panel configured to cover the opening of the casing in which

a first air inlet through which air is sucked in, a second air inlet that is positioned closer to a center of the casing than the first air inlet is to the center and through which air is sucked in, and

an air outlet through which the air sucked in through the first air inlet and the second air inlet is blown out, are formed,

a fan configured to move air to be sucked in through the first air inlet and the second air inlet and blown out through the air outlet; and an air guide wall provided to cover at least part of the second air inlet of the panel and configured to prevent sound within the casing from transmitting to outside of the casing via the second air inlet.

2. The indoor unit of claim 1, wherein the air guide wall is provided at a position different in height from the panel.
3. The indoor unit of claim 1 or 2, wherein the air guide wall has a width greater than or equal to a width of the second air inlet in a side cross-sectional view.
4. The indoor unit of any one of claims 1 to 3, wherein the air guide wall is positioned closer to the fan than the panel is to the fan.
5. The indoor unit of any one of claims 1 to 3, wherein the air guide wall is positioned closer to the air-conditioning target space to be air-conditioned than the panel is to the air-conditioning target space to be air-conditioned.
6. The indoor unit of any one of claims 1 to 5, wherein the air guide wall and the panel are integrated.
7. The indoor unit of any one of claims 1 to 6, wherein the air guide wall has a convex shape protruding toward the air-conditioning target space to be air-conditioned.
8. The indoor unit of any one of claims 1 to 7, further comprising a sound absorbing part provided on a surface of the panel facing toward the fan and on a surface of the air guide wall facing toward the fan and configured to absorb the sound.
9. The indoor unit of any one of claims 1 to 8, wherein the panel is inclined toward the fan as approaching from the first air inlet toward the second air inlet.
10. The indoor unit of any one of claims 1 to 9, further

comprising a bell mouth provided between the fan and the panel and having a cylindrical shape gradually reduced in diameter from an upstream to a downstream of air sent to the fan, wherein the second air inlet is provided on outside in a radial direction of a bell mouth opening in a downstream of the bell mouth. 5

