

DESCRIPTION

TITLE OF INVENTION: INDOOR UNIT OF AIR CONDITIONER

TECHNICAL FIELD

[0001]

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

BACKGROUND ART

[0002]

An indoor unit of a conventional air conditioner includes a turbo fan that sucks indoor air from below and discharges it in a lateral direction, and a heat exchanger provided along a front surface, a corner, and both side surfaces of a casing (see Patent Literature 1). Patent Literature 1 describes an aspect in which an indoor unit of an air conditioner is installed in a corner formed by a ceiling and a side wall of a room.

CITATION LIST

PATENT LITERATURE

[0003]

Patent Literature 1: JP 3141867 B2

SUMMARY OF THE INVENTION

TECHNICAL PROBLEMS

[0004]

In the indoor unit of the conventional air conditioner, it may be difficult to pull a refrigerant pipe out of the casing depending on the connection position between the heat exchanger and the refrigerant pipe. As a result, there is a risk that when the indoor unit is installed in a corner formed by the ceiling and the side wall of a room, the workability of the installation work may be deteriorated. However, Patent Literature 1

does not describe the workability of the work of installing an indoor unit in a corner formed by the ceiling and the side wall of a room.

[0005]

The present disclosure proposes an indoor unit of an air conditioner that is capable of improving the workability of installation work.

SOLUTIONS TO PROBLEMS

[0006]

An indoor unit of an air conditioner according to the present disclosure includes:

- at least one fan;

- a heat exchanger surrounding the at least one fan from four directions of front, rear, left, and right; and

- a casing that houses the fan and the heat exchanger, in which:

 - the casing includes

 - a suction port,

 - at least one blow-out port,

 - an installation part that is provided in a side surface of the casing to install the casing on a wall surface, and

 - a housing part that is disposed closer to the installation part than the heat exchanger is and houses at least a pipe to be connected to the heat exchanger; and

 - the fan, the heat exchanger, the installation part, and the housing part are disposed side by side in an order of the fan, the heat exchanger, the housing part, and the installation part in a side view.

[0007]

According to the present disclosure, the housing part for housing the pipe is disposed closer to the installation part side than the heat exchanger is, so that when the indoor unit of an air conditioner is installed on a wall surface, the pipe can be easily pulled out of the casing, which facilitates piping construction. As a result, the workability of work of installing the indoor unit of an air conditioner on a wall surface can be improved.

[0008]

The indoor unit of an air conditioner according to an embodiment includes a heat insulator disposed between the heat exchanger and the housing part.

[0009]

According to the above embodiment, a heat insulator is disposed between the heat exchanger and the housing part, so that heat exchange between the heat exchanger and the housing part is suppressed, and dew condensation on the housing part is suppressed. As a result, dripping of dew condensation water outside the unit can be suppressed.

[0010]

In the indoor unit of an air conditioner according to an embodiment, the at least one fan comprises a plurality of fans, the plurality of the fans are disposed side by side, and the housing part extends in a direction in which the plurality of the fans are disposed side by side.

[0011]

In the indoor unit of an air conditioner according to an embodiment, the casing includes an installation-part-side corner, and

the corner includes at least one connection port through which the pipe is to be inserted.

[0012]

In the indoor unit of an air conditioner according to an embodiment, the at least one blow-out port includes a first blow-out port provided in an installation-part-side part of a bottom surface of the casing.

[0013]

In the indoor unit of an air conditioner according to an embodiment, the first blow-out port is provided on an opposite side to the installation part with respect to the housing part in a bottom view.

[0014]

According to the above embodiment, the first blow-out port is disposed with the housing part interposed between the first blow-out port and the installation part in the bottom view, so that the first blow-out port is provided away from a wall surface. As a result, the wall surface can be suppressed from being stained by dirt and the like, which air blown out of the first blow-out port catches, when the air blown out hits the wall surface.

[0015]

The indoor unit of an air conditioner according to an embodiment includes a suction port provided in the bottom surface of the casing and on an opposite side to the installation part with respect to the first blow-out port, in which

the first blow-out port blows out obliquely downward toward the wall surface.

[0016]

According to the above embodiment, the first blow-out port blows obliquely downward toward the wall surface, so that the air blown out of the first blow-out port

flows obliquely downward toward an opposite side to the suction port. As a result, a short circuit, in which the air blown out of the first blow-out port is sucked into the suction port, can be suppressed.

[0017]

In the indoor unit of an air conditioner according to an embodiment, the casing includes a ventilation path that guides air from the fan to the first blow-out port, and the ventilation path has a portion formed to be away from the installation part.

[0018]

In the above embodiment, the ventilation path that guides air from the fan to the first blow-out port has a portion formed to be away from the installation part, so that the first blow-out port is provided away from a wall surface. As a result, the wall surface can be suppressed from being stained with dirt and the like, which air blown out of the first blow-out port catches, adhering to the wall surface when the air blown out hits the wall surface.

[0019]

In the indoor unit of an air conditioner according to an embodiment, the housing part is disposed closer to the installation part side than the ventilation path is.

[0020]

In the indoor unit of an air conditioner according to an embodiment, the at least one blow-out port includes at least one second blow-out port provided in the side surface of the casing.

