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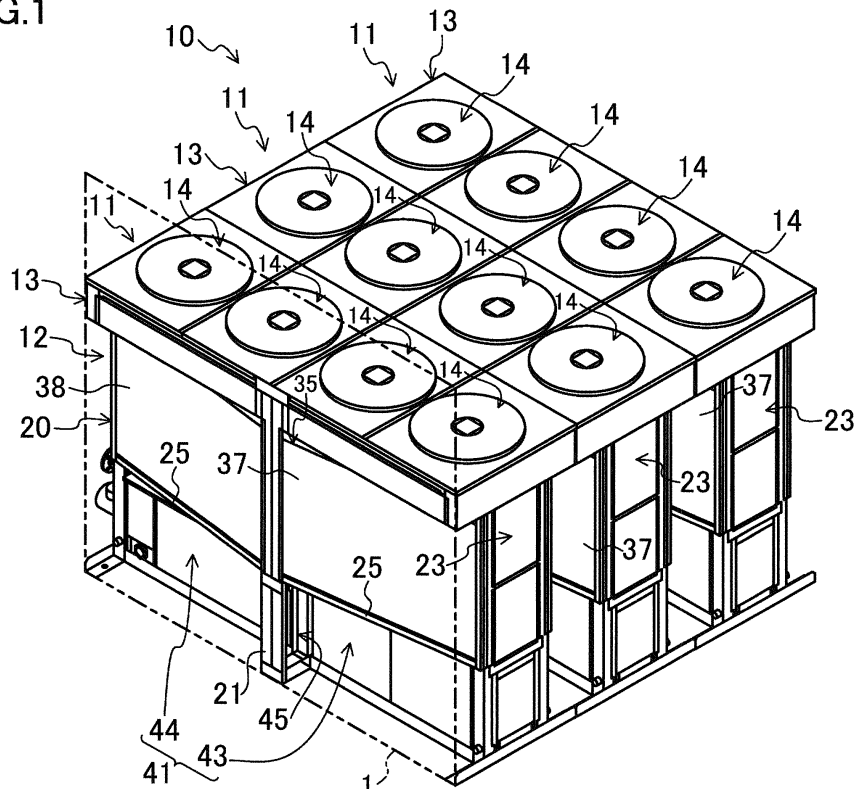
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(54) **OUTDOOR UNIT AND REFRIGERATION DEVICE**

(57) An outdoor unit (11) includes air blowers (17) arranged in an upper part of a casing (12). First and second body recesses (41, 42) formed below first and second

and heat exchanger bodies (35, 36) of the casing (12) and opening on sides of the casing (12) are formed.

FIG.1



Description

TECHNICAL FIELD

[0001] The present disclosure relates to an outdoor unit and a refrigerating apparatus including the outdoor unit. In particular, the present disclosure relates to an outdoor air intake structure.

BACKGROUND ART

[0002] Conventionally, a large-size heat pump chiller placed on a roof of a building as described in Patent Document 1 has been known as a refrigerating apparatus. An outdoor unit of the heat pump chiller includes a casing formed in a substantially hexagonal shape as viewed in the plane and formed with air suction ports on both of opposing sides of the casing, a plurality of flat plate shaped heat exchangers each arranged at a corresponding one of the air suction ports, and air blowers each disposed inside a corresponding one of air discharge ports formed at an upper surface of the casing.

CITATION LIST

PATENT DOCUMENT

[0003] PATENT DOCUMENT 1: Japanese Unexamined Patent Publication No. 2010-216798

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0004] In the heat pump chiller of Patent Document 1, e.g., three outdoor units are arranged, and air is taken through a clearance formed between adjacent ones of the outdoor units.

[0005] However, since a lower part of the casing is apart from the air blowers arranged in an upper part of the casing, air becomes difficult to flow in the lower part of the casing. For such a reason, there is a disadvantage that heat exchange performance in the lower part of the casing is lowered.

[0006] The present disclosure has been made in view of the foregoing, and aims to improve a heat exchange efficiency in an outdoor unit including heat exchangers arranged in a substantially hexagonal shape as viewed in the plane.

SOLUTION TO THE PROBLEM

[0007] A first aspect of the invention is intended for an outdoor unit including a casing (12) and a heat exchanger body (35, 36) disposed so as to extend along a side of the casing (12) and exposed to an outside of the casing (12), in which a pointed part (39) positioned on an outermost side of the casing (12) is formed at a middle of

the heat exchanger body (35, 36) as viewed in plane, and air flows from the outside to the casing (12) through the heat exchanger body (35, 36). The outdoor unit includes an air blower (17) disposed in an upper part of the casing (12) and configured to discharge the air from the casing (12) to the outside. A body recess (41, 42) formed below the heat exchanger body (35, 36) of the casing (12) and recessed inward relative to a side surface of the heat exchanger body (35, 36) is formed.

[0008] In the first aspect of the invention, the heat exchanger body (35, 36) is disposed on the side of the casing (12). The heat exchanger body (35, 36) extends along the side of the casing (12), and is exposed to the outside of the casing (12). The heat exchanger body (35, 36) includes, at the middle thereof as viewed in the plane, the pointed part (39) positioned on the outermost side of the casing (12). Air outside the casing (12) flows from the outside of the heat exchanger body (35, 36) into the casing (12) through the heat exchanger body (35, 36). The air flowing into the casing (12) exchanges heat with refrigerant when passing through the heat exchanger body (35, 36).

[0009] The body recess (41, 42) recessed inward relative to the side surface of the heat exchanger body (35, 36) is formed below the heat exchanger body (35, 36) along the side of the casing (12). Outdoor air flows into a space formed by the body recess (41, 42).

[0010] Air flowing through the body recess (41, 42) is guided upward to the outside of the heat exchanger body (35, 36). Then, the air flows from the outside of the heat exchanger body (35, 36) into the casing (12). The air flowing into the casing (12) exchanges heat with refrigerant when passing through the heat exchanger body (35, 36).

[0011] A second aspect of the invention is intended for the outdoor unit of the first aspect of the invention, in which the heat exchanger body (35, 36) includes first and second heat exchanger bodies (35, 36) each disposed so as to extend along a corresponding one of sides of the casing (12), each of the first and second heat exchanger bodies (35, 36) includes first and second heat exchange parts (37, 38) linearly extending toward the outside of the casing (12) such that an obtuse-angled pointed part (39) positioned on the outermost side of the casing (12) is formed at a middle of the each of the first and second heat exchanger bodies (35, 36) as viewed in the plane, and the body recess (41, 42) includes first and second body recesses (41, 42) each formed below a corresponding one of the first and second heat exchanger bodies (35, 36) of the casing (12) and recessed inward relative to a side surface of a corresponding one of the first and second heat exchanger bodies (35, 36).

[0012] In the second aspect of the invention, air outside the casing (12) flows from the outside into the casing (12) through the first and second heat exchange parts (37, 38) of the first and second heat exchanger bodies (35, 36). The air flowing into the casing (12) exchanges heat with refrigerant when passing through the first and sec-

ond heat exchange parts (37, 38).

[0013] The first and second body recesses (41, 42) recessed inward relative to the side surfaces of the first and second heat exchanger bodies (35, 36) are each formed below a corresponding one of the first and second heat exchanger bodies (35, 36). Air outside the casing (12) flows into each of the first and second body recesses (41, 42).

[0014] The air flowing into the first body recess (41) is guided upward to the outside of the first heat exchanger body (35). Then, the air flows from the outside into the casing (12) through the first and second heat exchange parts (37, 38) of the first heat exchanger body (35). The air flowing into the casing (12) exchanges heat with refrigerant when passing through the first and second heat exchange parts (37, 38). The air flowing into the second body recess (42) is guided upward to the outside of the second heat exchanger body (36). Then, the air flows from the outside into the casing (12) through the first and second heat exchange parts (37, 38) of the second heat exchanger body (36). The air flowing into the casing (12) exchanges heat with refrigerant when passing through the first and second heat exchange parts (37, 38).

[0015] A third aspect of the invention is intended for the outdoor unit of the second aspect of the invention, in which each of the first and second body recesses (41, 42) includes first and second recesses (43, 44) each positioned below a corresponding one of the first and second heat exchange parts (37, 38) and each recessed inward relative to a side surface of a corresponding one of the first and second heat exchange parts (37, 38), and an air communication part (45) allowing communication between a space formed by the first recess (43) and a space formed by the second recess (44) is formed.

[0016] In the third aspect of the invention, the first body recess (41) formed below the first heat exchanger body (35) includes the first and second recesses (43, 44). The second body recess (42) formed below the second heat exchanger body (36) includes the first and second recesses (43, 44).

[0017] The first recess (43) communicates with the outside of the casing (12) so that outdoor air can flow into the first recess (43). The air flowing into the first recess (43) is guided upward to the outside of the first heat exchange part (37), and then exchanges heat with refrigerant when flowing into the casing (12) through the first heat exchange part (37).

[0018] The second recess (44) communicates with the outside of the casing (12) so that outdoor air can flow into the second recess (44). The air flowing into the second recess (44) is guided upward to the outside of the second heat exchange part (38), and then exchanges heat with refrigerant when flowing into the casing (12) through the second heat exchange part (38).

[0019] The air communication part (45) allows communication between the space formed by the first recess (43) and the space formed by the second recess (44). Thus, air can flow between the first recess (43) and the

second recess (44). That is, air flowing through the first recess (43) flows into the second recess (44), whereas air flowing through the second recess (44) flows into the first recess (43). Thus, the volume of air flowing below the first and second heat exchanger bodies (35, 36) can be increased.

[0020] A fourth aspect of the invention is intended for the outdoor unit of the second or third aspect of the invention, in which, in the casing (12), a machine chamber (29) in which a component is housed is formed on an inside of the first and second body recesses (41, 42).

[0021] In the fourth aspect of the invention, the machine chamber (29) in which the component is housed is formed on the inside of the first and second body recesses (41, 42) in the casing (12). Thus, maintenance of the component provided in the machine chamber (29) can be performed through the first and second body recesses (41, 42).

