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(54) **INDOOR UNIT AND AIR CONDITIONING DEVICE COMPRISING THE SAME**

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(57) **ABSTRACT**

To provide an indoor unit that can suppress an increase in pressure loss, and that can reduce ventilation resistance in an air passage. The heat exchanger of the indoor unit includes a first portion and a second portion. In a cross section parallel to an axis of rotation of a centrifugal fan at a point where a distance between an outer edge of the centrifugal fan and an inner edge of the heat exchanger is smallest, an inner edge of the first portion and an inner edge of the second portion are arranged parallel to the axis of rotation, and the inner edge of the first portion is arranged radially outward of the inner edge of the second portion. In the cross section, a horizontal distance L1 is smaller than a horizontal distance L2, and a horizontal distance L3 is greater than a horizontal distance L4.

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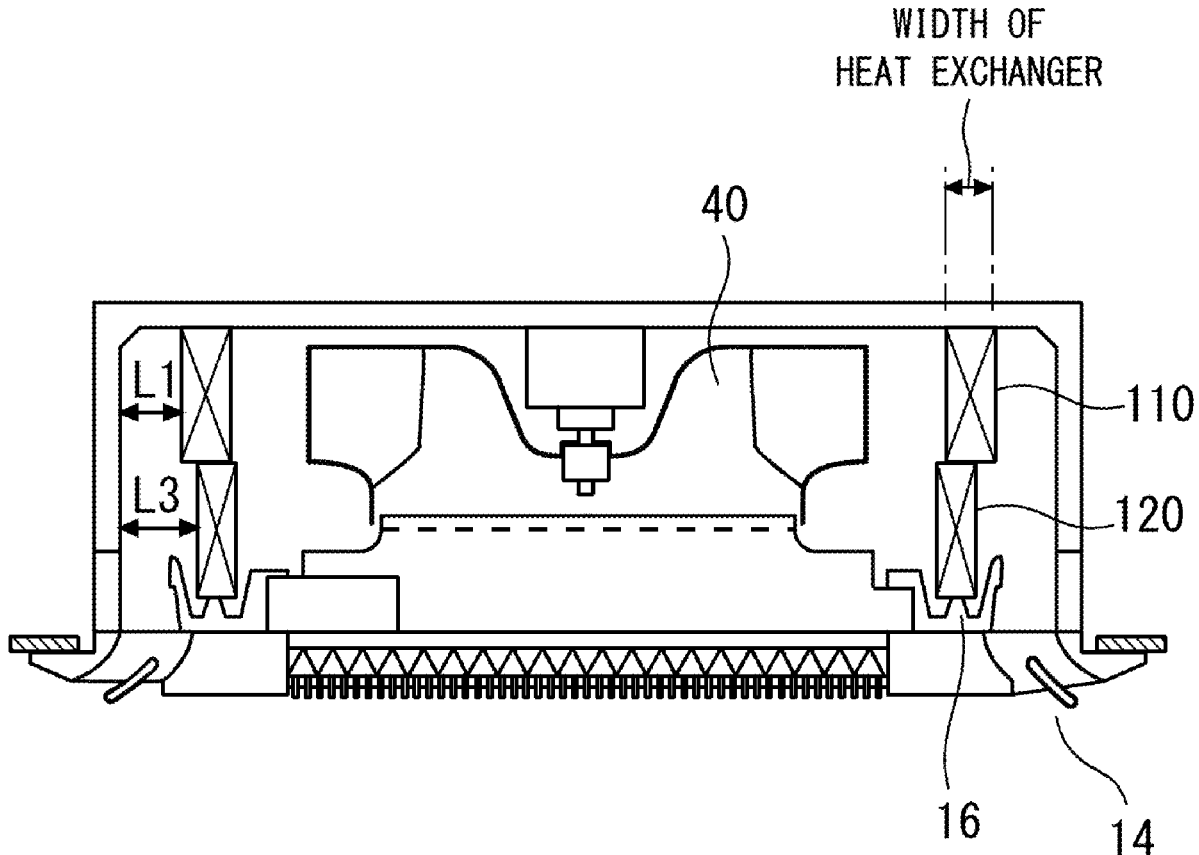