11. A refrigeration cycle device comprising the indoor unit of any one of claims 1 to 10. 10

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FIG. 1

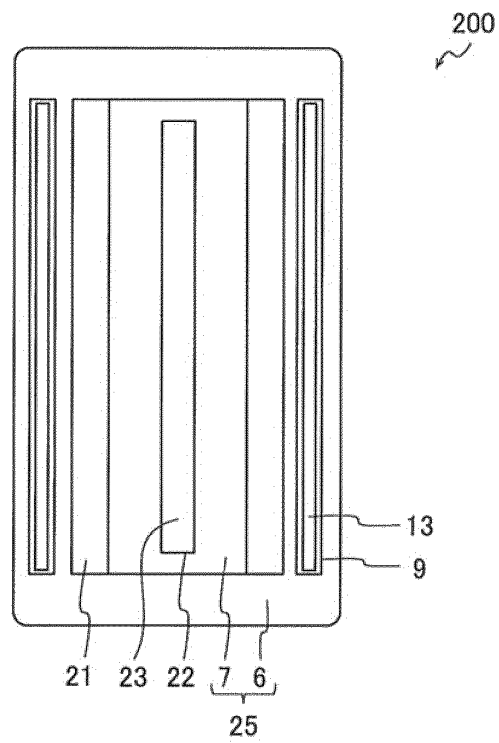


FIG. 2

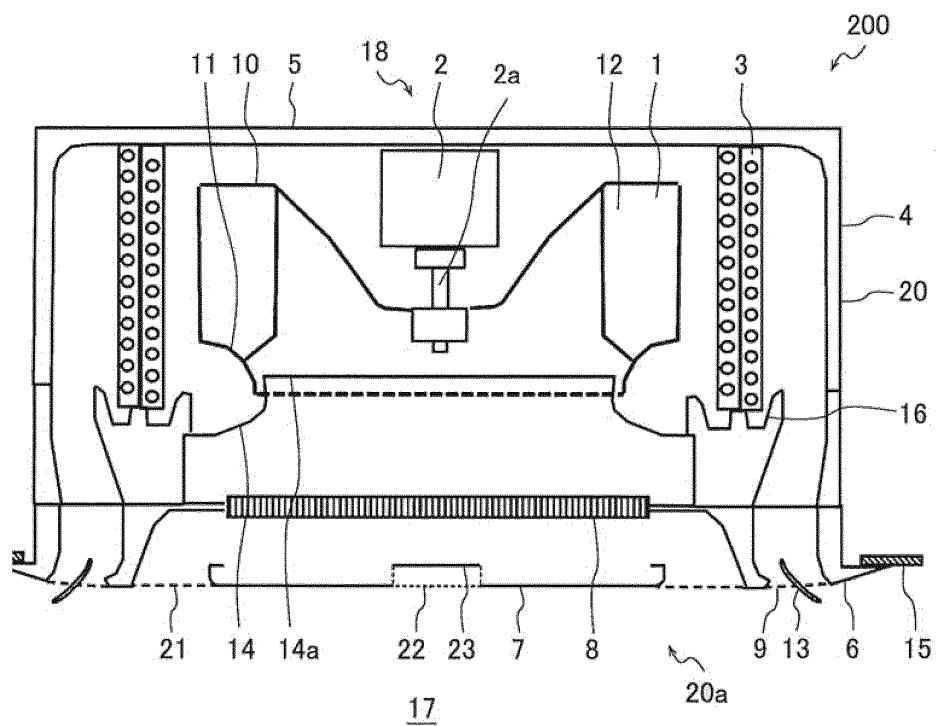


FIG. 3

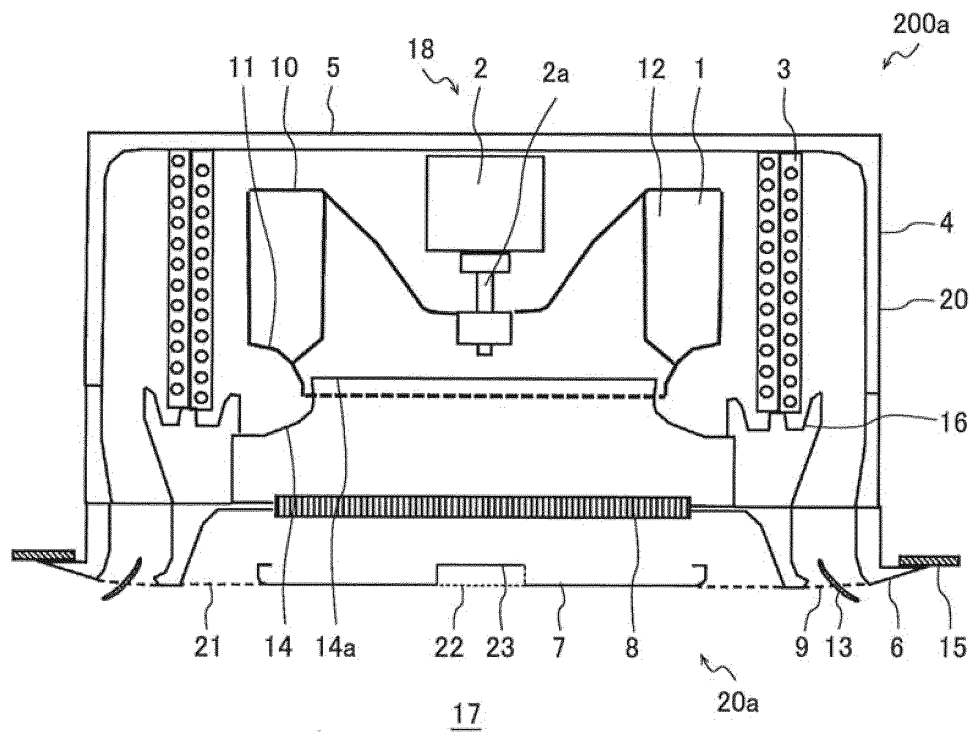


FIG. 4