[0022] A fifth aspect of the invention is intended for the outdoor unit of any one of the second to fourth aspects of the invention, in which the casing (12) includes a reinforcement member (25) which extends along the first or second heat exchanger body (35, 36) to support, from below, at least one of the first or second heat exchange part (37, 38) of the first or second heat exchanger body (35, 36) along which the reinforcement member (25) extends and to receive drainage water from the at least one of the first or second heat exchange part (37, 38).

[0023] In the fifth aspect of the invention, the reinforcement member (25) is provided along the first or second heat exchanger body (35, 36) in the casing (12). The reinforcement (25) supports each heat exchange part (37, 38) from the below, and receives drainage water. Thus, the reinforcement member (25) is a member having the function of reinforcing each heat exchange part (37, 38) and the function of serving as a drain pan.

[0024] A sixth aspect of the invention is intended for the outdoor unit of any one of the second to fifth aspects of the invention, in which the first and second heat exchange parts (37, 38) are connected to different refrigerant circuits to be operated independently of each other.

[0025] In the sixth aspect of the invention, the first and second heat exchange parts (37, 38) are connected to the different refrigerant circuits to be operated independently of each other. Thus, when only the first heat exchange part (37) is operated, air can be supplied from the second recess (44) to the first recess (43). Consequently, the flow rate of air flowing through each first heat exchange part (37) which is a target to be operated can be increased. On the other hand, when only the second heat exchange part (38) is operated, air can be supplied from the first recess (43) to the second recess (44). Consequently, the flow rate of air flowing through each second heat exchange part (38) which is a target to be operated can be increased.

[0026] A seventh aspect of the invention is intended for a refrigerating apparatus including the outdoor unit (11) of any one of the first to sixth aspects of the invention.

[0027] The refrigerating apparatus of the seventh aspect of the invention includes the outdoor unit (11).

ADVANTAGES OF THE INVENTION

[0028] According to the first aspect of the invention, since the body recess (41, 42) is formed, air can be, in addition to air flowing outside the heat exchanger body (35, 36), guided upward to the outside of the heat exchanger body (35, 36). Thus, the flow rate of air passing through the heat exchanger body (35, 36) can be increased. This improves a heat exchange efficiency of the heat exchanger body (35, 36). As a result, in the outdoor unit including heat exchangers arranged in a substantially hexagonal shape as viewed in the plane, a heat exchange efficiency thereof can be improved.

[0029] According to the second aspect of the invention, since the first and second body recesses (41, 42) are formed, air can be, in addition to air flowing outside the first and second heat exchanger bodies (35, 36), guided upward to the outside of the first and second heat exchanger bodies (35, 36). Thus, the flow rate of air passing through the first and second heat exchange parts (37, 38) can be increased. This improves a heat exchange efficiency of the first and second heat exchange parts (37, 38). As a result, in the outdoor unit including the heat exchangers arranged in a substantially hexagonal shape as viewed in the plane, the heat exchange efficiency thereof can be improved.

[0030] According to the third aspect of the invention, since the air communication part (45) is formed such that the space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other, air flowing through the first recess (43) can be supplied to the second recess (44), and air flowing through the second recess (44) can be supplied to the first recess (43). This increases the flow rate of air flowing between the first and second recesses (43, 44). That is, since part of the casing (12) below the first and second heat exchanger bodies (35, 36) is apart from the air blower (17), air becomes difficult to flow in such a part of the casing (12). However, in the present embodiment, since the air communication part (45) increases the flow rate of air flowing between the first and second recesses (43, 44), the flow rate of air in part of the casing (12) below the first and second heat exchanger bodies (35, 36) can be increased. This improves the heat exchange efficiency of the first and second heat exchange parts (37, 38). As a result, in the outdoor unit including the heat exchangers arranged in a substantially hexagonal shape as viewed in the plane, the heat exchange efficiency thereof can be improved.

[0031] According to the fourth aspect of the invention, since the machine chamber (29) is formed on the inside of the first and second body recesses (41, 42), maintenance of the component provided in the machine chamber (29) can be performed through the first and second body recesses (41, 42).

[0032] According to the fifth aspect of the invention, the reinforcement member (25) receiving drainage water is provided along the first or second heat exchanger body (35, 36), and is provided so as to support the first or second heat exchange part (37, 38) from the below. Thus, the first or second heat exchanger body (35, 36) can be reinforced by a single member, and drainage water flowing out from the first or second heat exchanger body (35, 36) can be disposed.

[0033] According to the sixth aspect of the invention, the first and second heat exchange parts (37, 38) are operated independently of each other. Thus, when only the first heat exchange part (37) is operated, air supplied from the second recess (44) to the first recess (43) can be guided to the first heat exchange part (37). Accordingly, the flow rate of air flowing through the first heat exchange part (37) which is in operation can be increased. On the other hand, when only the second heat exchange part (38) is operated, air supplied from the first recess (43) to the second recess (44) can be guided to the second heat exchange part (38). Accordingly, the flow rate of air flowing through the second heat exchange part (38) which is in operation can be increased.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034]

[FIG. 1] FIG. 1 is a schematic perspective view of a chiller apparatus of an embodiment.

[FIG. 2] FIG. 2 is a perspective view of a heat pump chiller outdoor unit of the embodiment as viewed from a first side.

[FIG. 3] FIG. 3 is a perspective view of the heat pump chiller outdoor unit of the embodiment as viewed from a second side.

[FIG. 4] FIG. 4 is a front view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 5] FIG. 5 is a back view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 6] FIG. 6 is a left side view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 7] FIG. 7 is a right side view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 8] FIG. 8 is a top view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 9] FIG. 9 is a bottom view of the heat pump chiller outdoor unit of the embodiment.

[FIG. 10] FIG. 10 is a longitudinal sectional view of

the heat pump chiller outdoor unit of the embodiment.

[FIG. 11] FIG. 11 is a perspective view illustrating the structure of a bottom member of the embodiment.

[FIG. 12] FIG. 12 is a perspective view illustrating the structure of a first bottom frame of the embodiment.

[FIG. 13] FIG. 13 is a perspective view illustrating the structure of a second bottom frame of the embodiment.

[FIG. 14] FIG. 14 is a perspective view illustrating an air flow in the heat pump chiller outdoor unit of the embodiment as viewed from the first side.

[FIG. 15] FIG. 15 is a perspective view illustrating an air flow in the heat pump chiller outdoor unit of the embodiment as viewed from the second side.

[FIG. 16] FIG. 16 is a schematic perspective view illustrating an air flow in the chiller apparatus of the embodiment.

[FIG. 17] FIG. 17 is a top view illustrating an air flow in the chiller apparatus of the embodiment.

[FIG. 18] FIG. 18 is a schematic perspective view illustrating an air flow in a single-circuit operation of the chiller apparatus of the embodiment.

[FIG. 19] FIG. 19 is a graph illustrating a relationship between the height of an outdoor unit of a conventional example and the volume of air in the outdoor unit of the conventional example.

[FIG. 20] FIG. 20 is a graph illustrating a relationship between the height of the outdoor unit of the embodiment and the volume of air in the outdoor unit of the embodiment.

[FIG. 21] FIG. 21 is a perspective view illustrating the structure of a second bottom frame of a variation of the embodiment.

DESCRIPTION OF EMBODIMENTS

[0035] An embodiment of the present disclosure will be described below in detail with reference to drawings.

[0036] Referring to FIG. 1, a refrigerating apparatus of the present embodiment is a chiller apparatus (10). The chiller apparatus (10) includes heat pump chiller outdoor units (11) placed on, e.g., a roof of a building and configured to cool or heat air conditioning water supplied into the building. In the chiller apparatus (10), three outdoor units (11) are, as an example, arranged in a width direc-

tion of the chiller apparatus (10) along a wall (1).

[0037] Referring to FIGS. 2-9, each outdoor unit (11) includes a casing (12) having a refrigerant circuit (not shown in the figure).

[0038] The casing (12) includes a fan casing (13) formed at an upper end of the casing (12), a bottom member (60) formed at a lower end of the casing (12), and a body (20) provided between the fan casing (13) and the bottom member (60). Note that the bottom member (60) is schematically illustrated in FIGS. 1-9, and the structure thereof will be described in detail later.

[0039] Referring to FIG. 10, air blowers (17) are housed in the fan casing (13), and the fan casing (13) is disposed in an upper end part of the casing (12).

[0040] The fan casing (13) is formed in a substantially-rectangular slightly-thin box shape as viewed in the plane, and is provided in the upper end part of the casing (12). Although not shown in the figure, a lower end part of the fan casing (13) corresponding to the body (20) opens. At an upper end surface of the fan casing (13), four air discharge ports (14) are formed so as to be arranged in a longitudinal direction of the casing (12). A fan guard is attached to each air discharge port (14) so as to cover an opening of the air discharge port (14). The fan guard is a protective net for the air blower (17). There are four air blowers (17) each provided in a corresponding one of the air discharge ports (14) of the fan casing (13), and bell mouths (16) are each provided so as to surround a corresponding one of the air blowers (17).

[0041] The fan casing (13) is formed such that side surfaces (15a, 15b) thereof are at the positions corresponding to the outermost parts of the body (20) which will be described later. Specifically, one (15a) of the side surfaces (15a, 15b) of the fan casing (13) is formed at the position corresponding to an obtuse-angled pointed part (39) positioned at the middle of a first heat exchanger body (35) on the outermost side of the casing (12) as viewed in the plane, and is formed so as to linearly extend in the longitudinal direction of the casing (12). Each part of the fan casing (13) outwardly protruding beyond the first heat exchanger body (35) as viewed in the plane serves as a first eave part (13a).

[0042] The other side surface (15b) of the fan casing (13) is formed at the position corresponding to an obtuse-angled pointed part (39) positioned at the middle of a second heat exchanger body (36) on the outermost side of the casing (12) as viewed in the plane, and is formed so as to linearly extend in the longitudinal direction of the casing (12). Each part of the fan casing (13) outwardly protruding beyond the second heat exchanger body (36) as viewed in the plane serves as a second eave part (13b).

[0043] The first and second eave part (13a, 13b) reduce or prevent so-called "short circulation" meaning that air upwardly discharged from the casing (12) through the air discharge ports (14) flows to below the fan casing (13), and then flows into air heat exchangers (37, 38).