FIG. 1

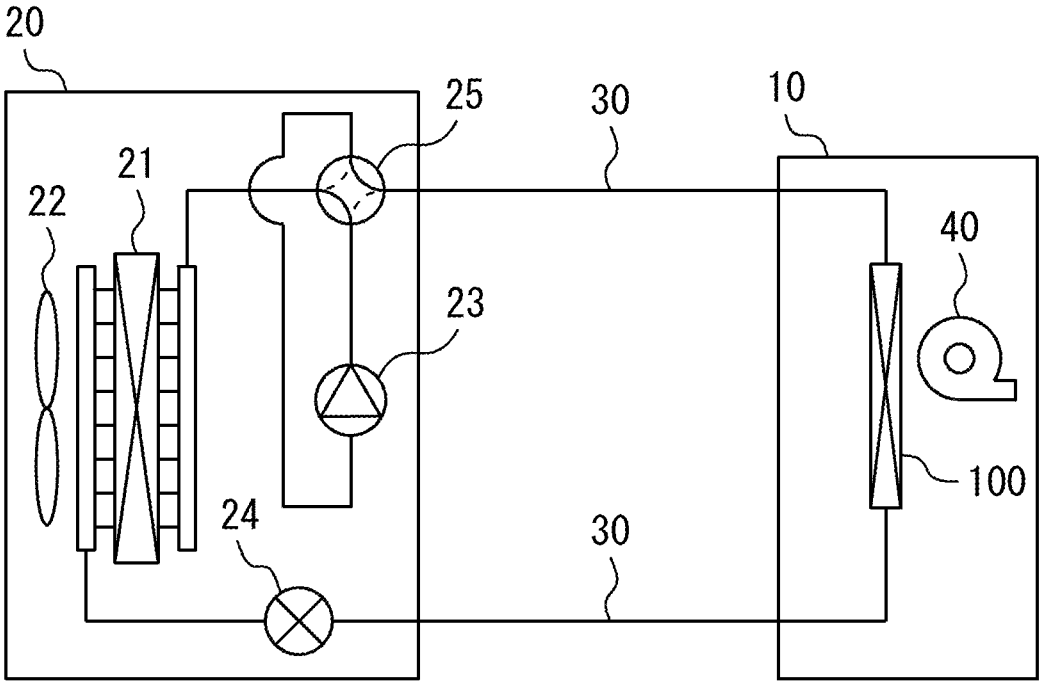


FIG. 2

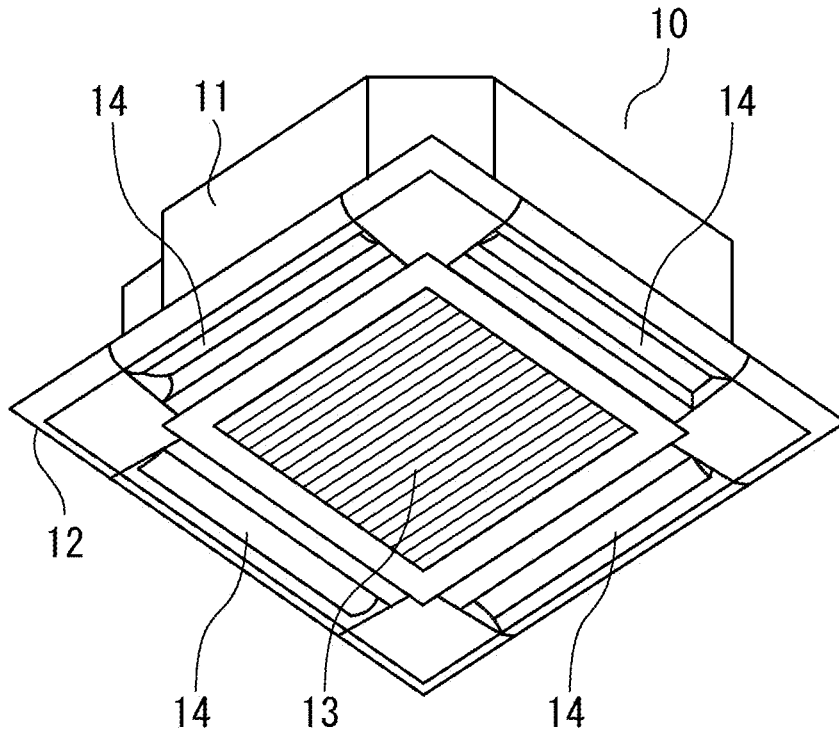


FIG. 3

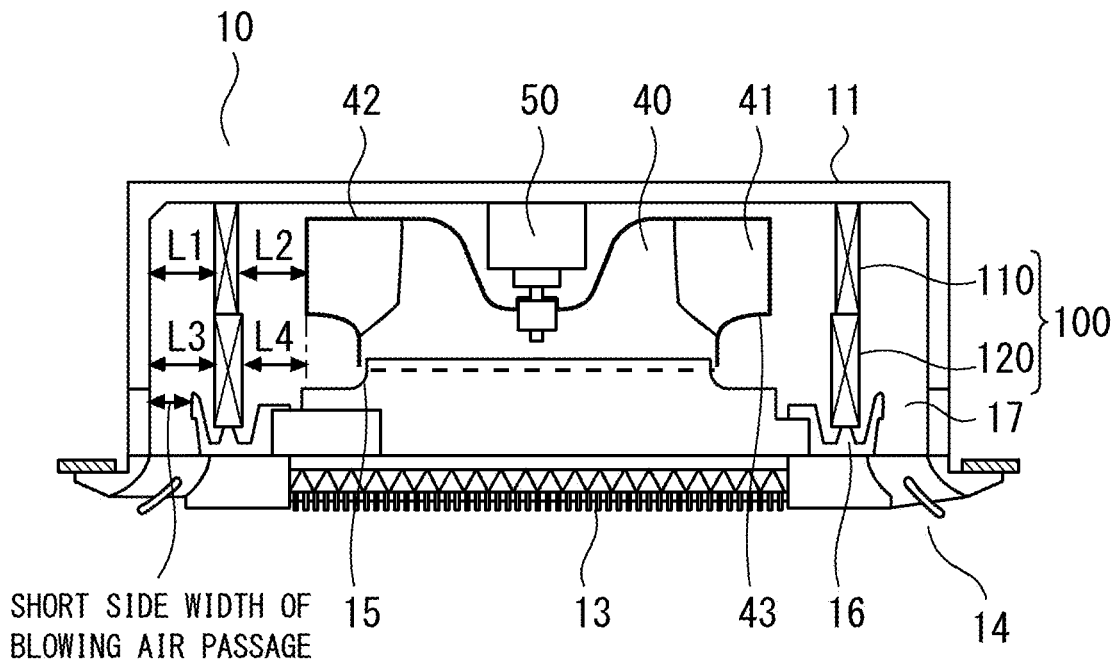


FIG. 4

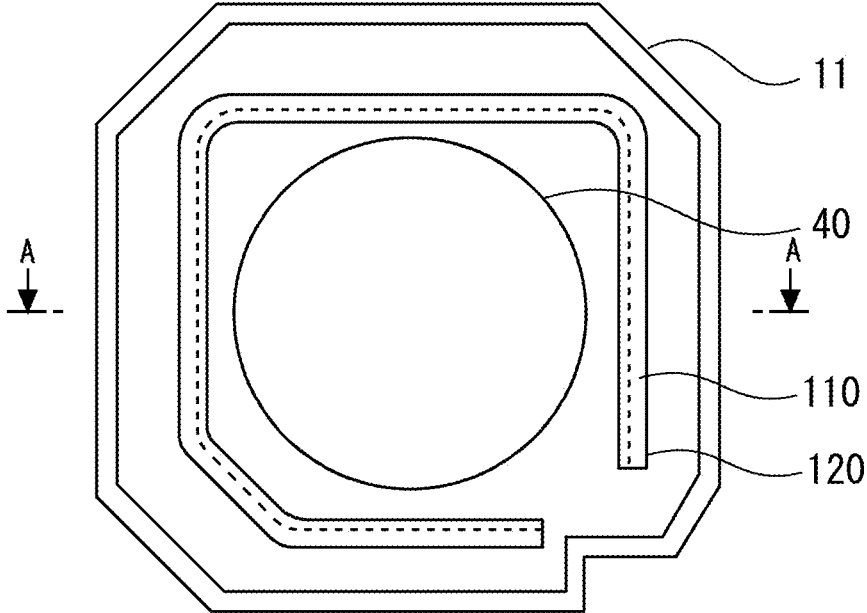


FIG. 5

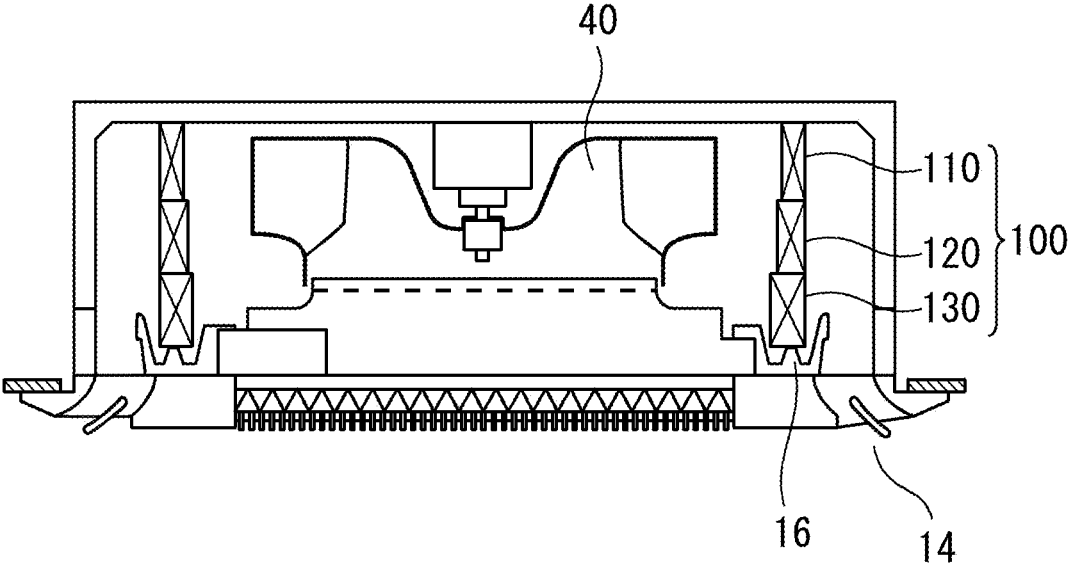


FIG. 6

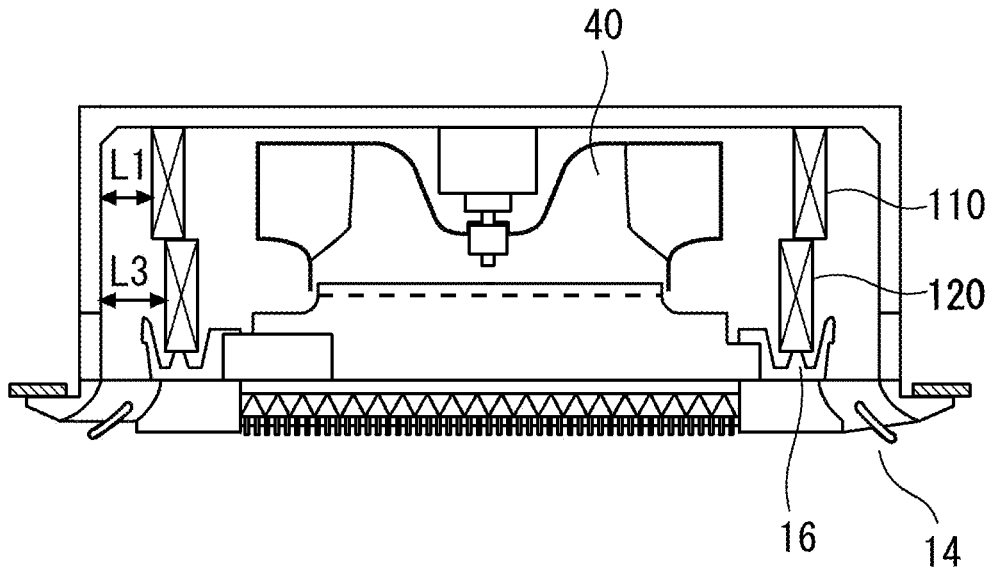


FIG. 7

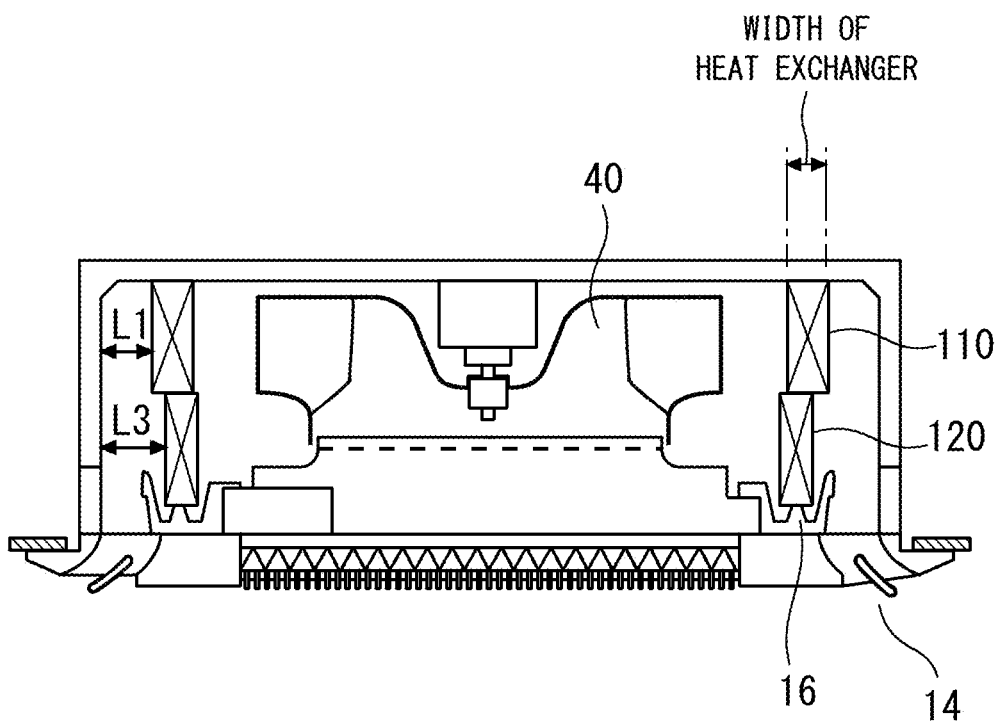


FIG. 8

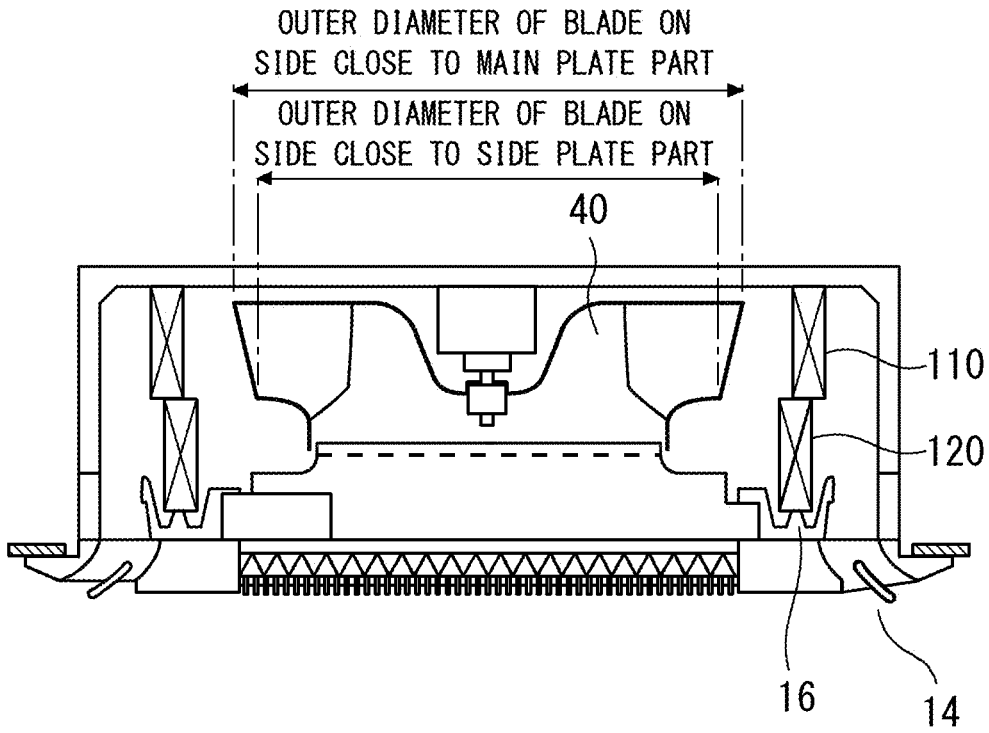


FIG. 9

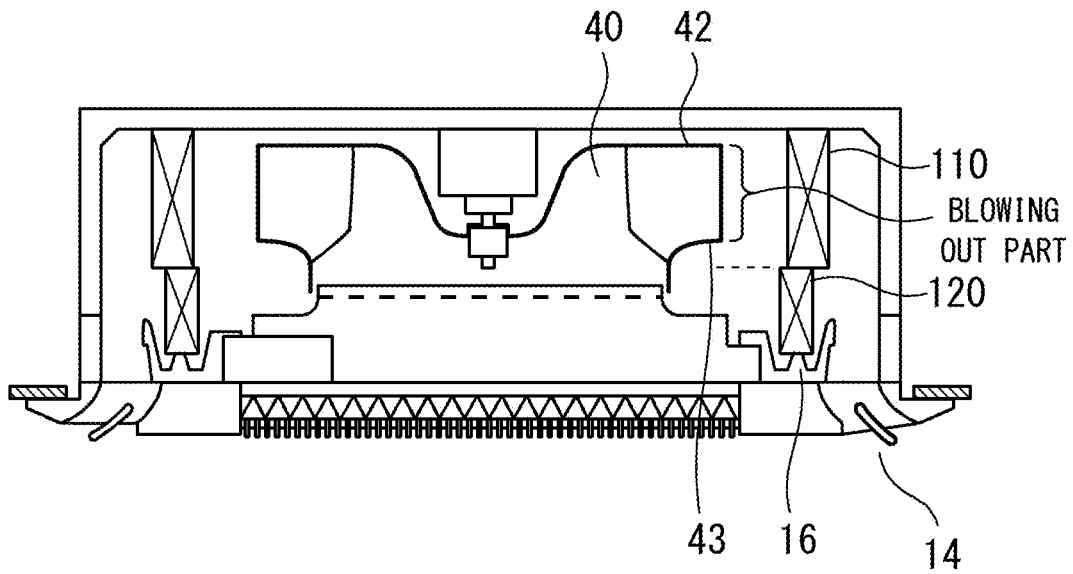


FIG. 10

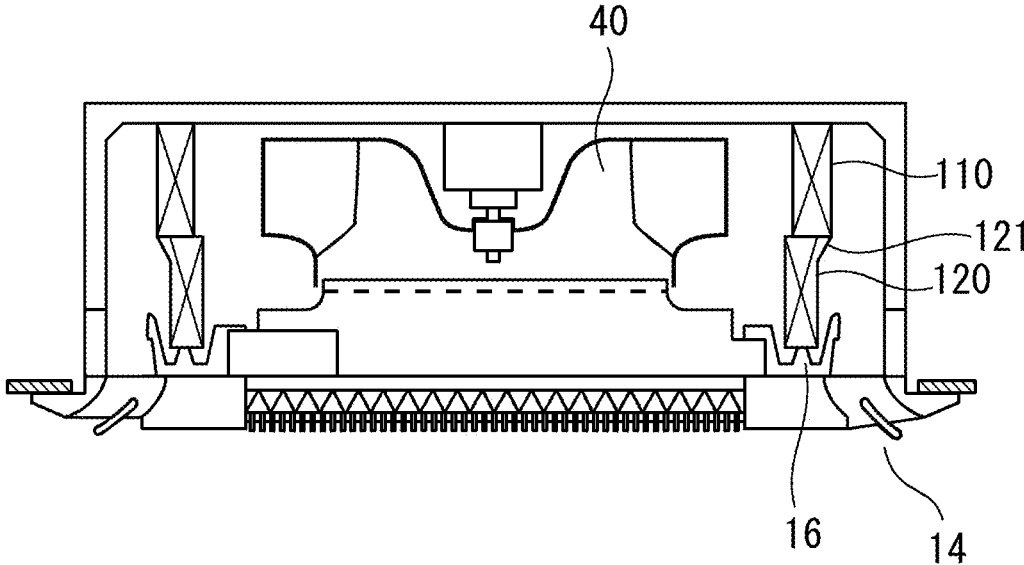
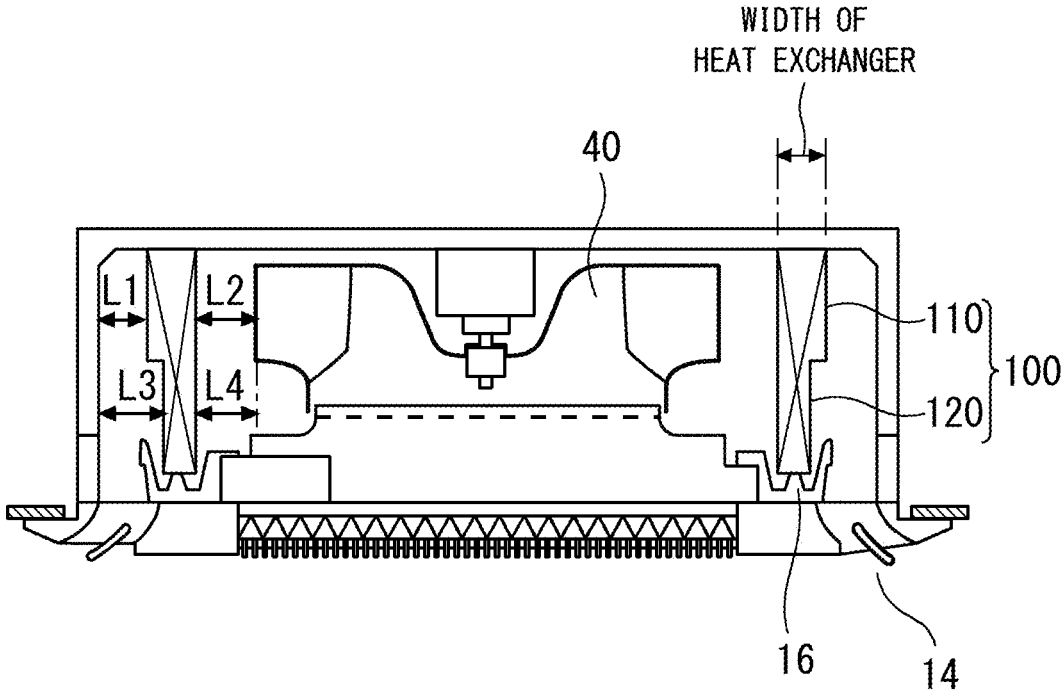


FIG. 11



INDOOR UNIT AND AIR CONDITIONING DEVICE COMPRISING THE SAME

TECHNICAL FIELD

[0001] The present disclosure relates to an indoor unit and an air conditioning device including the same.

BACKGROUND ART

[0002] There is a known indoor unit of an air conditioning device, the indoor unit being configured such that a heat exchanger is arranged outward of a centrifugal blower in the radial direction, the centrifugal blower and the heat exchanger are housed in a casing having a square shape in cross section perpendicular to the axis of the centrifugal blower, air suctioned into the indoor unit along the direction of the axis of the blower is discharged in the radial direction to cause the air to pass through the heat exchanger, and after passing through the heat exchanger, the air is changed in direction to the direction of the axis to cause the air to be discharged from unit outlet ports in the direction opposite to the suction direction, the unit outlet ports being formed in the casing. The end portion of the heat exchanger on the side close to the unit outlet ports in the direction of the axis of the centrifugal blower has, in cross section taken along a plane perpendicular to the axis of the centrifugal blower, a shape close to a square shape compared with a portion of the heat exchanger at a position facing the outlet port of the centrifugal blower (see PTL 1, for example).

CITATION LIST

Patent Literature

[0003] [PTL 1] JP 2001-124359 A

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0004] In the indoor unit of the air conditioning device in which the heat exchanger is arranged radially outward of the centrifugal fan in the casing, when the short side width of a blowing air passage is increased to reduce ventilation resistance in the blowing air passage extending from the heat exchanger to the outlet ports, the heat exchanger is to be arranged at a position closer to the