[0021]

According to the above embodiment, each of the first blow-out port provided in the bottom surface of the casing and the second blow-out port provided in the side

surface of the casing blows out air, so that air conditioned by the heat exchanger easily travels throughout a room, which can improve user comfort.

[0022]

In the indoor unit of an air conditioner according to an embodiment, the fan is provided such that a rotation shaft of the fan extends in a vertical direction.

BRIEF DESCRIPTION OF DRAWINGS

[0023]

FIG. 1 is a perspective view, viewed from diagonally right below, of an indoor unit of an air conditioner according to a first embodiment of the present disclosure.

FIG. 2 is a perspective view, viewed from diagonally left behind and below, of the indoor unit of an air conditioner according to the first embodiment.

FIG. 3 is a bottom view of the indoor unit of an air conditioner according to the first embodiment, from which a bottom grille is removed.

FIG. 4 is a bottom view of the indoor unit of an air conditioner according to the first embodiment, from which a bell mouth, a drain pan, a drain hose, and the like are removed.

FIG. 5 is a cross-sectional view taken along line V-V of FIG. 3.

FIG. 6 is a schematic view for explaining a blowing direction of an air conditioner according to the first embodiment.

FIG. 7 is a cross-sectional view, similar to FIG. 5, of an indoor unit of an air conditioner according to a modification of the first embodiment.

FIG. 8 is a cross-sectional view, similar to FIG. 5, of an indoor unit of an air conditioner according to a second embodiment of the present disclosure.

FIG. 9 is a cross-sectional view, similar to FIG. 5, of an indoor unit of an air conditioner according to a third embodiment of the present disclosure.

FIG. 10 is a bottom view, similar to FIG. 4, of an indoor unit of an air conditioner according to a fourth embodiment of the present disclosure.

DESCRIPTION OF EMBODIMENTS

[0024]

With reference to the attached drawings, an indoor unit 1 of an air conditioner according to embodiments of the present disclosure will be described below.

[0025]

[First embodiment]

FIG. 1 is a perspective view, viewed from diagonally right below, of an indoor unit 1 of an air conditioner according to a first embodiment. FIG. 2 is a perspective view, viewed from diagonally left behind and below, of the indoor unit 1 of an air conditioner according to the first embodiment.

[0026]

With reference to FIG. 1, the indoor unit 1 of an air conditioner according to the present embodiment includes a casing 10 having a substantially rectangular parallelepiped shape. The casing 10 includes a bottom grille 10a constituting a bottom surface of the casing 10, a front grille 10b constituting a front surface of the casing 10, a right side grille 10c constituting a right side surface of the casing 10, and a left side grille 10d constituting a left side surface of the casing 10. In the present embodiment, the bottom grille 10a, the front grille 10b, the right side grille 10c, and the left side grille 10d are integrally formed. In addition, the casing 10 includes a back panel 10e constituting a back surface of the casing 10 and a top panel 10f constituting a top surface of the casing 10, as shown in FIG. 2. The back panel 10e and the top panel 10f are integrally formed. Each of the bottom grille 10a, the front grille 10b, the right side grille 10c, the left side grille 10d, the back panel 10e, and the top panel 10f has a

substantially rectangular shape. The side surfaces of the casing 10 according to the present disclosure include the front surface, the left and right side surfaces, and the back surface of the casing 10. In other words, the side surfaces of the casing 10 are constituted by the front grille 10b, the right side grille 10c, the left side grille 10d, and the back panel 10e.

[0027]

With reference to FIGS. 1 and 2, the bottom grille 10a has a suction port 11 for taking indoor air into the casing 10, and a bottom blow-out port 12 for blowing out air from the inside of the casing 10 into a room. In other words, the casing 10 of the present embodiment includes the suction port 11 provided in the bottom surface of the casing 10 and the bottom blow-out port 12 provided in the bottom surface of the casing 10. The bottom blow-out port 12 of the present embodiment is provided in a back-panel 10e-side part of the bottom grille 10a of the casing 10 in a bottom view. Specifically, the bottom blow-out port 12 is provided to extend along the long side of the back-panel 10e-side part of the bottom grille 10a of the casing 10. The bottom blow-out port 12 according to the present embodiment is one example of the first blow-out port according to the present disclosure.

[0028]

The front grille 10b has a front blow-out port 13 for blowing out air from the inside of the casing 10 into the room. The front blow-out port 13 according to the present embodiment is one example of the second blow-out port according to the present disclosure.

[0029]

The right side grille 10c has a right side blow-out port 14 for blowing out air from the inside of the casing 10 into the room. Similarly, the left side grille 10d has a

left side blow-out port 15 for blowing out air from the inside of the casing 10 into the room. The right side blow-out port 14 provided in the right side grille 10c and the left side blow-out port 15 provided in the left side grille 10d have the same configuration. Each of the right side blow-out port 14 provided in the right side grille 10c and the left side blow-out port 15 provided in the left side grille 10d is one example of the second blow-out port according to the present disclosure.

[0030]

The back panel 10e is installed on a wall surface Wa via a mounting plate (not shown) fixed to the wall surface Wa. The back panel 10e of the present embodiment is one example of the installation part according to the present disclosure.