[0044] Each air blower (17) is an axial air blower (e.g.,

a propeller fan). There are four air blowers (17) each provided in a corresponding one of the four air discharge ports (14). The air blower (17) is configured to suck air from the outside into the casing (12) and to discharge such air to the outside through the fan casing (13) and the air discharge ports (14). Each bell mouth (16) is formed in a substantially cylindrical shape, and is provided in the fan casing (13) so as to surround a corresponding one of the air blowers (17).

[0045] Referring to FIG. 11, the bottom member (60) is disposed in a lower end part of the casing (12), and is a member on which later-described compressors (50) and a later-described water heat exchanger (51) are placed. The bottom member (60) is configured such that a first bottom frame (61) and a second bottom frame (62) are connected together. The first and second bottom frames (61, 62) are formed using the same type of body frames (63).

[0046] Referring to FIG. 12, the first bottom frame (61) includes the body frame (63), a divider (65), two compressor attachment plates (68), wire covers (67), and three support column attachment brackets (66).

[0047] The body frame (63) is formed in a substantially-rectangular thin frame shape as viewed in the plane. Grooves (64) arranged in two lines in a width direction of the body frame (63) are formed in the body frame (63). Each groove (64) is formed so as to extend in a longitudinal direction of the body frame (63).

[0048] Each compressor attachment plate (68) is formed in a substantially-rectangular plate shape. Each compressor attachment plate (68) is attached to the body frame (63) so as to cover a corresponding one of the grooves (64). Three compressors (50) which will be described later are placed on a single compressor attachment plate (68). Since the compressor attachment plates (68) covers the grooves (64), outdoor air is prevented from passing, without passing through the first and second heat exchanger bodies (35, 36), through the bottom member (60) and being taken into the casing (12).

[0049] The divider (65) of the first bottom frame (61) is formed in a substantially-rectangular plate shape, and is provided on one end side of the body frame (63). The divider (65) is disposed so as to outwardly extend from the substantially middle of the body frame (63) in the width direction thereof.

[0050] Each wire cover (67) is a cover member configured to protect an electric wire(s) of the outdoor unit (11). Each wire covers (67) is attached to the body frame (63) along a corresponding one of side surfaces of the body frame (63) extending in the longitudinal direction thereof.

[0051] Referring to FIG. 13, the second bottom frame (62) includes the body frame (63), a pump stand (71), a divider (65), a heat exchanger attachment plate (69), a closing plate (70), and three support column attachment brackets (66). Note that the configuration of the body frame (63) is similar to that of the first bottom frame (61).

[0052] The pump stand (71) is a stand on which a pump member (not shown in the figure) is placed. The pump

stand (71) is formed on one end surface of the second bottom frame (62) in the longitudinal direction of the body frame (63).

[0053] The closing plate (70) and the heat exchanger attachment plate (69) are each formed in a substantially-rectangular plate shape. Each of the closing plate (70) and the heat exchanger attachment plate (69) is attached to the body frame (63) so as to cover a corresponding one of the grooves (64). The later-described water heat exchanger (51) is placed on the heat exchanger attachment plate (69). Since the closing plate (70) and the heat exchanger attachment plate (69) close the grooves (64), outdoor air is prevented from passing, without passing through the first and second heat exchanger bodies (35, 36), through the bottom member (60) and being taken into the casing (12).

[0054] The divider (65) of the second bottom frame (62) is formed in a substantially-rectangular plate shape, and is provided on the other end side of the body frame (63). The divider (65) is disposed so as to outwardly extend from the substantially middle of the body frame (63) in the width direction thereof.

[0055] Referring to FIG. 11, the first and second bottom frames (61, 62) are connected together to form the bottom member (60). In the state in which the first and second bottom frames (61, 62) are connected together, the dividers (65) of the bottom frames (61, 62) form a bottom surface of the casing (12) without a clearance being formed therebetween. Since the bottom frames (61, 62) use the same type of body frames (63), the first and second bottom frames (61, 62) can be individually assembled. Moreover, the number of stocked body frames (63) which are spare frames for manufacturing can be reduced.

[0056] The body (20) of the casing (12) is formed in a substantially hexagonal shape as viewed in the plane, i.e., as viewed from the above. A vertically-extending long-side support column (21) stands at each of two vertexes of the hexagonal body (20) of the casing (12) on a long side thereof. Moreover, a vertically-extending short-side support column (22) stands at each of four vertexes of the hexagonal body (20) of the casing (12) on a short side thereof. In the body (20) of the casing (12), the long-side support column (21) and the short-side support columns (22) form two openings (27, 28) on each side of the casing (12) along the longitudinal direction thereof. Each opening (27, 28) is formed so as to extend from the bottom member (60) to the fan casing (13). In the body (20) of the casing (12), a partition plate (26) is provided so as to extend between the long-side support columns (21). The partition plate (26) is a member configured to divide an internal space of the body (20) into two chambers, and stands so as to vertically extend from the bottom member (60) to the fan casing (13).

[0057] Reinforcements (25) are provided in the body (20) of the casing (12). Each reinforcement (25) is formed in a rod shape having a substantially recessed cross section, and is, at the height slightly below the middle of the

support columns (21, 22), disposed so as to extend between the long-side support column (21) and the short-side support column (22). Each opening (27, 28) is divided into an upper opening (27) and a lower opening (28) by a corresponding one of the reinforcements (25). Each reinforcement (25) is provided along a corresponding one of the air heat exchangers (37, 38), and a single air heat exchanger (37, 38) is placed on a single reinforcement (25). Thus, each reinforcement (25) supports a corresponding one of the air heat exchangers (37, 38) from the below, and is configured to store drainage water flowing out from a corresponding one of the air heat exchangers (37, 38). That is, each reinforcement (25) functions as a support member configured to support a corresponding one of the air heat exchangers (37, 38), and also functions as a drain pan. Note that the reinforcement (25) serves as a reinforcement member of the present disclosure.

[0058] Each air heat exchanger (37, 38) is provided between the long-side support column (21) and the short-side support column (22) at a corresponding one of the upper openings (27). A machine chamber cover (32) linearly extending between the short-side support columns (22) in the longitudinal direction of the casing (12) is provided at the lower openings (28). That is, the air heat exchanger (37, 38) outwardly extending as viewed in the plane is provided at an upper part of the opening (27, 28), whereas the machine chamber cover (32) linearly extending as viewed in the plane is provided at a lower part of the opening (27, 28). The machine chamber covers (32) are disposed on the inside of side surfaces of the first and second heat exchanger bodies (35, 36), and a machine chamber (29) is formed inside the machine chamber covers (32). An intermediate path (45) is formed between each long-side support column (21) and the machine chamber cover (32).

[0059] Short-side parts of the casing (12) form a front part and a rear part, respectively. The front part of the casing (12) on one of the short sides thereof forms a front wall (23). A front opening for maintenance of components, such as the compressors (50), provided inside the casing (12) is formed at the front wall (23), and front doors (23a) are provided at the front opening. The rear part of the casing (12) on the other short side thereof forms a rear wall (24). A rear opening for maintenance of components, such as an electric component box (53), provided in the casing (12) is formed at the rear wall (24), and rear doors (24a) are provided at the rear opening.

[0060] The air heat exchangers (37, 38) include four air heat exchangers (37, 38). Each air heat exchanger (37, 38) is fitted into a corresponding one of the four upper openings (27) formed on both sides of the casing (12). That is, the air heat exchangers (37, 38) form outer walls of the casing (12).

[0061] Each air heat exchanger (37, 38) is an air heat exchanger formed in a flat plate shape and linearly extending as viewed in the plane. Two of the air heat exchangers (37, 38) are arranged on one of sides of the

body (20) of the casing (12) along the longitudinal direction thereof, and the remaining two of the air heat exchangers (37, 38) are arranged at the other side of the body (20) of the casing (12) along the longitudinal direction thereof. Specifically, each air heat exchanger (37, 38) is provided at a corresponding one of the upper openings (27) each surrounded by the reinforcement (25), the fan casing (13), the short-side support column (22), and the long-side support column (21) in the casing (12). Each air heat exchanger (37, 38) serves as a heat exchange part.

[0062] Of the four air heat exchangers (37, 38), two air heat exchangers (37, 38) arranged on one of the long sides of the body (20) of the casing (12) (i.e., arranged on a first side of the casing (12)) forms the first heat exchanger body (35), and two air heat exchangers (37, 38) arranged on the other long side of the body (20) of the casing (12) (i.e., arranged on a second side of the casing (12)) form the second heat exchanger body (36). Specifically, as viewed in FIG. 2, the first heat exchanger body (35) is disposed on the near side of the body (20) of the casing (12), and the second heat exchanger body (36) is disposed on the far side of the body (20) of the casing (12).

[0063] The first heat exchanger body (35) includes the first air heat exchanger (37) disposed on the front side of the casing (12), and the second air heat exchanger (38) disposed on the rear side of the casing (12). Similarly, the second heat exchanger body (36) includes the first air heat exchanger (37) disposed on the front side of the casing (12), and the second air heat exchanger (38) disposed on the rear side of the casing (12). The first air heat exchanger (37) and the second air heat exchanger (38) are configured as components independent from each other.

[0064] The first air heat exchanger (37) of the first heat exchanger body (35) and the first air heat exchanger (37) of the second heat exchanger body (36) are arranged such that an acute angle is, as viewed in the plane, formed at an intersection between an extension of the first air heat exchanger (37) of the first heat exchanger body (35) and an extension of the first air heat exchanger (37) of the second heat exchanger body (36). Outer end parts of the first air heat exchangers (37) whose extensions form the acute angle are arranged apart from each other with a predetermined distance. That is, the front wall (23) is provided between the outer end parts (37a) of the first air heat exchangers (37) whose extensions form the acute angle, and the opening for maintenance is formed at the front wall (23).

[0065] The second air heat exchanger (38) of the first heat exchanger body (35) and the second air heat exchanger (38) of the second heat exchanger body (36) are arranged such that an acute angle is, as viewed in the plane, formed at an intersection between an extension of the second air heat exchanger (38) of the first heat exchanger body (35) and an extension of the second air heat exchanger (38) of the second heat exchanger

body (36). Outer end parts of the second air heat exchangers (38) whose extensions form the acute angle are arranged apart from each other with a predetermined distance. That is, the rear wall (24) is provided between the outer end parts (38a) of the second air heat exchangers (38) whose extensions form the acute angle, and the opening for maintenance is formed at the rear wall (24).