centrifugal fan, which is arranged radially inward of the heat exchanger. When the heat exchanger is arranged at a position more inward in the radial direction, the length of the heat exchanger in the circumferential direction is reduced, thus reducing the ventilation area of the heat exchanger. Therefore, ventilation resistance of the heat exchanger increases and hence, it is impossible to obtain a sufficient advantageous effect that is expected due to a reduction in ventilation resistance in the blowing air passage. In the indoor unit of the air conditioning device disclosed in PTL 1, the heat exchanger has, in cross section taken along a plane perpendicular to the axis of the centrifugal blower, a shape close to a circular shape at a position facing the outlet port of the centrifugal blower and hence, the length of the heat exchanger in the circumferential direction is also reduced, thus reducing the ventilation area of the heat exchanger. Accordingly, ventilation resistance of the heat exchanger increases and hence, it is

impossible to obtain a sufficient advantageous effect that is expected due to a reduction in ventilation resistance in the blowing air passage.

[0005] The present disclosure has been made to solve such problems. An object of the present disclosure is to provide an indoor unit that is capable of suppressing an increase in pressure loss that occurs when air flow passes through a heat exchanger, and that is capable of reducing ventilation resistance in an air passage that extends to an outlet port after passing through the heat exchanger, and to provide an air conditioning device including the indoor unit.

Solution to Problem

[0006] An indoor unit according to the present disclosure includes: a casing; a panel provided on a side of the casing facing a space to be air conditioned, the panel having an inlet port and an outlet port; a centrifugal fan installed in the casing; a heat exchanger provided radially outward of the centrifugal fan in the casing; and a drain pan provided below the heat exchanger in the casing, a blowing air passage leading to the outlet port being formed between an outer periphery of the drain pan and a wall of the casing, the heat exchanger including a first portion and a second portion located below the first portion, in a cross section parallel to an axis of rotation of the centrifugal fan at a point where a distance between an outer edge of the centrifugal fan and an inner edge of the heat