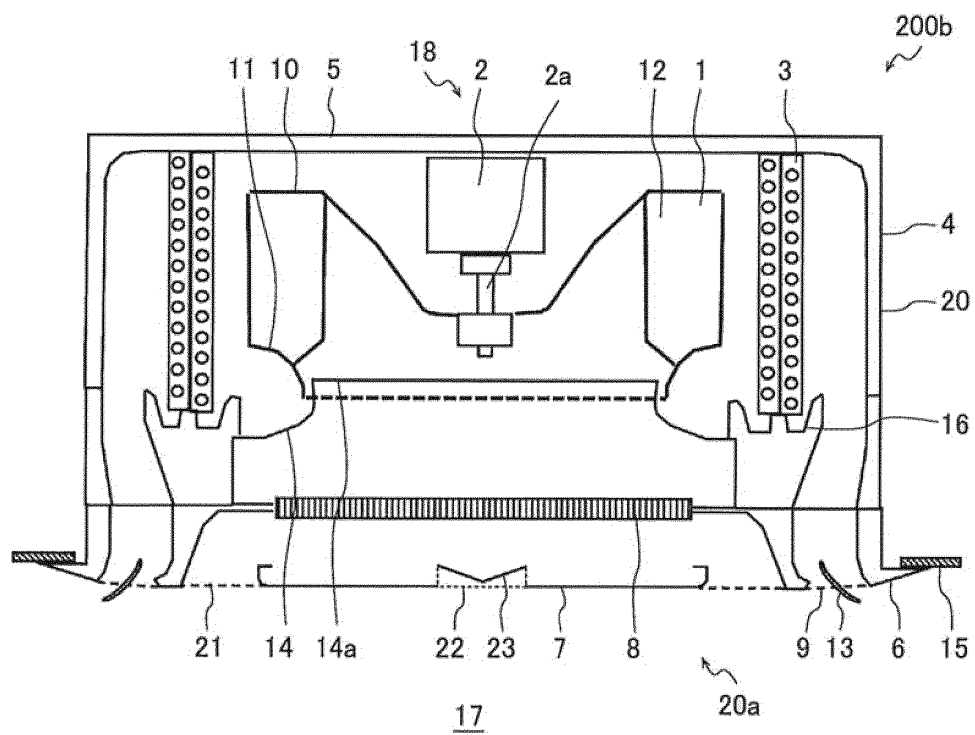


FIG. 5

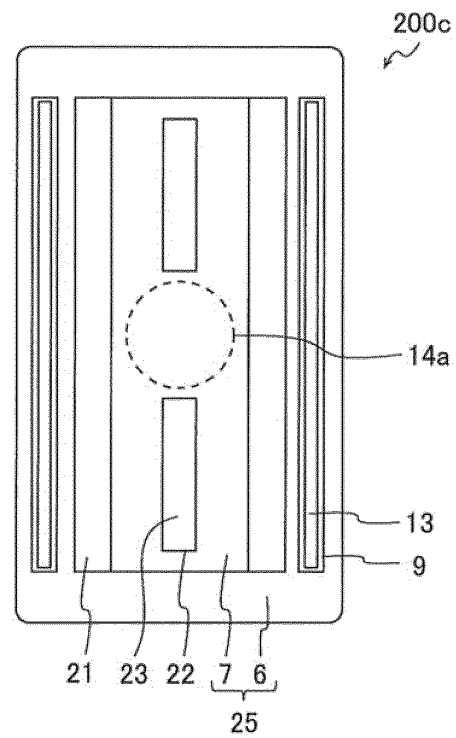


FIG. 6

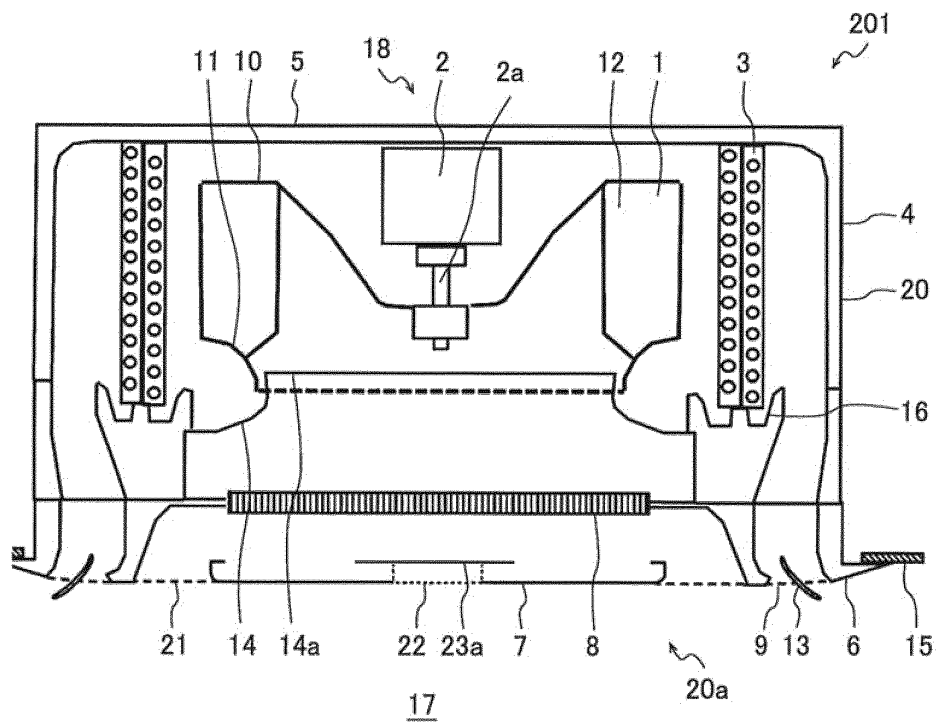


FIG. 7

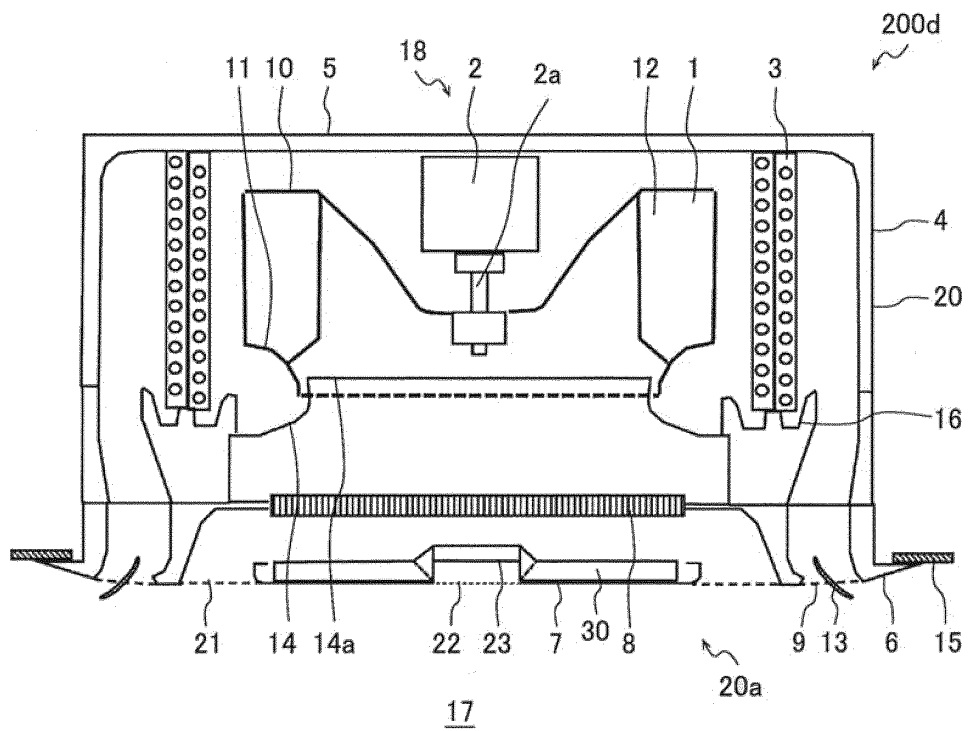