[0066] The first air heat exchanger (37) and the second air heat exchanger (38) of the first heat exchanger body (35) are arranged such that one of the obtuse-angled pointed parts (39) positioned on the outermost side of the casing (12) is formed at the middle of the first heat exchanger body (35) as viewed in the plane. The long-side support column (21) of the body (20) on the first side of the casing (12) stands so as to vertically extend at the formation position of such a pointed part (39). Moreover, the first air heat exchanger (37) and the second air heat exchanger (38) of the second heat exchanger body (36) are arranged such that the other obtuse-angled pointed part (39) positioned on the outermost of the casing (12) is formed at the middle of the second heat exchanger body (36) as viewed in the plane. The long-side support column (21) of the body (20) on the second side of the casing (12) stands so as to vertically extend at the formation position of such a pointed part (39).

[0067] In the first heat exchanger body (35), an inner end part (37b) of the first air heat exchanger (37) and an inner end part (38b) of the second air heat exchanger (38) are arranged in proximity to each other to form one of the pointed parts (39). Moreover, in the second heat exchanger body (36), an inner end part (37b) of the first air heat exchanger (37) and an inner end part (38b) of the second air heat exchanger (38) are arranged in proximity to each other to form the other pointed part (39).

[0068] That is, the inner end part (37b) of the first air heat exchanger (37) and the inner end part (38b) of the second air heat exchanger (38) forms the pointed part (39) formed between adjacent ones of the outer walls arranged in a substantially hexagonal shape as viewed in the plane. The air blowers (17) are provided within the region surrounded by the first and second heat exchanger bodies (35, 36) as viewed in the plane, i.e., as viewed from the above the casing (12). Note that the first air heat exchanger (37) serves as a first heat exchange part of the present disclosure, and the second air heat exchanger (38) serves as a second heat exchange part of the present disclosure.

[0069] Each front door (23a) is a detachable metal plate. The plurality of front doors (23a) are provided in the order from the bottom member (60) to the fan casing (13) of the casing (12) at the front maintenance opening formed at the front wall (23) on one of the short sides of the casing (12). Thus, a technician can detach the front doors (23a), and can perform maintenance of, e.g., an electric component box provided inside the casing (12).

[0070] Each rear door (24a) is a detachable metal plate. The rear doors (24a) are provided at the rear maintenance opening formed at the rear wall (24) on the other

short side of the casing (12). Thus, a technician can detach the rear doors (24a), and can perform maintenance of, e.g., the electric component box (53) provided inside the casing (12).

[0071] The machine chamber (29) includes a first machine chamber (30) and a second machine chamber (31). The machine chamber cover (32) includes a first cover (33) and a second cover (34).

[0072] The first machine chamber (30) is formed below the first air heat exchanger (37) of the first heat exchanger body (35) and the first air heat exchanger (37) of the second heat exchanger body (36). In the first machine chamber (30), each first cover (33) stands so as to extend, along the longitudinal direction of the casing (12), from a corresponding one of the short-side support columns (22) forming the front wall (23). Referring to FIG. 10, in the first machine chamber (30), six compressors (50) each configured to compress refrigerant are placed on the compressor attachment plates (68). Each first cover (33) forms a first recess (43).

[0073] The second machine chamber (31) is formed below the second air heat exchanger (38) of the first heat exchanger body (35) and the second air heat exchanger (38) of the second heat exchanger body (36). In the second machine chamber (31), each second cover (34) stands so as to extend, along the longitudinal direction of the casing (12), from a corresponding one of the short-side support columns (22) forming the rear wall (24). Referring to FIG. 10, in the second machine chamber (31), e.g., a single water heat exchanger (51) configured to adjust the temperature of air conditioning water which is a target for temperature adjustment, two expansion units (expansion valves), and the electric component box (53) are placed on the heat exchanger attachment plate (69) and the closing plate (70). The water heat exchanger (51) is connected to two refrigerant circuits. Each second cover (34) forms a second recess (44).

[0074] Of the four recesses (43, 44), two recesses (43, 44) positioned on the first side of the casing (12) forms a single first body recess (41), and the other two recesses (43, 44) positioned on the second side of the casing (12) forms a single second body recess (42). Specifically, the first body recess (41) is, below the first heat exchanger body (35) of the casing (12), formed by the first and second covers (33, 34) arranged on the inside of the side surface of the first heat exchanger body (35). Moreover, the second body recess (42) is, below the second heat exchanger body (36) of the casing (12), formed by the first and second covers (33, 34) arranged on the inside of the side surface of the second heat exchanger body (36).

[0075] The first body recess (41) includes one of the first recesses (43) formed on the front side of the casing (12), and one of the second recesses (44) formed on the rear side of the casing (12). Similarly, the second body recess (42) includes the other first recess (43) formed on the front side of the casing (12), and the other second recess (44) formed on the rear side of the casing (12).

[0076] The first recess (43) formed on the first side of the casing (12) is, below the first air heat exchanger (37) of the first heat exchanger body (35), formed by the first cover (33) disposed on the inside of the first air heat exchanger (37). Moreover, the first recess (43) formed on the second side of the casing (12) is, below the first air heat exchanger (37) of the second heat exchanger body (36), formed by the first cover (33) disposed on the inside of the first air heat exchanger (37). Each first recess (43) forms a space through which air flows.

[0077] The second recess (44) formed on the first side of the casing (12) is, below the second air heat exchanger (38) of the first heat exchanger body (35), formed by the second cover (34) disposed on the inside of the second air heat exchanger (38). Moreover, the second recess (44) formed on the second side of the casing (12) is, below the second air heat exchanger (38) of the second heat exchanger body (36), formed by the second cover (34) disposed on the inside of the second air heat exchanger (38). Each second recess (44) forms a space through which air flows.

[0078] The space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other through the intermediate path (45) which will be described later.

[0079] The compressors (50), the water heat exchanger (51), a four-way valve(s) (not shown in the figure), the expansion units, and the air heat exchangers (37, 38) together form a vapor compression refrigerant circuit. Such a refrigerant circuit includes a first refrigerant circuit and a second refrigerant circuit, and the first and second refrigerant circuits can be operated independently of each other. That is, each refrigerant circuit switches the four-way valve (not shown in the figure) such that refrigerant reversibly circulates, thereby cooling or heating air conditioning water.

[0080] The first refrigerant circuit includes three of the compressors (50), the water heat exchanger (51), the four-way valve (not shown in the figure), one of the expansion units, and two (37) of the air heat exchangers (37, 38). The second refrigerant circuit includes the remaining three of the compressors (50), the water heat exchanger (51), the four-way valve (not shown in the figure), the other expansion unit, and the remaining two (38) of the air heat exchangers (37, 38). That is, in the chiller apparatus (10) of the present embodiment, since the first and second refrigerant circuits are separately operated, the first and second air heat exchangers (37, 38) can be operated independently of each other.

[0081] Note that components housed in the machine chamber (29) are not limited to the compressors (50), the water heat exchanger (51), the expansion units, and the electric component box (53). For example, an electric board and wires of an inverter circuit configured to control operation of the chiller apparatus (10) are housed in the electric component box (53).

[0082] The intermediate path (45) is an air path formed between the outer wall of the casing (12) defined by the

machine chamber cover (32) and the long-side support column (21), and serves as an air communication part of the present disclosure. The intermediate path (45) allows communication between the space formed by the first recess (43) and the space formed by the second recess (44) so that air can flow between both spaces. Air flowing through the first recess (43) can be supplied to the space formed by the second recess (44) through the intermediate path (45), whereas air flowing through the second recess (44) can be supplied to the space formed by the first recess (43) through the intermediate path (45).

Air Flow in Single Outdoor Unit

[0083] Next, a flow of air in a single heat pump chiller outdoor unit (11) will be described. Referring to FIGS. 14 and 15, air outside (around) the outdoor unit (11) is taken into the casing (12) from the outside through the first and second heat exchanger bodies (35, 36) exposed to the outside of the casing (12) (see arrows in FIGS. 14 and 15).

[0084] Of air outside of the casing (12), air flowing into the first recess (43) is guided upward to the outside of the first air heat exchanger (37). Subsequently, the air exchanges heat with refrigerant when passing through the first air heat exchanger (37) of the heat exchanger body (35, 36), and then is taken into the casing (12). Note that part of the air flowing into the first recess (43) is supplied to the second recess (44) through the intermediate path (45).

[0085] Of the air outside of the casing (12), air flowing into the second recess (44) is guided upward to the outside of the second air heat exchanger (38). Subsequently, the air exchanges heat with refrigerant when passing through the second air heat exchanger (38) of the heat exchanger body (35, 36), and then is taken into the casing (12). Note that part of the air flowing into the second recess (44) is supplied to the space formed by the first recess (43) through the intermediate path (45).

[0086] Since the space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other through the intermediate path (45) as described above, air can flow between both spaces. Thus, the flow rate of air flowing through the intermediate path (45) increases.

Operation

[0087] Next, the operation of the chiller apparatus (10) of the present disclosure will be described.

[0088] The chiller apparatus (10) first starts the air blowers (17) to take air outside of the casing (12) into the casing (12) through the first and second heat exchanger bodies (35, 36). Referring to FIGS. 16 and 17, in the case where three heat pump chiller outdoor units (11) are arranged in the width direction of the chiller apparatus (10), air outside of the casing (12) flows toward the outside of the first and second heat exchanger bodies (35, 36)

through clearances formed on both sides of the casing (12) in the longitudinal direction thereof, and then is taken into the casing (12) through the first and second air heat exchangers (37, 38).

[0089] Air outside the casing (12) flows into the first recesses (43) through the clearances formed on the front side of the casing (12). The air flowing into the first recess (43) is guided upward to the outside of the first air heat exchanger (37), and then flows into the casing (12) through the first air heat exchanger (37). Such air exchanges heat with refrigerant when passing through the first air heat exchanger (37). Part of the air flowing into the first recess (43) flows into the second recess (44) through the intermediate path (45).