exchanger is smallest, an inner edge of the first portion of the heat exchanger and an inner edge of the second portion of the heat exchanger being arranged parallel to the axis of rotation of the centrifugal fan, and the inner edge of the first portion of the heat exchanger being arranged radially outward of the inner edge of the second portion of the heat exchanger, a distance L1 from an outer edge of the first portion of the heat exchanger to the wall of the casing in a direction perpendicular to the axis of rotation in the cross section being smaller than a distance L2 from the outer edge of the centrifugal fan to the inner edge of the first portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section, a distance L3 from an outer edge of the second portion of the heat exchanger to the wall of the casing in the direction perpendicular to the axis of rotation in the cross section is greater than a distance L4 from the outer edge of the centrifugal fan to the inner edge of the second portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section.

[0007] Alternatively, an indoor unit according to the present disclosure includes: a casing; a panel provided on a side of the casing facing a space to be air conditioned, the panel having an inlet port and an outlet port; a centrifugal fan installed in the casing; a heat exchanger provided radially outward of the centrifugal fan in the casing; and a drain pan provided below the heat exchanger in the casing, a blowing air passage leading to the outlet port being formed between an outer periphery of the drain pan and a wall of the casing, the heat exchanger including a first portion and a second portion located below the first portion, in a cross section parallel to an axis of rotation of the centrifugal fan at a point where a distance between an outer edge of the centrifugal fan and an inner edge of the heat exchanger is smallest, an inner edge of the first portion of the heat exchanger and an inner edge of the second portion of the heat exchanger being arranged parallel to the axis of rotation of the centrifugal fan, a distance L1 from an outer edge of the first portion of the

heat exchanger to the wall of the casing in a direction perpendicular to the axis of rotation in the cross section being smaller than a distance L3 from an outer edge of the second portion of the heat exchanger to the wall of the casing in the direction perpendicular to the axis of rotation in the cross section.