[0031]

The bottom grille 10a includes two bottom connection ports 16A, 16B through which a refrigerant pipe 55 (shown in FIG. 3) and a drain hose 44 (shown in FIG. 3) are to be inserted. The bottom connection ports 16A, 16B are so-called knockout holes having an opening and a lid part covering the opening. The bottom connection ports 16A, 16B are provided at both ends of the back-panel 10e-side part of the bottom grille 10a, respectively. Specifically, the bottom connection port 16A is provided in a right-side-grille 10c-side and back-panel 10e-side part of the bottom grille 10a, or right rear side part of the bottom grille 10a. The bottom connection port 16B is provided in a left-side-grille 10d-side and back-panel 10e-side part of the bottom grille 10a, or left rear side part of the bottom grille 10a. Each of the bottom connection ports 16A, 16B of the present embodiment is one example of the connection port according to the present disclosure.

[0032]

By removing the lid part of the bottom connection port 16A when the indoor unit 1 is installed, the opening of the bottom connection port 16A is exposed, so that the refrigerant pipe 55 (shown in FIG. 3) and the drain hose 44 (shown in FIG. 3) can be inserted and passed through the casing 10 in the vertical direction.

[0033]

By removing the lid part of the bottom connection port 16B when the indoor unit 1 is installed, the opening of the bottom connection port 16B is exposed, so that an external refrigerant pipe (not shown) to be connected to the refrigerant pipe 55 (shown in FIG. 3) can be inserted and passed through the casing 10 in the vertical direction. In addition, by removing the lid part of the bottom connection port 16B when the indoor unit 1 is installed, the opening of the bottom connection port 16B is exposed, so that an external drain hose (not shown) to be connected to the drain hose 44 (shown in FIG. 3) can be inserted and passed through the casing 10 in the vertical direction.

[0034]

The right side grille 10c includes a side connection port 17A through which the refrigerant pipe 55 (shown in FIG. 3) and the drain hose 44 (shown in FIG. 3) are to be inserted. In addition, the left side grille 10d includes a side connection port 17B through which the refrigerant pipe 55 and the drain hose 44 are to be inserted. The side connection ports 17A, 17B are so-called knockout holes having an opening and a lid part covering the opening. The side connection port 17A is provided in a bottom-grille 10a-side and back-panel 10e-side part of the right side grille 10c, or lower rear side part of the right side grille 10c. The side connection port 17B is provided in a bottom-grille 10a-side and back-panel 10e-side part the left side grille 10d, or lower rear side part of the left side grille 10d. Each of the side connection ports 17A, 17B of the

present embodiment is one example of the connection port according to the present disclosure.

[0035]

By removing the lid part of the side connection port 17A when the indoor unit 1 is installed, the opening of the side connection port 17A is exposed, so that the refrigerant pipe 55 (shown in FIG. 3) and the drain hose 44 (shown in FIG. 3) can be inserted and passed through the casing 10 in the left-right direction.

[0036]

By removing the lid part of the side connection port 17B when the indoor unit 1 is installed, the opening of the side connection port 17B is exposed, so that an external refrigerant pipe (not shown) to be connected to the refrigerant pipe 55 (shown in FIG. 3) can be inserted and passed through the casing 10 in the left-right direction. In addition, by removing the lid part of the side connection port 17B when the indoor unit 1 is installed, the opening of the side connection port 17B is exposed, so that an external drain hose (not shown) to be connected to the drain hose 44 (shown in FIG. 3) can be inserted and passed through the casing 10 in the left-right direction.

[0037]

The casing 10 of the present embodiment includes a corner C1 constituted by the bottom grille 10a, the right side grille 10c, and the back panel 10e. The corner C1 of the casing 10 includes the bottom connection port 16A and the side connection port 17A. In addition, the casing 10 includes a corner C2 constituted by the bottom grille 10a, the left side grille 10d, and the back panel 10e. The corner C2 of the casing 10 includes the bottom connection port 16B and the side connection port 17B.

[0038]

FIG. 3 is a bottom view of the indoor unit 1 of an air conditioner according to the first embodiment, from which the bottom grille 10a is removed. In FIG. 3, the same components as in FIGS. 1 and 2 are denoted by the same reference signs.

[0039]

With reference to FIG. 3, the indoor unit 1 according to the present embodiment includes two fans 20A, 20B. The two fans 20A, 20B are provided at positions overlapping the suction port 11 in a bottom view. The two fans 20A, 20B are disposed side by side. Specifically, the two fans 20A, 20B are disposed side by side along the wall surface Wa. In other words, the two fans 20A, 20B are disposed side by side along the direction in which the back panel 10e extends, in the bottom view. The fans 20A, 20B of the present embodiment are turbofans. Each of the fans 20A, 20B is rotationally driven around a rotation shaft R such that air is sucked along the rotation shaft R and air is blown out in a direction intersecting with the rotation shaft R. The fans 20A, 20B are not limited to turbofans, and may be centrifugal fans having another configuration or axial fans such as propeller fans.

[0040]

Inside the casing 10 of the indoor unit 1, a bell mouth 30 for introducing air to the two fans 20A, 20B and a drain pan 40 for receiving dew condensation water generated in a heat exchanger 50 (shown in FIG. 4) are provided.