[0090] Air outside the casing (12) flows into the second recesses (44) through the clearances formed on the rear side of the casing (12). The air flowing into the second recess (44) is guided upward to the outside of the second air heat exchanger (38), and then flows into the casing (12) through the second air heat exchanger (38). Such air exchanges heat with refrigerant when passing through the second air heat exchanger (38). Part of the air flowing into the second recess (44) flows into the first recess (43) through the intermediate path (45).

[0091] Since the space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other through the intermediate path (45) as described above, air can flow between both spaces. Thus, the flow rate of air flowing through the intermediate path (45) increases.

[0092] The air taken into the casing (12) through each air heat exchanger (37, 38) is upwardly discharged from the casing (12) through the air discharge ports (14) by the air blowers (17) provided in an upper part of the casing (12).

[0093] Next, operation of the refrigerant circuits in the case where air conditioning water in the water heat exchanger (51) is used for cooling will be described.

[0094] In the first refrigerant circuit, the compressors (50) are started to compress refrigerant. The compressed refrigerant discharged from the compressors (50) flows into the first air heat exchangers (37). In each of the first and second heat exchanger bodies (35, 36), when air outside the casing (12) passes through the first air heat exchanger (37) forming the heat exchanger body (35, 36), the refrigerant dissipates heat to the air to be taken into the casing (12) to heat such air. The refrigerant cooled by dissipating the heat to the air is expanded by the expansion valve, and then flows into the water heat exchanger (51). In the water heat exchanger (51), the refrigerant absorbs heat from air conditioning water flowing through the water heat exchanger (51) to cool the air conditioning water. The cooled air conditioning water is supplied into the building. The refrigerant flowing out from the water heat exchanger (51) is sucked into the compressors (50) again, and is compressed.

[0095] In the second refrigerant circuit, the compressors (50) are started to compress refrigerant. The com-

pressed refrigerant discharged from the compressors (50) flows into the second air heat exchangers (38). In each of the first and second heat exchanger bodies (35, 36), when air outside the casing (12) passes through the second air heat exchanger (38) forming the heat exchanger body (35, 36), the refrigerant dissipates heat to the air to be taken into the casing (12) to heat such air. The refrigerant cooled by dissipating the heat to the air is expanded by the expansion valve, and then flows into the water heat exchanger (51). In the water heat exchanger (51), the refrigerant absorbs heat from air conditioning water flowing through the water heat exchanger (51) to cool the air conditioning water. The cooled air conditioning water is supplied into the building. The refrigerant flowing out from the water heat exchanger (51) is sucked into the compressors (50) again, and is compressed.

[0096] Operation of the refrigerant circuits in the case where air conditioning water in the water heat exchanger (51) is used for heating will be described.

[0097] In the first refrigerant circuit, the compressors (50) are started to compress refrigerant. The compressed refrigerant discharged from the compressors (50) flows into the water heat exchanger (51). In the water heat exchanger (51), the refrigerant dissipates heat to air conditioning water flowing through the water heat exchanger (51) to heat such air conditioning water. The heated air conditioning water is supplied into the building. The refrigerant flowing out from the water heat exchanger (51) is expanded by the expansion valve, and then flows into the first air heat exchangers (37). In each of the first and second heat exchanger bodies (35, 36), when air outside the casing (12) passes through the first air heat exchanger (37) forming the heat exchanger body (35, 36), the refrigerant absorbs heat from the air to be taken into the casing (12) to cool such air. The refrigerant flowing out from the first air heat exchangers (37) is sucked into the compressors (50) again, and is compressed.

[0098] In the second refrigerant circuit, the compressors (50) are started to compress refrigerant. The compressed refrigerant discharged from the compressors (50) flows into the water heat exchanger (51). In the water heat exchanger (51), the refrigerant dissipates heat to air conditioning water flowing through the water heat exchanger (51) to heat such air conditioning water. The heated air conditioning water is supplied into the building. The refrigerant flowing out from the water heat exchanger (51) is expanded by the expansion valve, and then flows into the second air heat exchangers (38). In each of the first and second heat exchanger bodies (35, 36), when air outside the casing (12) passes through the second air heat exchanger (38) forming the heat exchanger body (35, 36), the refrigerant absorbs heat from the air to be taken into the casing (12) to cool such air. The refrigerant flowing out from the second air heat exchangers (38) is sucked into the compressors (50) again, and is compressed.

[0099] Next, maintenance of the chiller apparatus (10)

by a technician will be described.

[0100] When the technician performs maintenance, the chiller apparatus (10) is stopped, and the machine chamber cover (32) is detached so that, e.g., maintenance of the compressors (50) of the first and second machine chambers (30, 31) can be performed through the lower opening (28). Moreover, the front doors (23a) or the rear doors (24a) are detached so that, e.g., maintenance of the electric component box (53) can be performed from the front or rear side of the casing (12) of the outdoor unit (11).

Single-Circuit Operation

[0101] The outdoor units (11) of the present embodiment can be, referring to FIG. 18, operated using only a single circuit depending on a load. Specifically, the operation of the chiller apparatus (10) can be performed using only the first refrigerant circuit. If the operation of the chiller apparatus (10) is performed using only the single circuit, the air blowers (17) for the second refrigerant circuit are stopped.

[0102] First, air outside the casing (12) flows into the outside of the first and second heat exchanger bodies (35, 36) through the clearances formed on the front side of the casing (12), and then is taken into the casing (12) through each first air heat exchanger (37).

[0103] Moreover, air outside the casing (12) flows into the first recesses (43) through the clearances formed on the front side of the casing (12). The air flowing into the space of the first recess (43) is guided upward to the outside of the first air heat exchanger (37), and then flows into the casing (12) through the first air heat exchanger (37). Subsequently, such air exchanges heat with refrigerant when passing through the first air heat exchanger (37).

[0104] Further, air outside the casing (12) flows into the second recesses (44) through the clearances formed on the rear side of the casing (12). As described above, the space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other through the intermediate path (45). Thus, the air flowing through the second recess (44) is supplied to the first recess (43) through the intermediate path (45). Thus, the volume of air flowing through the first recess (43) increases.

[0105] The air taken into the casing (12) through the first air heat exchangers (37) is upwardly discharged from the casing (12) through the air discharge ports (14) by the air blowers (17) provided in the upper part of the casing (12).

Advantages of the Embodiment

[0106] According to the foregoing embodiment, since the first and second body recesses (41, 42) are formed, air can be, in addition to air flowing outside the first and second heat exchanger bodies (35, 36), guided upward

to the outside of the first and second heat exchanger bodies (35, 36). Thus, the flow rate of air passing through the first and second air heat exchangers (37, 38) can be increased (see FIG. 20). This improves a heat exchange efficiency of the first and second air heat exchangers (37, 38). As a result, in the outdoor unit (11) including the air heat exchangers (37, 38) arranged in a substantially hexagonal shape as viewed in the plane, a heat exchange efficiency thereof can be improved.

[0107] Since the intermediate path (45) is formed such that the space formed by the first recess (43) and the space formed by the second recess (44) communicate with each other, air flowing through the space of the first recess (43) can be supplied to the second recess (44), and air flowing through the second recess (44) can be supplied to the first recess (43). This increases the flow rate of air in both spaces of the first and second recesses (43, 44). In a conventional apparatus, since part of a casing below first and second heat exchanger bodies is apart from air blowers, air becomes difficult to flow in such a part of the casing (see FIG. 19). However, in the present embodiment, since the intermediate path (45) increases the flow rate of air flowing through both spaces of the first and second recesses (43, 44), the flow rate of air in part of the casing (12) below the first and second heat exchanger bodies (35, 36) can be increased (see FIG. 20). This improves the heat exchange efficiency of the first and second air heat exchangers (37, 38). As a result, in the outdoor unit (11) including the air heat exchangers (37, 38) arranged in a substantially hexagonal shape as viewed in the plane, the heat exchange efficiency thereof can be improved.

[0108] Since the machine chamber (29) is formed on the inside relative to the first and second body recesses (41, 42), maintenance of the components in the machine chamber (29) can be performed through the first and second body recesses (41, 42).

[0109] Each reinforcement (25) receiving drainage water is provided along the first heat exchanger body (35) or the second heat exchanger body (36), and is provided so as to support the first heat exchanger body (35) or the second heat exchanger body (36) from the below. Thus, the first and second heat exchanger bodies (35, 36) can be reinforced, and drainage water flowing out from the first heat exchanger body (35) or the second heat exchanger body (36) can flow into a corresponding one of the reinforcements (25).

[0110] The first air heat exchanger (37) and the second air heat exchanger (38) are operated independently of each other. Thus, when only the first air heat exchanger (37) is operated, air supplied from the second recess (44) to the first recess (43) can be guided to the first air heat exchanger (37). Accordingly, the flow rate of air flowing through the first air heat exchanger (37) which is in operation can be increased. When only the second air heat exchanger (38) is operated, air supplied from the first recess (43) to the second recess (44) can be guided to the second air heat exchanger (38). Accordingly, the flow

rate of air flowing through the second air heat exchanger (38) which is in operation can be increased.

Variation of the Embodiment

[0111] Next, a variation of the foregoing embodiment will be described. A chiller apparatus (10) of the present variation is different from the chiller apparatus (10) of the foregoing embodiment in the configuration of a bottom member (60). Note that only a difference of the present variation from the foregoing embodiment will be described.

[0112] Specifically, in the present variation, a stand (72) on which a water outlet pipe of the water heat exchanger (51) is placed is provided on the body frame (63) of the second bottom frame (62), and no pump stand is provided. Other configurations, features, and advantages are similar to those of the foregoing embodiment.

<Other Embodiments>

[0113] The foregoing embodiment may have the following configurations.

[0114] A plurality of outdoor units (11) of the foregoing embodiment may be connected together, or a single outdoor unit (11) may be placed along a wall.

[0115] In the foregoing embodiment, the machine chamber cover (32) is provided to form the body recess (41, 42) such that the machine chamber (29) is formed. The present disclosure is not limited to such a configuration. Specifically, the six compressors (50), the water heat exchanger (51), the expansion units, the electric component box (53), etc. may be arranged in the air path, without providing the machine chamber cover (32). That is, in the present embodiment, the components of the outdoor unit (11), such as the six compressors (50), the water heat exchanger (51), the expansion units, and the electric component box (53), are arranged in the air path.