[0008] An air conditioning device according to the present disclosure includes the indoor unit according to the above.

Advantageous Effects of the Invention

[0009] According to the indoor unit and the air conditioning device including the indoor unit according to the present disclosure, it is possible to obtain advantageous effects of suppressing an increase in pressure loss that occurs when air flow passes through the heat exchanger, and of reducing ventilation resistance in the air passage that extends to the outlet port after passing through the heat exchanger.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a diagram showing the configuration of an air conditioning device according to Embodiment 1.

[0011] FIG. 2 is a perspective view of an indoor unit of the air conditioning device according to Embodiment 1.

[0012] FIG. 3 is a longitudinal cross-sectional view of the indoor unit of the air conditioning device according to Embodiment 1.

[0013] FIG. 4 is a transverse cross-sectional view of the indoor unit of the air conditioning device according to Embodiment 1.

[0014] FIG. 5 is a longitudinal cross-sectional view of a first modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0015] FIG. 6 is a longitudinal cross-sectional view of a second modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0016] FIG. 7 is a longitudinal cross-sectional view of a third modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0017] FIG. 8 is a longitudinal cross-sectional view of a fourth modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0018] FIG. 9 is a longitudinal cross-sectional view of a fifth modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0019] FIG. 10 is a longitudinal cross-sectional view of a sixth modification of the indoor unit of the air conditioning device according to Embodiment 1.

[0020] FIG. 11 is a longitudinal cross-sectional view of a seventh modification of the indoor unit of the air conditioning device according to Embodiment 1.

DESCRIPTION OF EMBODIMENTS

[0021] Embodiments of an indoor unit and an air conditioning device that includes the indoor unit according to the present disclosure will be described with reference to the attached drawings. In each of the drawings, identical or corresponding parts are given the same signs, and the repeated description will be simplified or omitted when appropriate. In the description made hereinafter, for the sake of convenience, the positional relationship of each of structures may be expressed with reference to the states shown in the drawings. The present disclosure is not limited to the following embodiments, and each embodiment may be

freely combined, any components of each embodiment may be modified, or any components of each embodiment may be omitted without departing from the gist of the present disclosure.

Embodiment 1

[0022] Embodiment 1 of the present disclosure will be described with reference to FIG. 1 to FIG. 11. FIG. 1 is a diagram showing the configuration of an air conditioning device. FIG. 2 is a perspective view of an indoor unit of the air conditioning device.

[0023] FIG. 3 is a longitudinal cross-sectional view of the indoor unit of the air conditioning device. FIG. 4 is a transverse cross-sectional view of the indoor unit of the air conditioning device.

[0024] FIG. 5 is a longitudinal cross-sectional view of a first modification of the indoor unit of the air conditioning device.

[0025] FIG. 6 is a longitudinal cross-sectional view of a second modification of the indoor unit of the air conditioning device.

[0026] FIG. 7 is a longitudinal cross-sectional view of a third modification of the indoor unit of the air conditioning device.

[0027] FIG. 8 is a longitudinal cross-sectional view of a fourth modification of the indoor unit of the air conditioning device.

[0028] FIG. 9 is a longitudinal cross-sectional view of a fifth modification of the indoor unit of the air conditioning device.

[0029] FIG. 10 is a longitudinal cross-sectional view of a sixth modification of the indoor unit of the air conditioning device.

[0030] FIG. 11 is a longitudinal cross-sectional view of a seventh modification of the indoor unit of the air conditioning device.

[0031] As shown in FIG. 1, the air conditioning device according to the present embodiment includes an indoor unit 10 and an outdoor unit 20. The indoor unit 10 is installed in the interior of a room that is the target of air conditioning, that is, in a room. The outdoor unit 20 is installed outside the room, that is, outdoors. The indoor unit 10 includes an indoor unit heat exchanger 100 and a centrifugal fan 40. The outdoor unit 20 includes an outdoor unit heat exchanger 21, an outdoor unit fan 22, a compressor 23, an expansion valve 24, and a four-way valve 25.

[0032] The indoor unit 10 and the outdoor unit 20 are connected with each other by refrigerant pipes 30. The refrigerant pipes 30 are provided between the indoor unit heat exchanger 100 of the indoor unit 10 and the outdoor unit heat exchanger 21 of the outdoor unit 20 in a state that allows circulation. Refrigerant is sealed in the refrigerant pipes 30. An example of the refrigerant sealed in the refrigerant pipes 30 includes difluoromethane (CH₂F₂: R32).

[0033] The refrigerant pipes 30 sequentially connect the indoor unit heat exchanger 100, the four-way valve 25, the compressor 23, the outdoor unit heat exchanger 21, and the expansion valve 24. Accordingly, a refrigerant circuit is formed in which refrigerant circulates between the indoor unit heat exchanger 100 and the outdoor unit heat exchanger 21.

[0034] The compressor 23 is equipment that compresses supplied refrigerant to increase the pressure and the tem-

perature of the refrigerant. For the compressor 23, a rotary compressor, a scroll compressor, a reciprocating compressor, or the like may be used, for example. The expansion valve 24 expands refrigerant, condensed by the outdoor unit heat exchanger 21, to reduce the pressure of the refrigerant.

[0035] The indoor unit heat exchanger 100 causes the refrigerant that flows into the indoor unit heat exchanger 100 to exchange heat with air around the indoor unit heat exchanger 100. The centrifugal fan 40 blows air in such a way as to cause indoor air to pass through an area around the indoor unit heat exchanger 100, thus promoting heat exchange between the refrigerant and air by the indoor unit heat exchanger 100, and sending the air heated or cooled by the heat exchange into the room again. The outdoor unit heat exchanger 21 causes the refrigerant that flows into the outdoor unit heat exchanger 21 to exchange heat with air around the outdoor unit heat exchanger 21. The outdoor unit fan 22 blows air in such a way as to cause outdoor air to pass through an area around the outdoor unit heat exchanger 21, thus promoting heat exchange between the refrigerant and air by the outdoor unit heat exchanger 21.

[0036] In the refrigerant circuit having such a configuration, heat exchange between refrigerant and air is performed in each of the indoor unit heat exchanger 100 and the outdoor unit heat exchanger 21 and hence, the refrigerant circuit serves as a heat pump that transfers heat between the indoor unit 10 and the outdoor unit 20. When the four-way valve 25 is switched, a circulating direction of the refrigerant in the refrigerant circuit is reversed, so that a cooling operation and a heating operation of the air conditioner can be switched.

[0037] As shown in FIG. 2 to FIG. 4, the indoor unit 10 of a configuration example which will be described here is a ceiling embedded type (ceiling cassette type). That is, the indoor unit 10 is embedded in the ceiling of the room. The indoor unit 10 includes a casing 11 and a panel 12. The casing 11 has a box shape having an open lower side. The panel 12 is mounted on the lower side of the casing 11. The casing 11 is embedded in the ceiling of the room. The panel 12 is exposed to the interior of a room 1 from the ceiling. The lower side of the casing 11 is the side facing the space that is the target of the air conditioning (hereinafter also referred to as "space to be air conditioned"). Accordingly, the panel 12 is provided on the side of the casing 11 facing the space to be air conditioned.

[0038] The panel 12 has an inlet port 13 and outlet ports 14. The inlet port 13 is an opening through which air is taken into the inside of the casing 11 from the outside. The outlet ports 14 are openings through which air is discharged to the outside from the inside of the casing 11. The panel 12 has a quadrangular shape. The inlet port 13 is located at the center portion of the panel 12. The outlet ports 14 are located along the respective sides of the panel 12 having a quadrangular shape. In the configuration example shown in the drawing, the panel 12 has four outlet ports 14.

[0039] The indoor unit heat exchanger 100 and the centrifugal fan 40 are housed in the casing 11. The centrifugal fan 40 is provided in the casing 11 with the suction side thereof facing downward. Rotation of the centrifugal fan 40 is driven by a fan motor 50. The fan motor 50 is mounted on the ceiling side of a body 3. A bell mouth 15 is provided at a position below the centrifugal fan 40 and above the inlet port 13. The bell mouth 15 is provided to introduce air into the centrifugal fan 40.