[0041]

The drain pan 40 includes a drain pan body 41 for receiving the dew condensation water generated in the heat exchanger 50 (shown in FIG. 4), and a guide part 43 forming a ventilation path 42 for guiding the air blown out of the fans 20A, 20B to the bottom blow-out port 12. The drain pan 40 is made of a heat insulating material. The guide part 43 is formed such that the ventilation path 42 overlaps the bottom blow-

out port 12 in the bottom view. In addition, a drain hose 44 for discharging liquid accumulated in the drain pan body 41 to the outside of the casing 10 of the indoor unit 1 is connected to the drain pan 40. A connection part between the drain pan body 41 and the drain hose 44 is disposed on a right-side-grille 10c-side part in the casing 10. In other words, the connection part between the drain pan body 41 and the drain hose 44 is provided near the corner C1 (shown in FIG. 1). The drain hose 44 according to the present embodiment is one example of the pipe according to the present disclosure.

[0042]

With reference to FIG. 3, the casing 10 includes a housing part 18 for housing the refrigerant pipe 55 and the drain hose 44. The housing part 18 extends along the wall surface Wa. In other words, the housing part 18 extends along the direction in which the back panel 10e extends (the left-right direction in FIG. 3) in the bottom view. In still other words, the housing part 18 extends in the direction in which the two fans 20A, 20B are disposed side by side. The housing part 18 extends between the corner C1, where the bottom connection port 16A and the side connection port 17A are provided, and the corner C2, where the bottom connection port 16B and the side connection port 17B are provided.

[0043]

The housing part 18 of the present embodiment is a space provided inside the casing 10, and is defined by the bottom grille 10a (shown in FIG. 1), the back panel 10e, and the guide part 43 of the drain pan 40. In addition, the housing part 18, the bottom blow-out port 12, and the suction port 11 of the present embodiment are disposed, in the bottom view, in the order of the housing part 18, the bottom blow-out port 12, and the suction port 11 from the back-panel 10e-side part toward the front grille 10b. In other words, the bottom blow-out port 12 of the present embodiment is provided, in the

bottom view, on an opposite side to the back panel 10e with respect to the housing part 18.

[0044]

FIG. 4 is a bottom view of the indoor unit 1 of an air conditioner according to the first embodiment, from which the bottom grille 10a, the drain pan 40, and the drain hose 44 are removed. In FIG. 4, the same components as in FIGS. 1 to 3 are denoted by the same reference signs.

[0045]

With reference to FIG. 4, the indoor unit 1 of an air conditioner includes the heat exchanger 50 surrounding the two fans 20A, 20B from four directions of front, rear, left, and right. Specifically, the heat exchanger 50 includes a first heat exchange portion 51 extending in the front-rear direction and disposed between the fan 20A and the right side grille 10c, and a second heat exchange portion 52 extending in the left-right direction and disposed between the two fans 20A, 20B and the front grille 10b. In addition, the heat exchanger 50 includes a third heat exchange portion 53 extending in the front-rear direction and disposed between the fan 20B and the left side grille 10d, and a fourth heat exchange portion 54 extending in the left-right direction and disposed between the two fans 20A, 20B and the back panel 10e. The first heat exchange portion 51, the second heat exchange portion 52, the third heat exchange portion 53, and the fourth heat exchange portion 54 of the heat exchanger 50 of the present embodiment are integrally provided.

[0046]

The second heat exchange portion 52 is provided to be continuous with the first heat exchange portion 51 at an end on one side (right side in FIG. 4), and is provided to

be continuous with the third heat exchange portion 53 at an end on the other side (left side in FIG. 4).

[0047]

The fourth heat exchange portion 54 is connected to the refrigerant pipe 55 at an end on one side (right side in FIG. 4), and is provided to be continuous with the third heat exchange portion 53 at an end on the other side (left side in FIG. 4). A connection part between the heat exchanger 50 and the refrigerant pipe 55 is disposed on the right-side-grille 10c-side part in the casing 10. In other words, the connection part between the heat exchanger 50 and the refrigerant pipe 55 is provided near the corner C1 (shown in FIG. 1) of the casing 10.

[0048]

The refrigerant pipe 55 includes a pipe 55a and a pipe 55b. The refrigerant pipe 55 of the present embodiment is covered with a pipe cover 56 made of a heat insulating material. The refrigerant pipe 55 according to the present embodiment is one example of the pipe according to the present disclosure.

[0049]

FIG. 5 is a cross-sectional view taken along line V-V of FIG. 3. In FIG. 5, the same components as in FIGS. 1 to 4 are denoted by the same reference signs as in FIGS. 1 to 4.

[0050]

With reference to FIG. 5, the ventilation path 42 has a bent portion 42a formed to be away from the back panel 10e, or to extend obliquely downward. Specifically, the bent portion 42a of the ventilation path 42 of the present embodiment extends to be away from the back panel 10e as going from the upstream (the upper side in the view) toward the downstream (the lower side in FIG. 5). In addition, the guide part 43 of the

drain pan 40 has a shape following the shape of the ventilation path 42. In other words, the guide part 43 has a bent portion 43a formed to be away from the back panel 10e. Specifically, the bent portion 43a of the guide part 43 of the drain pan 40 according to the present embodiment extends to be away from the back panel 10e as going from one side (the upper side in FIG. 5) toward the other side (the lower side in FIG. 5). The guide part 43 of the drain pan 40 according to the present embodiment is one example of the heat insulator according to the present disclosure.