FIG. 8

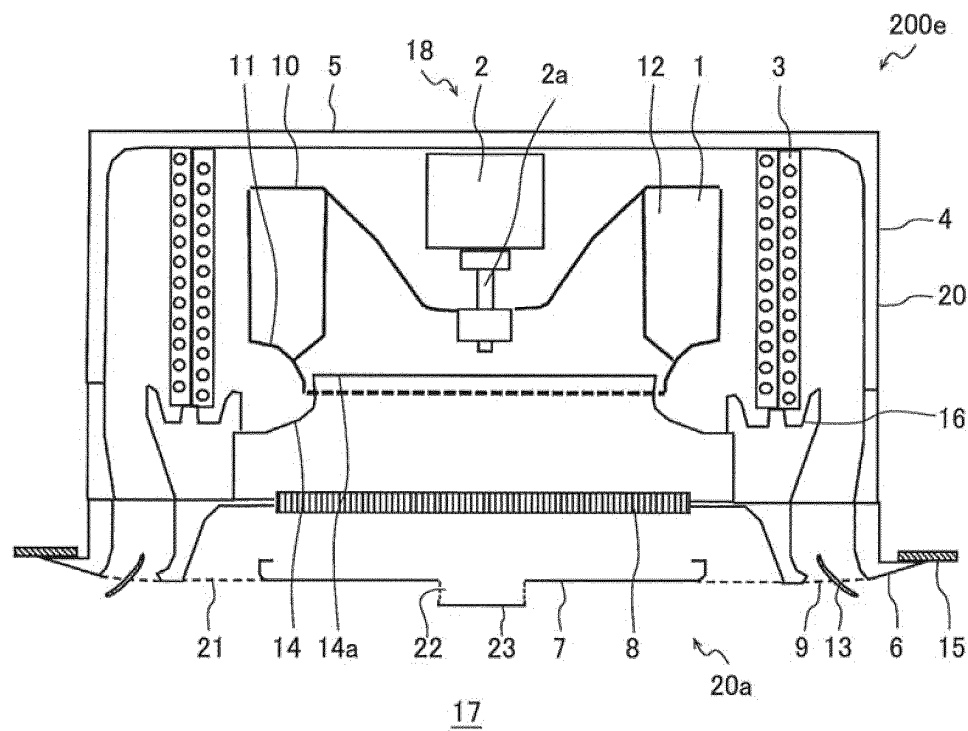


FIG. 9

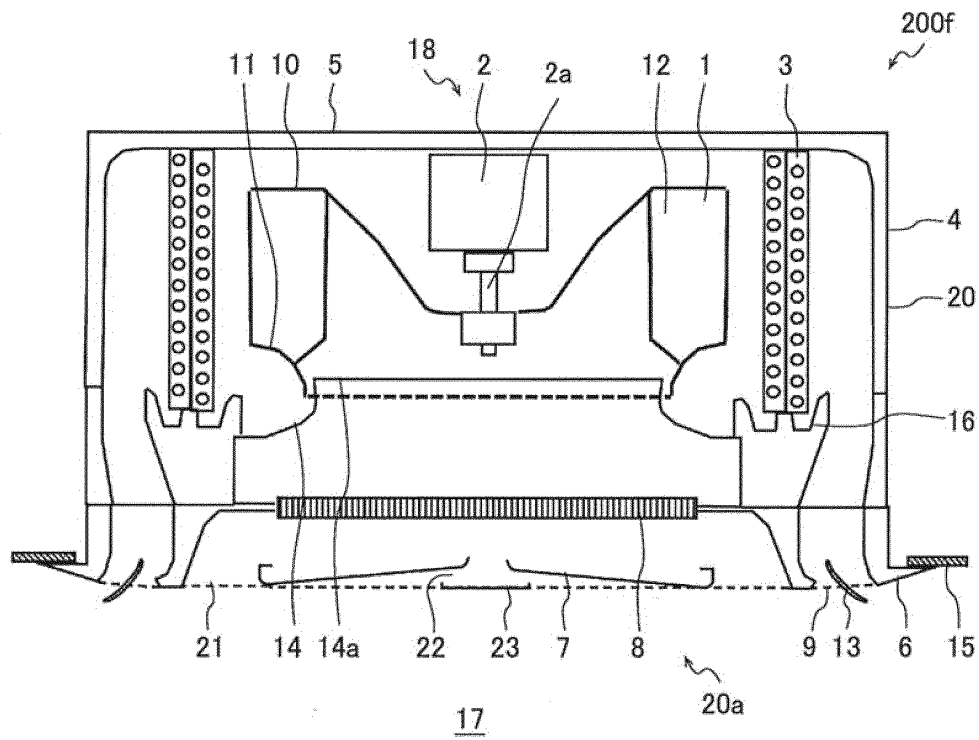
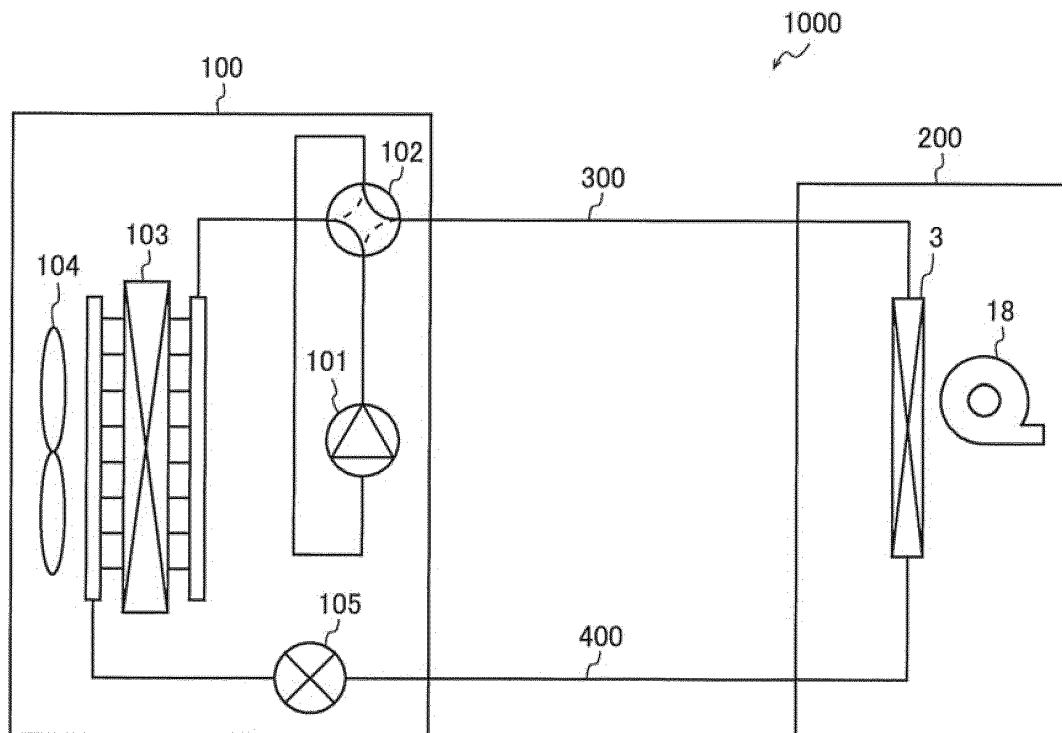