[0040] The centrifugal fan 40 includes a main plate part 42, a side plate part 43, and a plurality of blades 41. The main plate part 42 is a disk-like member having a bulged center portion. The shaft of the fan motor 50 is fixed to the center portion of the main plate part 42. The plurality of blades 41 are radially arranged in the circumferential direction of the main plate part 42 at the peripheral edge portion of the main plate part 42.

[0041] Each blade 41 has one end thereof connected to the main plate part 42, and the other end thereof connected to the side plate part 43. That is, each of the plurality of blades 41 is arranged between the main plate part 42 and the side plate part 43. The plurality of blades 41 are arranged at certain intervals from each other in the circumferential direction of the main plate part 42.

[0042] The side plate part 43 is an annular member. The side plate part 43 is fixed to the end portions of the plurality of blades 41 on the side opposite to the main plate part 42 and on the outer peripheral side. The side plate part 43 couples the plurality of blades 41 to each other, thus maintaining the positional relationship between the distal ends of the respective blades 41 and reinforcing the plurality of blades 41.

[0043] The indoor unit heat exchanger 100 is provided radially outward of the centrifugal fan 40 in the casing 11. The indoor unit heat exchanger 100 is arranged in such a way as to annularly surround the centrifugal fan 40. The indoor unit heat exchanger 100 exchanges heat between indoor air suctioned through the inlet port 13 by the centrifugal fan 40 and the refrigerant, thus generating cool air or warm air. A drain pan 16 is provided below the indoor unit heat exchanger 100 in the casing 11. The drain pan 16 is provided to receive condensation water that is generated in the indoor unit heat exchanger 100 due to condensation of moisture in air cooled during a heat exchange process. In the casing 11, a blowing air passage 17 leading to the outlet ports 14 is formed between the outer periphery of the drain pan 16 and the wall of the casing 11.

[0044] In the indoor unit 10 of the air conditioning device having the above-mentioned configuration, when the centrifugal fan is rotated by the fan motor 50, air flow directing toward the outlet ports 14 from the inlet port 13 is produced in an air passage in the casing 11, so that air is suctioned through the inlet port 13, and the air is blown out from the outlet ports 14. The air suctioned through the inlet port 13 passes through the bell mouth 15, and then flows into the suction side of the centrifugal fan 40. After flowing into the centrifugal fan 40, the air is blown out from a gap formed between the main plate part 42 and the side plate part 43 of the centrifugal fan 40 toward a space located radially outward of the centrifugal fan 40. After being blown out from the centrifugal fan 40, the air passes through the indoor unit heat exchanger 100 from the inner peripheral side to the outer peripheral side. The air is heated or cooled when passing through the indoor unit heat exchanger 100. Whether air is heated or cooled depends on whether the air conditioning device is performing a cooling operation or a heating operation. After passing through the indoor unit heat exchanger 100, the air passes through an area between the indoor unit heat exchanger 100 and the wall of the casing 11 and, thereafter, passes through the blowing air passage 17 formed between the drain pan 16 and the wall of the casing 11, and is then blown out from the outlet ports 14.

[0045] In the indoor unit **10** of the air conditioning device according to the present embodiment, the indoor unit heat exchanger **100** includes a first portion **110** and a second portion **120**. The second portion **120** is located below the first portion **110**. The first portion **110** and the second portion **120** of the indoor unit heat exchanger **100** may be formed as an integral body or may be separate from each other. In the example shown in the drawing, the first portion **110** and the second portion **120** of the indoor unit heat exchanger **100** are separate from each other.

[0046] A cross-sectional view in FIG. 3 shows, of cross sections including the axis of rotation of the centrifugal fan **40**, a cross section at a point where the distance between the outer edge of the centrifugal fan **40** and the inner edge of the indoor unit heat exchanger **100** is smallest. The cross section includes the axis of rotation of the centrifugal fan **40**, thus being a cross section parallel to the axis of rotation of the centrifugal fan **40**. An example of such a cross section is a cross section A shown in FIG. 4. In the description made hereinafter, a cross section parallel to the axis of rotation of the centrifugal fan **40** at a point where the distance between the outer edge of the centrifugal fan **40** and the inner edge of the indoor unit heat exchanger **100** is smallest is taken as the cross section A, and the cross section is simply referred to as “cross section A”.

[0047] As shown in FIG. 3, in the cross section A, the inner edge of the first portion **110** of the indoor unit heat exchanger **100** and the inner edge of the second portion **120** of the indoor unit heat exchanger **100** are arranged parallel to the axis of rotation of the centrifugal fan **40**. Further, in the cross section A, the inner edge of the first portion **110** of the indoor unit heat exchanger **100** is arranged radially outward of the inner edge of the second portion **120** of the indoor unit heat exchanger **100**.

[0048] In the indoor unit **10** having the above-mentioned configuration, distances L1, L2, L3 and L4 are defined as follows. Usually, the indoor unit **10** is installed with the axis of rotation of the centrifugal fan **40** extending vertically. In this case, a distance in the direction perpendicular to the axis of rotation of the centrifugal fan **40** may also be referred to as a horizontal distance.

[0049] Distance L1: distance from outer edge of first portion **110** of indoor unit heat exchanger **100** to wall of casing **11** in direction perpendicular to axis of rotation of centrifugal fan **40** in cross section A

[0050] Distance L2: distance from outer edge of centrifugal fan **40** to inner edge of first portion **110** of indoor unit heat exchanger **100** in direction perpendicular to axis of rotation of centrifugal fan **40** in cross section A

[0051] Distance L3: distance from outer edge of second portion **120** of indoor unit heat exchanger **100** to wall of casing **11** in direction perpendicular to axis of rotation of centrifugal fan **40** in cross section A

[0052] Distance L4: distance from outer edge of centrifugal fan **40** to inner edge of second portion **120** of indoor unit heat exchanger **100** in direction perpendicular to axis of rotation of centrifugal fan **40** in cross section A

[0053] In the indoor unit **10** according to the present embodiment, the distances L1, L2, L3 and L4 defined above satisfy the relationship expressed by the following formula (1) and formula (2).

$$L1 < L2 \quad (1)$$

$$L3 > L4 \quad (2)$$

[0054] That is, the distance L1 from the outer edge of the first portion **110** of the indoor unit heat exchanger **100** to the wall of the casing **11** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A is smaller than the distance L2 from the outer edge of the centrifugal fan **40** to the inner edge of the first portion **110** of the indoor unit heat exchanger **100** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A. The distance L3 from the outer edge of the second portion **120** of the indoor unit heat exchanger **100** to the wall of the casing **11** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A is greater than the distance L4 from the outer edge of the centrifugal fan **40** to the inner edge of the second portion **120** of the indoor unit heat exchanger **100** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A.

[0055] In the configuration example shown in FIG. 3, the distance from the outer edge of the centrifugal fan **40** to the outer edge of the first portion **110** of the indoor unit heat exchanger **100** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A is equal to the distance from the outer edge of the centrifugal fan **40** to the outer edge of the second portion **120** of the indoor unit heat exchanger **100** in the direction perpendicular to the axis of rotation of the centrifugal fan **40** in the cross section A. The width of the second portion **120** of the indoor unit heat exchanger **100** from the inner edge to the outer edge in the cross section A is greater than the width of the first portion **110** of the indoor unit heat exchanger **100** from the inner edge to the outer edge in the cross section A.

[0056] In the indoor unit **10** having the above-mentioned configuration, the indoor unit heat exchanger **100** is arranged such that mainly the first portion **110** faces the gap formed between the main plate part **42** and the side plate part **43** of the centrifugal fan **40**. A larger amount of air flow that is blown out from the gap formed between the main plate part **42** and the side plate part **43** of the centrifugal fan **40** passes through the first portion **110** of the indoor unit heat exchanger **100** than through the second portion **120** of the indoor unit heat exchanger **100**. Therefore, ventilation resistance of the indoor unit heat exchanger **100** is significantly affected by the size of the ventilation area of the first portion **110**.