[0051]

As described above, the housing part 18 of the casing 10 is defined by the bottom grille 10a, the back panel 10e, and the guide part 43 of the drain pan 40. The housing part 18 of the casing 10 is formed to become wider as going from one side (the upper side in FIG. 5) toward the other side (the lower side in FIG. 5), due to the shape of the bent portion 43a of the guide part 43 of the drain pan 40. In other words, the space for housing the refrigerant pipe 55 and the drain hose 44 becomes larger following the shape of the guide part 43 of the drain pan 40.

[0052]

In addition, the housing part 18 is disposed closer to the back panel 10e than the heat exchanger 50 is. Specifically, the housing part 18 is disposed closer to the long side of the back-panel 10e-side part than the fourth heat exchange portion 54 of the heat exchanger 50 is.

[0053]

In addition, the guide part 43 has a back surface side portion 43b that partitions the ventilation path 42 and the housing part 18. The back surface side portion 43b of the guide part 43 suppresses heat exchange between the air passing through the ventilation path 42 and the housing part 18.

[0054]

The fans 20A, 20B are provided such that the rotation shafts R of the fans 20A, 20B extend in the vertical direction.

[0055]

(Flow of air)

Hereinafter, with reference to FIG. 6, this view is a schematic view for explaining a flow of air blown out of the indoor unit 1 of an air conditioner according to the present embodiment. FIG. 6 shows one example of an installation mode of the indoor unit 1 of an air conditioner, and the indoor unit 1 of the present embodiment is installed on the wall surface Wa above a window Wi. With reference to FIGS. 4, 5, and 6, the indoor unit 1 according to the present embodiment blows out air conditioned by the heat exchanger 50 in four directions of the front side of the casing 10, the lateral sides of the casing 10, and the lower side of the casing 10.

[0056]

With reference to FIGS. 4, 5, and 6, the indoor unit 1 blows out the air conditioned by the heat exchanger 50 from the front blow-out port 13 of the front grille 10b toward the front side of the casing 10. The indoor unit 1 blows out the conditioned air from the left side blow-out port 15 of the left side grille 10d toward the left side of the casing 10. The indoor unit 1 blows out the air conditioned by the heat exchanger 50 from the right side blow-out port 14 of the right side grille 10c toward the right side of the casing 10. The indoor unit 1 blows out the air conditioned by the heat exchanger 50 from the bottom blow-out port 12 of the bottom grille 10a toward the lower side of the casing 10.

[0057]

With reference to FIG. 4, a part of the air blown out in the centrifugal directions of the fans 20A, 20B by the fans 20A, 20B passes through the first heat exchange portion 51 of the heat exchanger 50 to be blown out into the room from the right side blow-out port 14 of the right side grille 10c. In other words, the indoor unit 1 blows out the air conditioned by the first heat exchange portion 51 of the heat exchanger 50 from the right side blow-out port 14 of the right side grille 10c toward the lateral side of the casing 10 (see reference signs A in FIGS. 4 and 6).

[0058]

A part of the air blown out in the centrifugal directions of the fans 20A, 20B by the fans 20A, 20B passes through the second heat exchange portion 52 of the heat exchanger 50 to be blown out into the room from the front blow-out port 13 of the front grille 10b. In other words, the indoor unit 1 blows out the air conditioned by the second heat exchange portion 52 of the heat exchanger 50 from the front blow-out port 13 (shown in FIG. 1) of the front grille 10b toward the front side of the casing 10 (see reference signs B in FIGS. 4, 5, and 6).

[0059]

A part of the air blown out in the centrifugal directions of the fans 20A, 20B by the fans 20A, 20B passes through the third heat exchange portion 53 of the heat exchanger 50 to be blown into the room from the left side blow-out port 15 of the left side grille 10d. In other words, the indoor unit 1 blows out the air conditioned by the third heat exchange portion 53 of the heat exchanger 50 from the left side blow-out port 15 of the left side grille 10d toward the lateral side of the casing 10 (see reference signs C in FIGS. 4 and 6).

[0060]

With reference to FIG. 5, a part of the air blown out in the centrifugal directions of the fans 20A, 20B by the fans 20A, 20B passes through the fourth heat exchange portion 54 of the heat exchanger 50 to be guided to the ventilation path 42, and is blown out into the room from the bottom blow-out port 12 of the bottom grille 10a. In other words, the indoor unit 1 blows out the air conditioned by the fourth heat exchange portion 54 of the heat exchanger 50 from the bottom blow-out port 12 of the bottom grille 10a toward the lower side of the casing 10 (see reference signs D in FIGS. 5 and 6). The air blown out into the room from the bottom blow-out port 12 is drawn to the wall surface Wa by the Coanda effect, and flows along the wall surface Wa.

[0061]

According to the above embodiment, the housing part 18 for housing a pipe, such as the refrigerant pipe 55 or the drain hose 44, is disposed closer to the back panel 10e than the heat exchanger 50 is, so that when the indoor unit 1 of an air conditioner is installed on the wall surface Wa, the pipe can be easily pulled out of the casing 10. As a result, piping construction is facilitated, and the workability of the work of installing the indoor unit 1 of an air conditioner on the wall surface Wa can be improved.