FIG. 10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/028096

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. F24F13/20 (2006.01) i, F24F13/24 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. F24F13/20, F24F13/24

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 1971-2018

Registered utility model specifications of Japan 1996-2018

Published registered utility model applications of Japan 1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2006-329518 A (HITACHI, LTD.) 07 December 2006, paragraphs [0001]-[0017], fig. 1-6	1-3, 5, 7-8, 11
A	(Family: none)	4, 6, 9-10
Y	JP 2008-241143 A (DAIKIN INDUSTRIES, LTD.) 09 October 2008, paragraphs [0005]-[0053], fig. 1-6	1-3, 5, 7-8, 11
A	(Family: none)	4, 6, 9-10
Y	US 2010/0175411 A1 (LG ELECTRONICS INC.) 15 July 2010, paragraphs [0002]-[0056], fig. 1-8	1-3, 5, 7-8, 11
A	& WO 2010/079899 A2 & EP 2226576 A2 & KR 10-2010-0082620 A & ES 2602132 T	4, 6, 9-10

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

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Date of the actual completion of the international search
12.09.2018Date of mailing of the international search report
25.09.2018Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2018/028096

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2013-108716 A (DAIKIN INDUSTRIES, LTD.) 06 June 2013, paragraphs [0001]-[0083], fig. 1-5 (Family: none)	1-11
A	JP 2012-163255 A (MITSUBISHI ELECTRIC CORPORATION) 30 August 2012, paragraphs [0012]-[0036], fig. 1-5 (Family: none)	1-11
A	JP 2006-284090 A (DAIKIN INDUSTRIES, LTD.) 19 October 2006, paragraphs [0001]-[0036], fig. 1-6 (Family: none)	1-11
A	JP 8-226668 A (MITSUBISHI ELECTRIC CORPORATION) 03 September 1996, paragraphs [0002]-[0060], fig. 1-10 (Family: none)	1-11

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2013108716 A [0004]