[0057] In the indoor unit **10** according to the present embodiment, regarding the first portion **110** of the indoor unit heat exchanger **100**, increasing the distance L2 to the centrifugal fan **40** can increase the ventilation area of the indoor unit heat exchanger **100**, thus can reduce ventilation resistance in the first portion **110** of the indoor unit heat exchanger **100**. In contrast, regarding the second portion **120** of the indoor unit heat exchanger **100**, increasing the distance L3 to the wall of the casing **11** increases the cross-sectional area of the air passage that extends to the blowing air passage **17** and the outlet ports after passing through the first portion **110** and the second portion **120** of the indoor unit heat exchanger **100**, thus can reduce ventilation resistance in this air passage. Accordingly, it is possible to suppress an increase in pressure loss that occurs when air

flow passes through the indoor unit heat exchanger 100, and it is also possible to reduce ventilation resistance in the air passage that extends to the outlet port 14 after passing through the indoor unit heat exchanger 100. By reducing ventilation resistance from the indoor unit heat exchanger 100 to the outlet ports 14, it is possible to achieve a reduction in power consumption and noise of the fan motor 50.

[0058] Next, modifications of the indoor unit 10 according to the present embodiment will be described. FIG. 5 is a cross-sectional view showing the first modification of the indoor unit 10 in the cross section A. The indoor unit heat exchanger 100 may be separated into three or more portions. In the first modification, the indoor unit heat exchanger 100 further includes a third portion 130 in addition to the first portion 110 and the second portion 120. The third portion 130 is arranged further below the second portion 120.

[0059] In the cross section A, the inner edge of the third portion 130 of the indoor unit heat exchanger 100 is also arranged parallel to the axis of rotation of the centrifugal fan 40 in the same manner as the first portion 110 and the second portion 120. Further, in the cross section A, the inner edge of the third portion 130 of the indoor unit heat exchanger 100 is arranged radially inward of the inner edge of the second portion 120 of the indoor unit heat exchanger 100. In the configuration example shown in the drawing, the distance from the outer edge of the centrifugal fan 40 to the outer edge of the third portion 130 of the indoor unit heat exchanger 100 in the direction perpendicular to the axis of rotation of the centrifugal fan 40 in the cross section A is equal to the distance from the outer edge of the centrifugal fan 40 to the outer edge of the first portion 110 and the outer edge of the second portion 120 of the indoor unit heat exchanger 100 in the direction perpendicular to the axis of rotation of the centrifugal fan 40 in the cross section A. The width of the third portion 130 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A is greater than the width of the second portion 120 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A.

[0060] FIG. 6 is a cross-sectional view showing the second modification of the indoor unit 10 in the cross section A. In the second modification, the above-described distance L1 is set to be smaller than the above-described distance L3. After passing through the indoor unit heat exchanger 100, the air flow is changed in direction to the downward direction. A larger amount of air flow that passes through the indoor unit heat exchanger 100 collects at a lower portion, thus increasing air speed at the lower portion. Accordingly, in the air passage of the air flow after passing through the indoor unit heat exchanger 100, air speed is lower at the upper portion than at the lower portion and hence, even when the distance L1 from the outer edge of the first portion 110 of the indoor unit heat exchanger 100 to the wall of the casing 11 is reduced, it is possible to suppress an influence of such a reduction on an increase in ventilation resistance to a low level. Accordingly, it is possible to suppress an increase in pressure loss that occurs when air flow passes through the indoor unit heat exchanger 100, and it is also possible to reduce ventilation resistance in the air passage that extends to the outlet port 14 after passing through the indoor unit heat exchanger 100.

[0061] FIG. 7 is a cross-sectional view showing the third modification of the indoor unit 10 in the cross section A. The third modification is obtained by changing the above-de-

scribed second modification such that the width of the first portion 110 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A is set to be greater than the width of the second portion 120 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A. As described above, air flow from the centrifugal fan 40 is mainly blown out from the gap formed between the main plate part 42 and the side plate part 43 and hence, speed of air flow that flows into the first portion 110, which is located at the upper portion of the indoor unit heat exchanger 100, is higher than speed of air flow that flows into the second portion 120, which is located at the lower portion of the indoor unit heat exchanger 100. By increasing the ventilation distance by increasing the width of the first portion 110, the speed of the air flow that passes through the first portion 110 of the indoor unit heat exchanger 100 can be reduced and hence, it is possible to cause air flow to have uniform air speed after passing through the indoor unit heat exchanger 100.

[0062] FIG. 8 is a cross-sectional view showing the fourth modification of the indoor unit 10 in the cross section A. In the fourth modification, the outer diameter of the blade 41 on the side close to the main plate part 42 is greater than the outer diameter of the blade 41 on the side close to the side plate part 43. Particularly in the example shown in the drawing, the outer diameter of the blade 41 gradually increases as the blade 41 extends toward the main plate part 42 from the side plate part 43. By increasing the distance L2 from the first portion 110 of the indoor unit heat exchanger 100 to the centrifugal fan 40, it is possible to increase the outer diameter of the blade 41 on the side close to the main plate part 42. By increasing the outer diameter of the blade 41 on the side close to the main plate part 42, it is possible to increase the air volume of the centrifugal fan 40. Further, it is possible to reduce the rotational speed of the centrifugal fan 40 that is required to obtain the same air volume and hence, a reduction in noise can be achieved.

[0063] FIG. 9 is a cross-sectional view showing the fifth modification of the indoor unit 10 in the cross section A. In the fifth modification, the upper end of the second portion 120 of the indoor unit heat exchanger 100 is located lower than the side plate part 43 of the centrifugal fan 40. Therefore, regarding air flow from the centrifugal fan 40, it is possible to reduce the amount of inflow of the air flow into the second portion 120, which is located at the lower portion of the indoor unit heat exchanger 100, and it is possible to increase the amount of inflow of the air flow into the first portion 110, which is located at the upper portion of the indoor unit heat exchanger 100. By increasing the distance L2 from the first portion 110 of the indoor unit heat exchanger 100 to the centrifugal fan 40, it is possible to increase the distance that air flow from the centrifugal fan 40 flows before flowing into the indoor unit heat exchanger 100.

[0064] Here, when air flow from the centrifugal fan 40 is viewed from the direction of the axis of rotation of the centrifugal fan 40, the air flow includes a turning component that turns in the rotational direction of the centrifugal fan 40. Therefore, when the air flow from the centrifugal fan 40 flows into the indoor unit heat exchanger 100, the direction of the air flow is changed. By increasing the distance that the air flow from the centrifugal fan 40 flows before flowing into the indoor unit heat exchanger 100, it is possible to alleviate such a sudden change in direction of the air flow when the

air flow flows into the indoor unit heat exchanger 100 and hence, it is possible to achieve a further reduction in ventilation resistance of the indoor unit heat exchanger 100.

[0065] FIG. 10 is a cross-sectional view showing the sixth modification of the indoor unit 10 in the cross section A. In the sixth modification, the indoor unit 10 further includes a water guide part 121. The water guide part 121 is provided to the outer peripheral side of the second portion 120 of the indoor unit heat exchanger 100. The water guide part 121 is provided to guide condensation water to the second portion 120 of the indoor unit heat exchanger 100 from the first portion 110 of the indoor unit heat exchanger 100. In the configuration example shown in the drawing, the water guide part 121 is formed by extending fins radially outward, the fins being included in the second portion 120 of the indoor unit heat exchanger 100. The outer edge of the water guide part 121 is inclined in such a way as to move inward as the water guide part 121 extends toward the lower side from the upper side.

[0066] When the first portion 110 of the indoor unit heat exchanger 100 protrudes outward from the second portion 120, condensation water that gathers at the lower end portion of the outer edge of the first portion 110 tends to be blown off into the air passage. With the provision of the water guide part 121, condensation water that is generated in the first portion 110 of the indoor unit heat exchanger 100 can be guided to the second portion 120 through the water guide part 121. Further, the condensation water that is guided to the second portion 120 can be collected into the drain pan. Therefore, it is possible to suppress a situation in which condensation water generated in the first portion 110 is blown off into the air passage from the first portion 110, and is then released to the outside of the casing 11 through the outlet port 14.