[0116] Note that the foregoing embodiments have been set forth merely for the purpose of preferred examples in nature, and are not intended to limit the scope, applications, and use of the invention.

INDUSTRIAL APPLICABILITY

[0117] As described above, the present disclosure is useful for the refrigerating apparatus including the heat exchangers.

DESCRIPTION OF REFERENCE CHARACTERS

[0118]

- 10 Chiller Apparatus
- 11 Outdoor Unit
- 12 Casing
- 17 Air Blower
- 25 Reinforcement (Reinforcement Member)

- 29 Machine Chamber
- 35 First Heat Exchanger Body
- 36 Second Heat Exchanger Body
- 37 First Air Heat Exchanger (First Heat Exchange Part)
- 38 Second Air Heat Exchanger (Second Heat Exchange Part)
- 39 Pointed Part
- 41 First Body Recess
- 42 Second Body Recess
- 43 First Recess
- 44 Second Recess
- 45 Intermediate Path (Air Communication Part)

Claims

1. An outdoor unit including a casing (12) and a heat exchanger body (35, 36) disposed so as to extend along a side of the casing (12) and exposed to an outside of the casing (12), in which a pointed part (39) positioned on an outermost side of the casing (12) is formed at a middle of the heat exchanger body (35, 36) as viewed in plane, and air flows from the outside to the casing (12) through the heat exchanger body (35, 36), the outdoor unit comprising: an air blower (17) disposed in an upper part of the casing (12) and configured to discharge the air from the casing (12) to the outside, wherein a body recess (41, 42) formed below the heat exchanger body (35, 36) of the casing (12) and recessed inward relative to a side surface of the heat exchanger body (35, 36) is formed.
2. The outdoor unit of claim 1, wherein the heat exchanger body (35, 36) includes first and second heat exchanger bodies (35, 36) each disposed so as to extend along a corresponding one of sides of the casing (12), each of the first and second heat exchanger bodies (35, 36) includes first and second heat exchange parts (37, 38) linearly extending toward the outside of the casing (12) such that an obtuse-angled pointed part (39) positioned on the outermost side of the casing (12) is formed at a middle of the each of the first and second heat exchanger bodies (35, 36) as viewed in the plane, and the body recess (41, 42) includes first and second body recesses (41, 42) each formed below a corresponding one of the first and second heat exchanger bodies (35, 36) of the casing (12) and recessed inward relative to a side surface of a corresponding one of the first and second heat exchanger bodies (35, 36).

3. The outdoor unit of claim 2, wherein
each of the first and second body recesses (41, 42)
includes first and second recesses (43, 44) each po-
sitioned below a corresponding one of the first and
second heat exchange parts (37, 38) and each re- 5
cessed inward relative to a side surface of a corre-
sponding one of the first and second heat exchange
parts (37, 38), and
an air communication part (45) allowing communi-
cation between a space formed by the first recess 10
(43) and a space formed by the second recess (44)
is formed.

4. The outdoor unit of claim 2, wherein
in the casing (12), a machine chamber (29) in which 15
a component is housed is formed on an inside of the
first and second body recesses (41, 42).

5. The outdoor unit of claim 2, wherein
the casing (12) includes a reinforcement member 20
(25) which extends along the first or second heat
exchanger body (35, 36)
to support, from below, at least one of the first or
second heat exchange part (37, 38) of the first or
second heat exchanger body (35, 36) along which 25
the reinforcement member (25) extends and
to receive drainage water from the at least one of
the first or second heat exchange part (37, 38).

6. The outdoor unit of claim 2, wherein 30
the first and second heat exchange parts (37, 38)
are connected to different refrigerant circuits to be
operated independently of each other.

7. A refrigerating apparatus comprising: 35

the outdoor unit (11) of claim 1.