[0062]

In the above embodiment, the casing 10 has the bottom connection ports 16A, 16B and the side connection ports 17A, 17B, through each of which a pipe such as the refrigerant pipe 55 or the drain hose 44 is to be inserted, in both the corner parts C1, C2 of the casing 10. By properly selecting a connection port, through which the pipe is to be inserted, from the bottom connection ports 16A, 16B and the side connection ports 17A, 17B depending on the installation position of the indoor unit 1 and the position of a pipe hole (not shown) provided in the wall surface Wa, piping construction is

facilitated. As a result, the workability of the work of installing the indoor unit 1 of an air conditioner on a wall surface can be improved.

[0063]

In the above embodiment, the connection part between the heat exchanger 50 and the refrigerant pipe 55 and the connection part between the drain pan body 41 and the drain hose 44 are disposed near the corner C1 of the casing 10. Therefore, when an external pipe to be connected to a pipe such as the refrigerant pipe 55 or the drain hose 44 is inserted through the bottom connection port 16B or the side connection port 17B provided in the corner C2, the pipe needs to be pulled out. According to the above embodiment, the housing part 18 extends between the corner C1 and the corner C2 of the casing 10, so that a pipe such as the refrigerant pipe 55 or the drain hose 44 and an external pipe to be connected to the pipe can be pulled out to the housing part 18 provided in the casing 10. As a result, a pipe such as the refrigerant pipe 55 or the drain hose 44 do not need to be pulled out to the outside of the casing 10, so that appearance can be improved.

[0064]

According to the above embodiment, the guide part 43 made of a heat insulating material is disposed between the heat exchanger 50 and the housing part 18, so that heat exchange between the heat exchanger 50 and the housing part 18 is suppressed, and dew condensation on the housing part 18 is suppressed. As a result, dripping of dew condensation water outside the unit can be suppressed.

[0065]

According to the above embodiment, the back surface side portion 43b of the guide part 43 made of a heat insulating material is disposed between the ventilation path 42 and the housing part 18, so that heat exchange between the air passing through the

ventilation path 42 and the housing part 18 is suppressed, and dew condensation in the housing part 18 is suppressed. As a result, dripping of dew condensation water outside the unit can be suppressed.

[0066]

According to the above embodiment, the bottom blow-out port 12 is disposed, in a bottom view, with the housing part 18 interposed between the back panel 10e and the bottom blow-out port 12, so that the bottom blow-out port 12 is provided away from the wall surface Wa. As a result, the wall surface Wa can be suppressed from being stained with dirt and the like, which air blown out of the bottom blow-out port 12 catches, adhering to the wall surface Wa when the air blown out hits the wall surface Wa.

[0067]

In the above embodiment, the ventilation path 42 for guiding the air from the fans 20A, 20B to the bottom blow-out port 12 has the bent portion 42a formed to be away from the back panel 10e, so that the bottom blow-out port 12 is provided away from the wall surface Wa. As a result, the wall surface Wa can be suppressed from being stained with dirt and the like, which air blown out of the bottom blow-out port 12 catches, adhering to the wall surface Wa when the air blown out hits the wall surface Wa.

[0068]

In the above embodiment, the indoor unit 1 of an air conditioner blows out air from each of the bottom blow-out port 12 provided in the bottom surface of the casing 10, and the front blow-out port 13, the right side blow-out port 14, and the left side blow-out port 15 provided in the side surfaces of the casing 10. As a result, the air

conditioned by the heat exchanger 50 easily travels throughout the room, so that user comfort can be improved.

[0069]

<Modification>

FIG. 7 is a cross-sectional view, similar to FIG. 5, of an indoor unit 101 of an air conditioner according to a modification of the present embodiment.

[0070]

With reference to FIG. 7, a drain pan body 141 of a drain pan 140 and a guide part 160 of the indoor unit 101 according to the present modification are formed separately. In the present modification, a ventilation path 161 is defined by the drain pan body 141 of the drain pan 140 and the guide part 160 formed separately from the drain pan body 141. The guide part 160 of the present modification is one example of the heat insulator according to the present disclosure.

[0071]

[Second embodiment]

An indoor unit 201 of an air conditioner according to a second embodiment has the same configurations as the indoor unit 1 of an air conditioner according to the first embodiment except for the configuration of the bottom grille 10a, and FIGS. 3 and 4 are incorporated. In the second embodiment, the same configurations as in the first embodiment are denoted by the same reference signs, and detailed description thereof will be omitted.

[0072]

FIG. 8 is a cross-sectional view, similar to FIG. 5, of the indoor unit 201 of an air conditioner according to the second embodiment of the present disclosure.

[0073]

With reference to Fig. 8, the bottom grille 10a of the casing 10 according to the present embodiment includes a flap 270 for changing the direction of wind from the bottom blow-out port 12.