[0067] FIG. 11 is a cross-sectional view showing the seventh modification of the indoor unit 10 in the cross section A. Also in the seventh modification, the indoor unit heat exchanger 100 includes the first portion 110 and the second portion 120 in the same manner as the configuration examples described above. In the configuration example shown in the drawing, the first portion 110 and the second portion 120 are formed as an integral body. In the cross section A, the inner edge of the first portion 110 of the indoor unit heat exchanger 100 and the inner edge of the second portion 120 of the indoor unit heat exchanger 100 are arranged parallel to the axis of rotation of the centrifugal fan 40.

[0068] In the indoor unit 10 according to the seventh modification, the above-described distance L1 is smaller than the above-described distance L3. That is, the distance L1 from the outer edge of the first portion 110 of the indoor unit heat exchanger 100 to the wall of the casing 11 in the direction perpendicular to the axis of rotation of the centrifugal fan 40 in the cross section A is smaller than the distance L3 from the outer edge of the second portion 120 of the indoor unit heat exchanger 100 to the wall of the casing 11 in the direction perpendicular to the axis of rotation of the centrifugal fan 40 in the cross section A.

[0069] In the configuration example shown in FIG. 11, the above-described distance L2 is equal to the above-described distance L4. The width of the first portion 110 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A is greater than the width of the

second portion 120 of the indoor unit heat exchanger 100 from the inner edge to the outer edge in the cross section A. [0070] In the indoor unit 10 according to the seventh modification having the above-mentioned configuration, after passing through the indoor unit heat exchanger 100, air flow is changed in direction to the downward direction. A larger amount of air flow that passes through the indoor unit heat exchanger 100 collects at the lower portion, thus increasing air speed at the lower portion. Accordingly, in the air passage of the air flow after passing through the indoor unit heat exchanger 100, air speed is lower at the upper portion than at the lower portion and hence, even when the distance L1 from the outer edge of the first portion 110 of the indoor unit heat exchanger 100 to the wall of the casing 11 is reduced, it is possible to suppress an influence of such a reduction on an increase in ventilation resistance to a low level. Accordingly, it is possible to suppress an increase in pressure loss that occurs when air flow passes through the indoor unit heat exchanger 100, and it is also possible to reduce ventilation resistance in the air passage that extends to the outlet port 14 after passing through the indoor unit heat exchanger 100.

[0071] By setting the width of the first portion 110 of the indoor unit heat exchanger 100 to be greater than the width of the second portion 120, the speed of the air flow that passes through the first portion 110 of the indoor unit heat exchanger 100 can be reduced and hence, it is possible to further reduce air speed at the upper portion compared with the lower portion in the air passage of the air flow after passing through the indoor unit heat exchanger 100. Therefore, even when the distance L1 from the outer edge of the first portion 110 of the indoor unit heat exchanger 100 to the wall of the casing 11 is reduced, it is possible to further suppress an influence of such a reduction on an increase in ventilation resistance to a low level.

[0072] Accordingly, when the first portion 110 of the indoor unit heat exchanger 100 is caused to approach the wall of the casing 11 by increasing the distance from the centrifugal fan 40 to change ventilation resistance, the beneficial effect caused by increasing the ventilation area of the indoor unit heat exchanger 100 outweighs the effect of an increase in ventilation resistance after passing through the indoor unit heat exchanger 100. Overall, it is possible to suppress an increase in pressure loss that occurs when air flow passes through the indoor unit heat exchanger 100, and it is also possible to reduce ventilation resistance in the air passage that extends to the outlet port 14 after passing through the indoor unit heat exchanger 100. By reducing ventilation resistance from the indoor unit heat exchanger 100 to the outlet ports 14, it is possible to achieve a reduction in power consumption and noise of the fan motor 50.

INDUSTRIAL APPLICABILITY

[0073] The present disclosure is applicable to an indoor unit including, in a casing, a centrifugal fan and a heat exchanger provided radially outward of the centrifugal fan, and to an air conditioning device that includes the indoor unit.

REFERENCE SIGNS LIST

- [0074] 10 Indoor unit
- [0075] 11 Casing
- [0076] 12 Panel

- [0077] 13 Inlet port
- [0078] 14 Outlet port
- [0079] 15 Bell mouth
- [0080] 16 Drain pan
- [0081] 17 Blowing air passage
- [0082] 20 Outdoor unit
- [0083] 21 Outdoor unit heat exchanger
- [0084] 22 Outdoor unit fan
- [0085] 23 Compressor
- [0086] 24 Expansion valve
- [0087] 25 Four-way valve
- [0088] 30 Refrigerant pipe
- [0089] 40 Centrifugal fan
- [0090] 41 Blade
- [0091] 42 Main plate part
- [0092] 43 Side plate part
- [0093] 50 Fan motor
- [0094] 100 Indoor unit heat exchanger
- [0095] 110 First portion
- [0096] 120 Second portion
- [0097] 121 Water guide part
- [0098] 130 Third portion

1. An indoor unit comprising:
 a casing;
 a panel provided on a side of the casing facing a space to be air conditioned, the panel having an inlet port and an outlet port;
 a centrifugal fan installed in the casing;
 a heat exchanger provided radially outward of the centrifugal fan in the casing; and
 a drain pan provided below the heat exchanger in the casing,
 a blowing air passage leading to the outlet port being formed between an outer periphery of the drain pan and a wall of the casing,
 the heat exchanger including a first portion and a second portion located below the first portion,
 in a cross section parallel to an axis of rotation of the centrifugal fan at a point where a distance between an outer edge of the centrifugal fan and an inner edge of the heat exchanger is smallest, an inner edge of the first portion of the heat exchanger and an inner edge of the second portion of the heat exchanger being arranged parallel to the axis of rotation of the centrifugal fan, and the inner edge of the first portion of the heat exchanger being arranged radially outward of the inner edge of the second portion of the heat exchanger,
 a distance L1 from an outer edge of the first portion of the heat exchanger to the wall of the casing in a direction perpendicular to the axis of rotation in the cross section being smaller than a distance L2 from the outer edge of the centrifugal fan to the inner edge of the first portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section,
 a distance L3 from an outer edge of the second portion of the heat exchanger to the wall of the casing in the direction perpendicular to the axis of rotation in the cross section being greater than a distance L4 from the outer edge of the centrifugal fan to the inner edge of the second portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section, the distance L1 being equal to the distance L3, the distance L2 being greater than the distance L4.

2. (canceled)
 3. (canceled)
 4. (canceled)
 5. The indoor unit according to claim 1, wherein the centrifugal fan comprises:
 a main plate part;
 a side plate part arranged below the main plate part; and
 a plurality of blades radially arranged between the main plate part and the side plate part,
 wherein an outer diameter of each of the blades on a side close to the main plate part is greater than an outer diameter of each of the blades on a side close to the side plate part.
 6. The indoor unit according to claim 1, wherein the centrifugal fan comprises:
 a main plate part;
 a side plate part arranged below the main plate part; and
 a plurality of blades radially arranged between the main plate part and the side plate part,
 wherein an upper end of the second portion of the heat exchanger is located lower than the side plate part.
 7. An indoor unit comprising:
 a casing;
 a panel provided on a side of the casing facing a space to be air conditioned, the panel having an inlet port and an outlet port;
 a centrifugal fan installed in the casing;
 a heat exchanger provided radially outward of the centrifugal fan in the casing; and
 a drain pan provided below the heat exchanger in the casing,
 a blowing air passage leading to the outlet port being formed between an outer periphery of the drain pan and a wall of the casing,
 the heat exchanger including a first portion and a second portion located below the first portion,
 in a cross section parallel to an axis of rotation of the centrifugal fan at a point where a distance between an outer edge of the centrifugal fan and an inner edge of the heat exchanger is smallest, an inner edge of the first portion of the heat exchanger and an inner edge of the second portion of the heat exchanger being arranged parallel to the axis of rotation of the centrifugal fan,
 a distance L1 from an outer edge of the first portion of the heat exchanger to the wall of the casing in a direction perpendicular to the axis of rotation in the cross section being smaller than a distance L3 from an outer edge of the second portion of the heat exchanger to the wall of the casing in the direction perpendicular to the axis of rotation in the cross section,
 a distance L2 from the outer edge of the centrifugal fan to the inner edge of the first portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section being equal to a distance L4 from the outer edge of the centrifugal fan to the inner edge of the second portion of the heat exchanger in the direction perpendicular to the axis of rotation in the cross section.
 8. An air conditioning device comprising the indoor unit according to claim 1.

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