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FIG.1

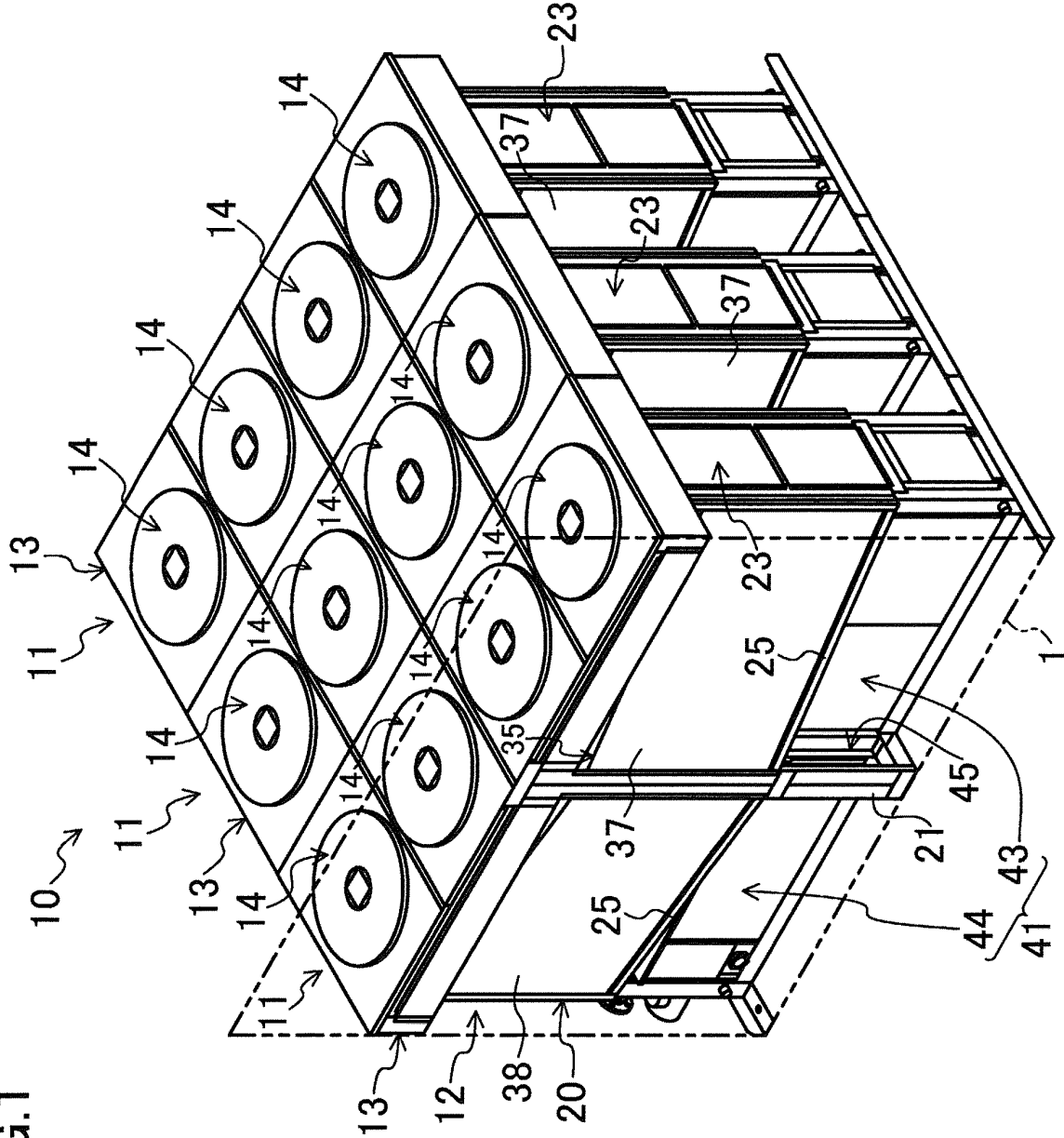


FIG.2

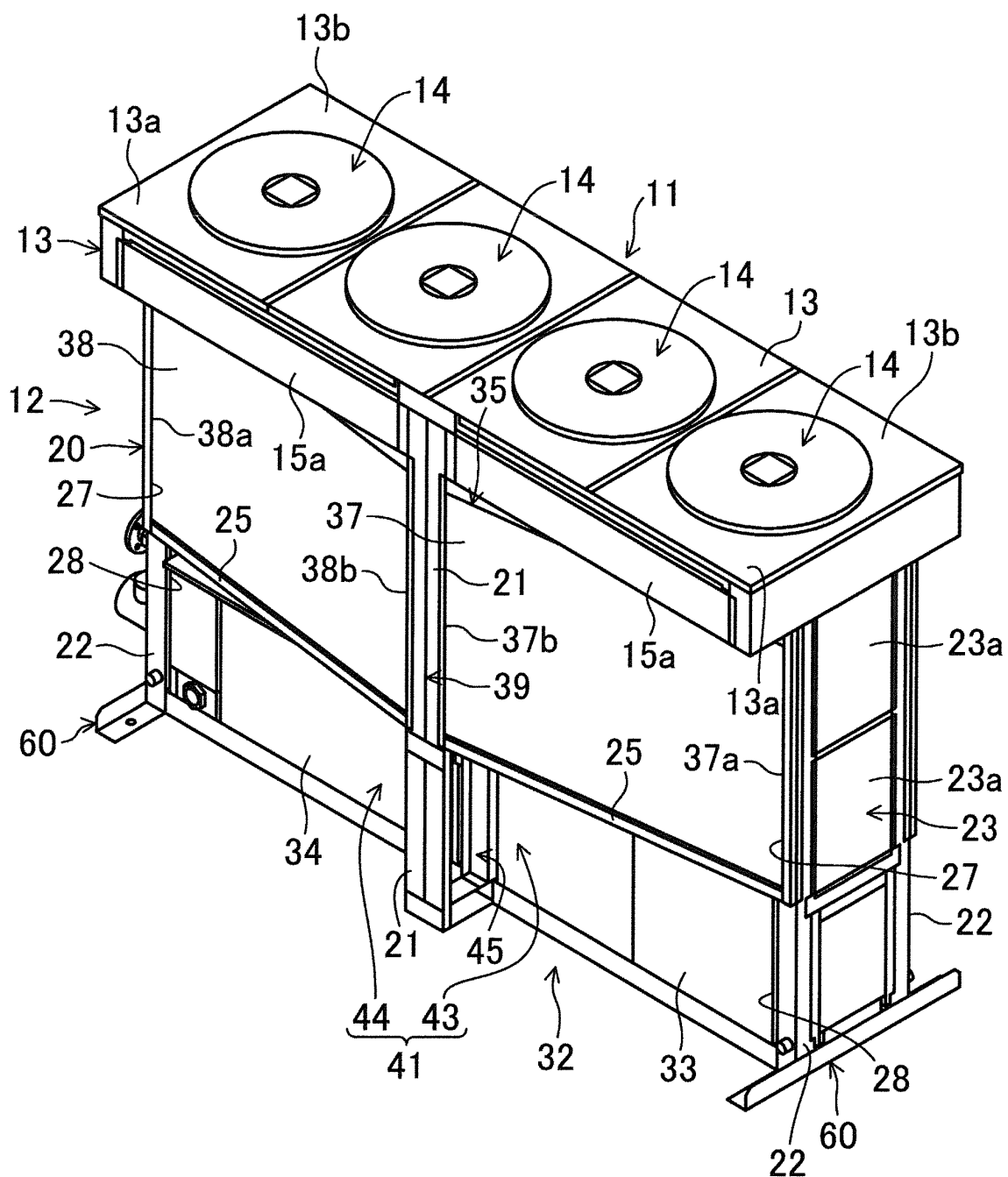


FIG.3

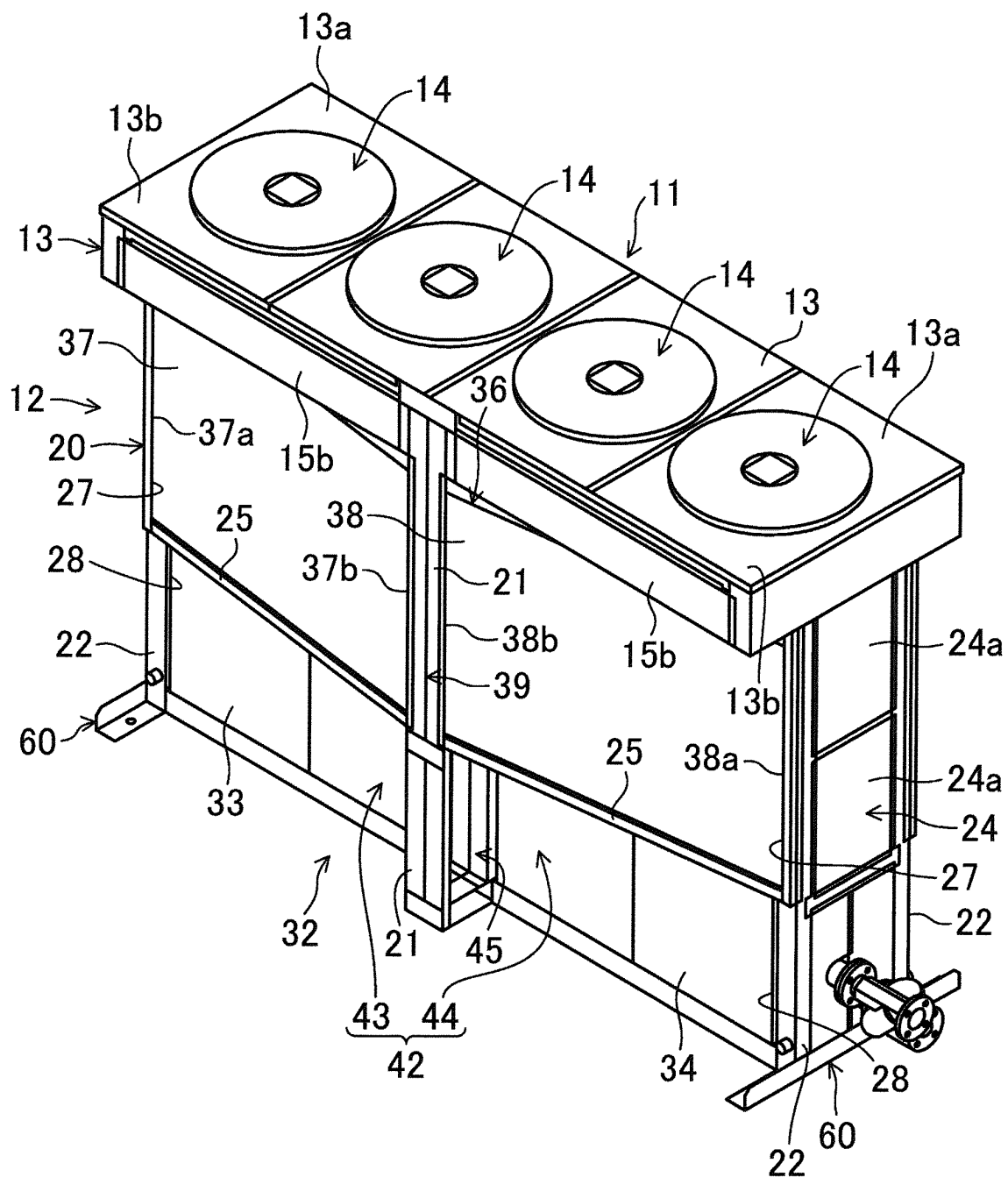