[0074]

The flap 270 of the present embodiment is provided such that the air conditioned by the heat exchanger 50 is blown out obliquely downward from the bottom blow-out port 12 toward the wall surface Wa. In other words, the bottom blow-out port 12 of the present embodiment blows out obliquely downward toward the wall surface Wa. Specifically, the flap 270 is provided to extend, from the upstream side toward the downstream side of the bottom blow-out port 12, toward the wall surface Wa. In the present embodiment, an angle $\theta 1$ formed by a plane D1 parallel to the wall surface Wa and a plane D2 parallel to the flap 270 is 30 degrees.

[0075]

The second embodiment exhibits the same operational effects as those of the first embodiment.

[0076]

According to the above embodiment, the bottom blow-out port 12 blows out obliquely downward toward the wall surface Wa, so that the air blown out of the bottom blow-out port 12 flows obliquely downward toward the opposite side to the suction port 11. As a result, a short circuit, in which the air blown out of the bottom blow-out port 12 is sucked into the suction port 11, can be suppressed.

[0077]

The flap 270 may be rotatably attached to the casing 10 such that the angle $\theta 1$ formed by the plane D1 parallel to the wall surface Wa and the plane D2 parallel to the flap 270 can be changed.

[0078]

In addition, the bottom grille 10a includes one flap 270 in the present embodiment, but the bottom grille 10a may include a plurality of the flaps 270.

[0079]

[Third embodiment]

An indoor unit 301 of an air conditioner according to a third embodiment has the same configurations as the indoor unit 1 of an air conditioner according to the first embodiment except for the configuration of a ventilation path 342, and FIGS. 3 and 4 are incorporated. In the third embodiment, the same configurations as in the first embodiment are denoted by the same reference signs, and detailed description thereof will be omitted.

[0080]

FIG. 9 is a cross-sectional view, similar to FIG. 5, of the indoor unit 301 of an air conditioner according to the third embodiment of the present disclosure.

[0081]

With reference to FIG. 9, a drain pan 340 of the present embodiment includes a drain pan body 341 for receiving the dew condensation water generated in the heat exchanger 50, and a guide part 343 forming the ventilation path 342 for guiding the air blown out by the fans 20A, 20B (shown in FIG. 3) to the bottom blow-out port 12. The ventilation path 342 of the present embodiment is provided such that the air conditioned by the heat exchanger 50 is blown out obliquely downward from the bottom blow-out port 12 toward the wall surface Wa. In other words, the bottom blow-out port 12 of the present embodiment blows out the air conditioned by the heat exchanger 50 obliquely downward toward the wall surface Wa. Specially, the ventilation path 342 has, near the bottom blow-out port 12, a deflection part 342a extending, from the

upstream side toward the downstream side, toward the wall surface Wa. In the present embodiment, an angle θ_2 formed by the plane D1 parallel to the wall surface Wa and a plane D3 parallel to the deflection part 342a of the ventilation path 342 is 30 degrees.

[0082]

The third embodiment exhibits the same operational effects as those of the first embodiment.

[0083]

According to the above embodiment, the bottom blow-out port 12 blows out obliquely downward toward the wall surface Wa, so that the air blown out of the bottom blow-out port 12 flows obliquely downward toward the opposite side to the suction port 11. As a result, a short circuit, in which the air blown out of the bottom blow-out port 12 is sucked into the suction port 11, can be suppressed.

[0084]

[Fourth embodiment]

An indoor unit 401 of an air conditioner according to a fourth embodiment has the same configurations as the indoor unit 1 of an air conditioner according to the first embodiment except for the configuration of a heat exchanger 450, and FIGS. 1 and 2 are incorporated. In the fourth embodiment, the same configurations as in the first embodiment are denoted by the same reference signs, and detailed description thereof will be omitted.

[0085]

FIG. 10 is a bottom view, similar to FIG. 4, of the indoor unit 401 of an air conditioner according to the fourth embodiment of the present disclosure.

[0086]

With reference to FIG. 10, the indoor unit 401 according to the present embodiment includes the heat exchanger 450 surrounding the two fans 20A, 20B from four directions of front, rear, left, and right. Specifically, the heat exchanger 450 includes a first heat exchange portion 451 extending in the left-right direction and disposed between the fan 20A and the back panel 10e, and a second heat exchange portion 452 extending in the front-rear direction and disposed between the fan 20A and the right side grille 10c. In addition, the heat exchanger 450 includes a third heat exchange portion 453 extending in the left-right direction and disposed between the two fans 20A, 20B and the front grille 10b, and a fourth heat exchange portion 454 extending in the front-rear direction and disposed between the fan 20B and the left side grille 10d. In addition, the heat exchanger 450 includes a fifth heat exchange portion 455 extending in the left-right direction and is disposed between the fan 20B and the back panel 10e. The first heat exchange portion 451, the second heat exchange portion 452, the third heat exchange portion 453, the fourth heat exchange portion 454, and the fifth heat exchange portion 455 of the heat exchanger 450 of the present embodiment are integrally provided.

[0087]

The second heat exchange portion 452 is provided to be continuous with the first heat exchange portion 451 at an end on one side (lower side in FIG. 10), and is provided to be continuous with the third heat exchange portion 453 at an end on the other side (upper side in FIG. 10).

[0088]

The fourth heat exchange portion 454 is provided to be continuous with the fifth heat exchange portion 455 at an end on one side (lower side in FIG. 10), and is

provided to be continuous with the third heat exchange portion 453 at an end on the other side (upper side in FIG. 10).

[0089]

In addition, the fifth heat exchange portion 455 is connected to the refrigerant pipe 55 at an end on one side (right side in FIG. 10). A connection part between the heat exchanger 450 and the refrigerant pipe 55 is disposed near the center, in the left-right direction, of the casing 10.

[0090]

The fourth embodiment exhibits the same operational effects as those of the first embodiment.

[0091]

While embodiments have been described above, it can be construed that various changes in form and detail may be made without departing from the spirit and scope of the claims.

[0092]

For example, the indoor unit 1, 101, 201, 301, 401 of an air conditioner may include a drain pump. In this case, the drain hose 44 can be pulled out upward from the casing 10.

REFERENCE SIGNS LIST

[0093]

- 1 indoor unit
- 10 casing
- 10a bottom grille
- 10b front grille
- 10c right side grille

10d	left side grille
10e	back panel (installation part)
10f	top panel
11	suction port
12	bottom blow-out port (first blow-out port)
13	front blow-out port (second blow-out port)
14	right side blow-out port (second blow-out port)
15	left side blow-out port (second blow-out port)
16A, 16B	bottom connection port
17A, 17B	side connection port
18	housing part
20A, 20B	fan
30	bell mouth
40	drain pan
41	drain pan body
42	ventilation path
43	guide part (heat insulator)
43a	bent portion
43b	back-surface-side portion
44	drain hose
50	heat exchanger
51	first heat exchange portion
52	second heat exchange portion
53	third heat exchange portion
54	fourth heat exchange portion

55	refrigerant pipe
101	indoor unit
140	drain pan
141	drain pan body
160	guide part (heat insulator)
161	ventilation path
201	indoor unit
270	flap
301	indoor unit
340	drain pan
341	drain pan body
342	ventilation path
342a	deflection part
343	guide part
401	indoor unit
450	heat exchanger
451	first heat exchange portion
452	second heat exchange portion
453	third heat exchange portion
454	fourth heat exchange portion
455	fifth heat exchange portion
C1, C2	corner

CLAIMS

1. An indoor unit (1, 101, 201, 301, 401) of an air conditioner, comprising:
at least one fan (20A, 20 B);
a heat exchanger (50, 450) surrounding the at least one fan (20A, 20B) from four directions of front, rear, left, and right; and
a casing (10) that houses the at least one fan (20A, 20B) and the heat exchanger (50, 450), wherein
the casing (10) includes
a suction port (11),
at least one blow-out port (12, 13, 14, 15), and
an installation part (10e) that is provided in a side surface of the casing (10) to install the casing (10) on a wall surface (Wa), and
a housing part (18) that is disposed closer to the installation part (10e) than the heat exchanger (50, 450) is and houses at least a pipe (55) to be connected to the heat exchanger (50,450), and
the at least one fan (20A, 20B), the heat exchanger (50, 450), the installation part (10e), and the housing part (18) are disposed side by side in an order of the at least one fan (20A, 20B), the heat exchanger (50, 450), the housing part (18), and the installation part (10e) in a side view.
2. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to claim 1, further comprising a heat insulator (43, 160) disposed between the heat exchanger (50, 450) and the housing part (18).

3. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to claim 1 or claim 2, wherein

the at least one fan (20A, 20 B) comprises a plurality of fans (20A, 20B),

the plurality of the fans (20A, 20B) are disposed side by side, and

the housing part (18) extends in a direction in which the plurality of the fans (20A, 20B) are disposed side by side.

4. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to any one of claims 1 to 3, wherein

the casing (10) includes an installation-part (10e)-side corner (C1, C2), and

the corner (C1, C2) includes at least one connection port (16A, 16B, 17A, 17B) through which the pipe (55) is to be inserted.

5. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to any one of claims 1 to 4, wherein

the at least one blow-out port (12, 13, 14, 15) includes a first blow-out port (12) provided in an installation-part (10e)-side part of a bottom surface of the casing (10).

6. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to claim 5, wherein the first blow-out port (12) is provided on an opposite side to the installation part (10e) with respect to the housing part (18) in a bottom view.

7. The indoor unit (201, 301) of an air conditioner according to claim 5 or claim 6, further comprising a suction port (11) provided in the bottom surface of the casing

(10) and on an opposite side to the installation part (10e) with respect to the first blow-out port (12), wherein

the first blow-out port (12) blows out obliquely downward toward the wall surface (Wa).

8. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to any one of claims 5 to 7, wherein

the casing (10) includes a ventilation path (42, 161, 342) that guides air from the at least one fan (20A, 20B) to the first blow-out port (12), and

the ventilation path (42) includes a portion (42a) formed to be away from the installation part (10e).

9. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to claim 8, wherein the housing part (18) is disposed closer to the installation part (10e) than the ventilation path (42,161,342) is.

10. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to any one of claims 5 to 9, wherein the at least one blow-out port (12, 13, 14, 15) includes at least one second blow-out port (13, 14, 15) provided in a side surface of the casing (10).

11. The indoor unit (1, 101, 201, 301, 401) of an air conditioner according to any one of claims 1 to 10, wherein the at least one fan (20A, 20B) is provided such that a rotation shaft (R) of the fan (20A, 20B) extends in a vertical direction.