FIG.4

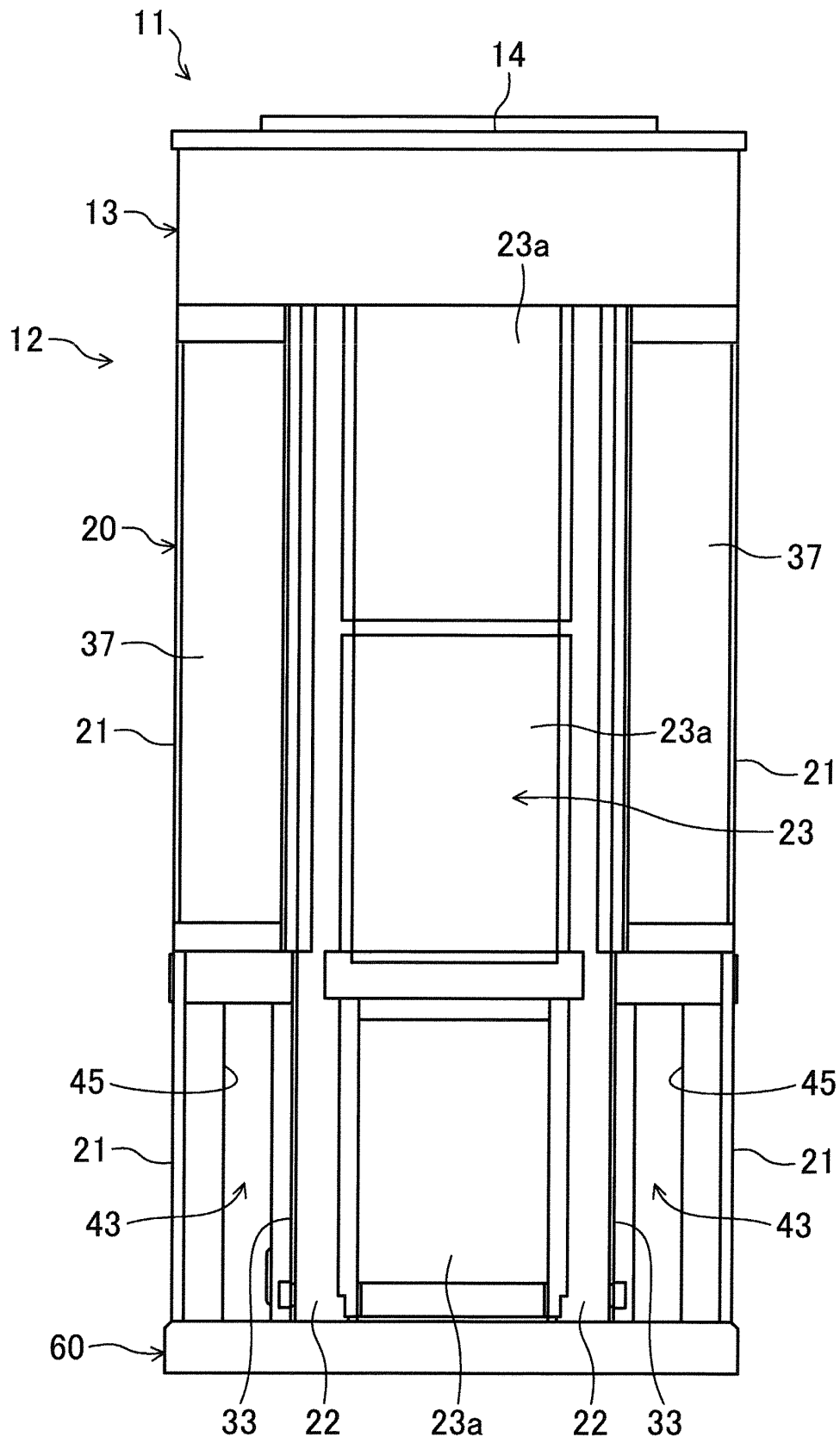


FIG.5

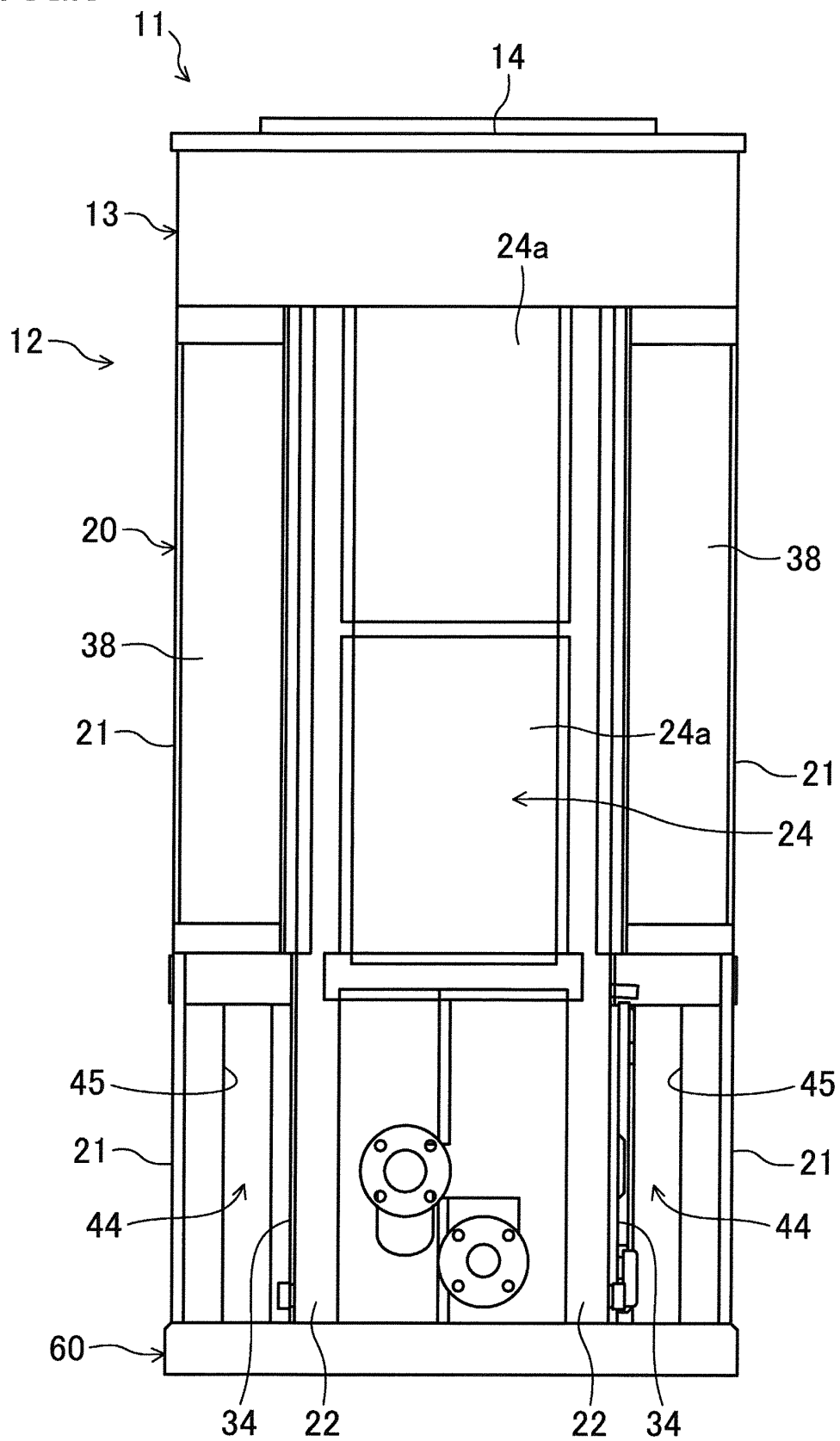


FIG.6

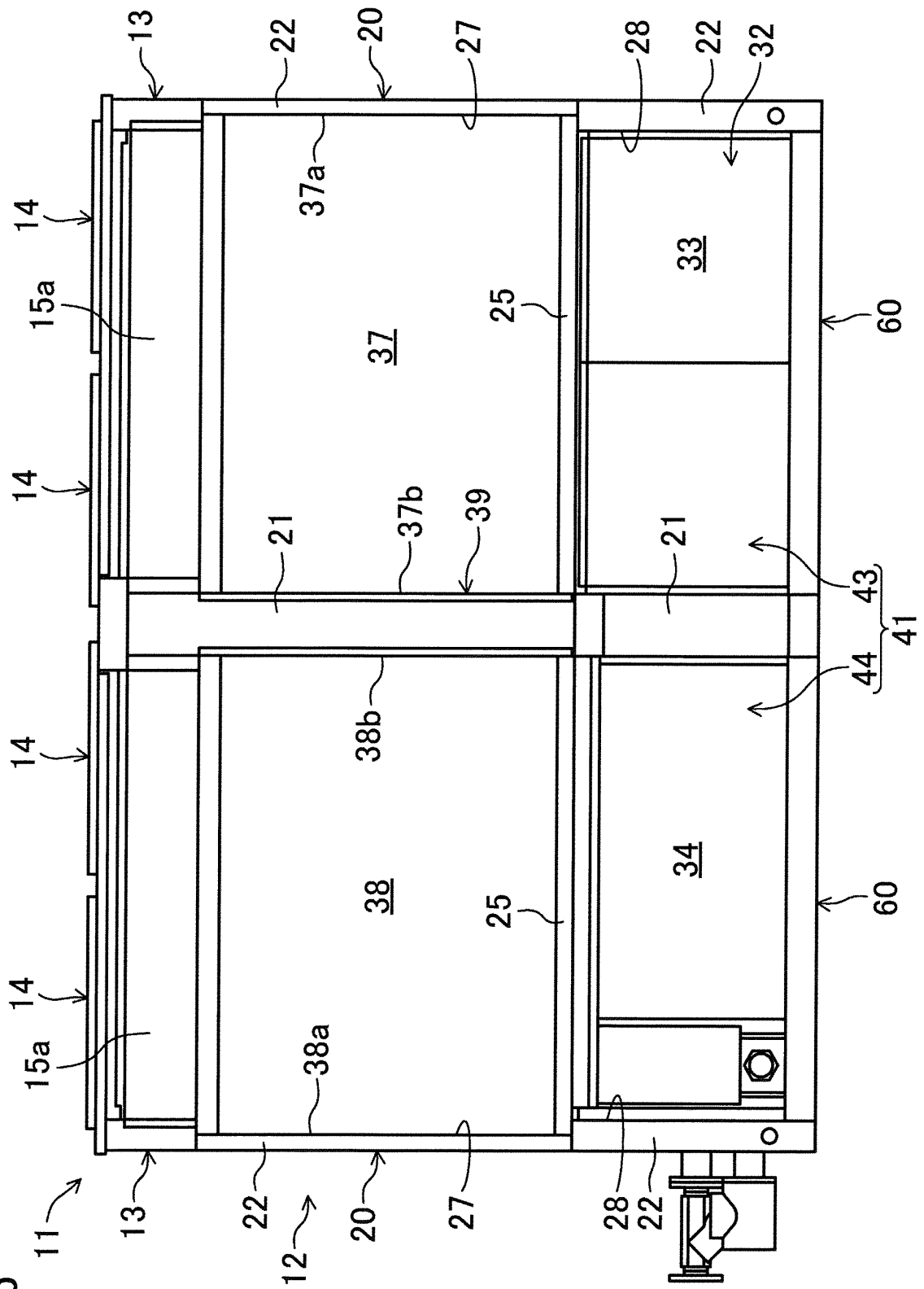


FIG. 7

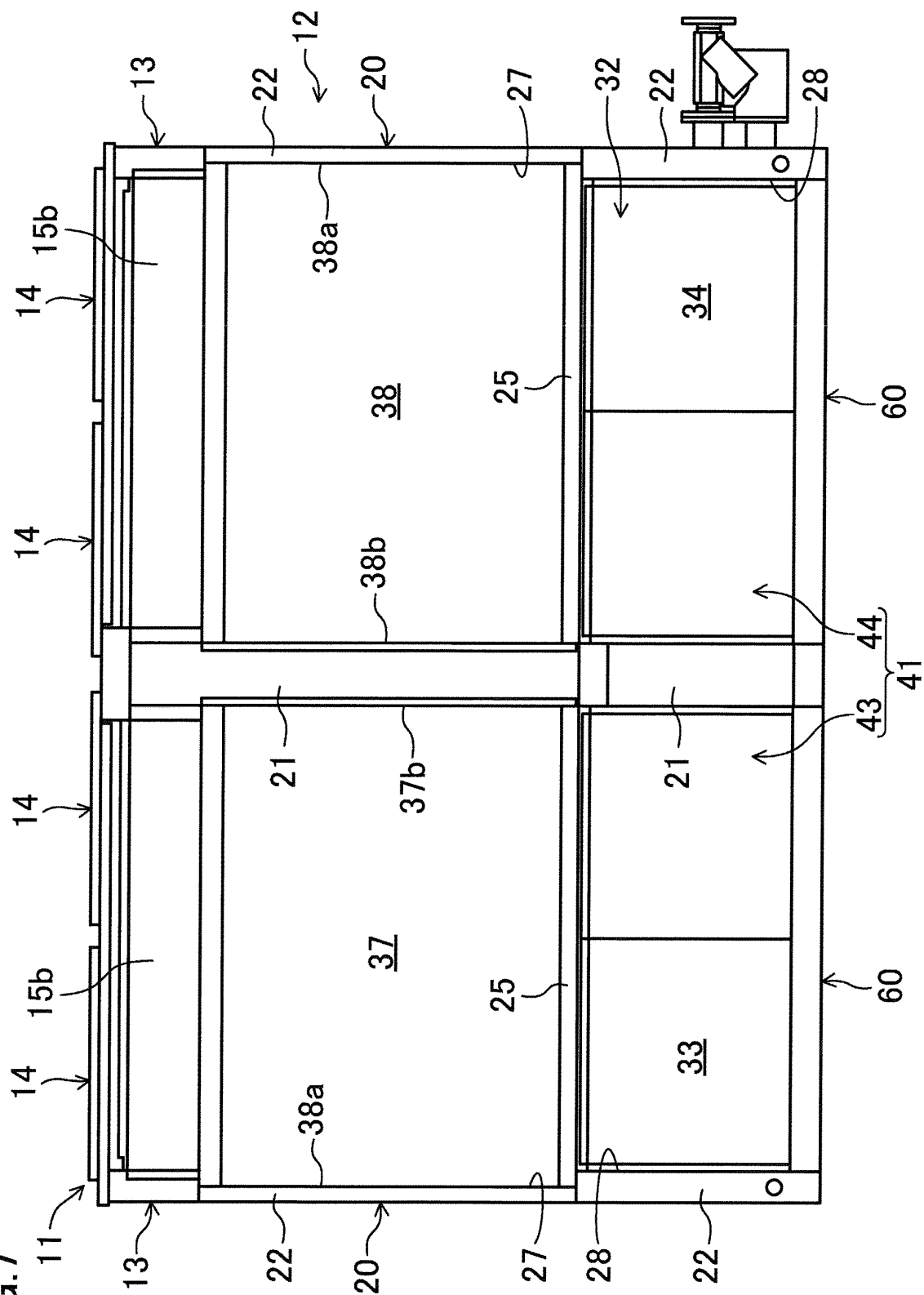


FIG.8

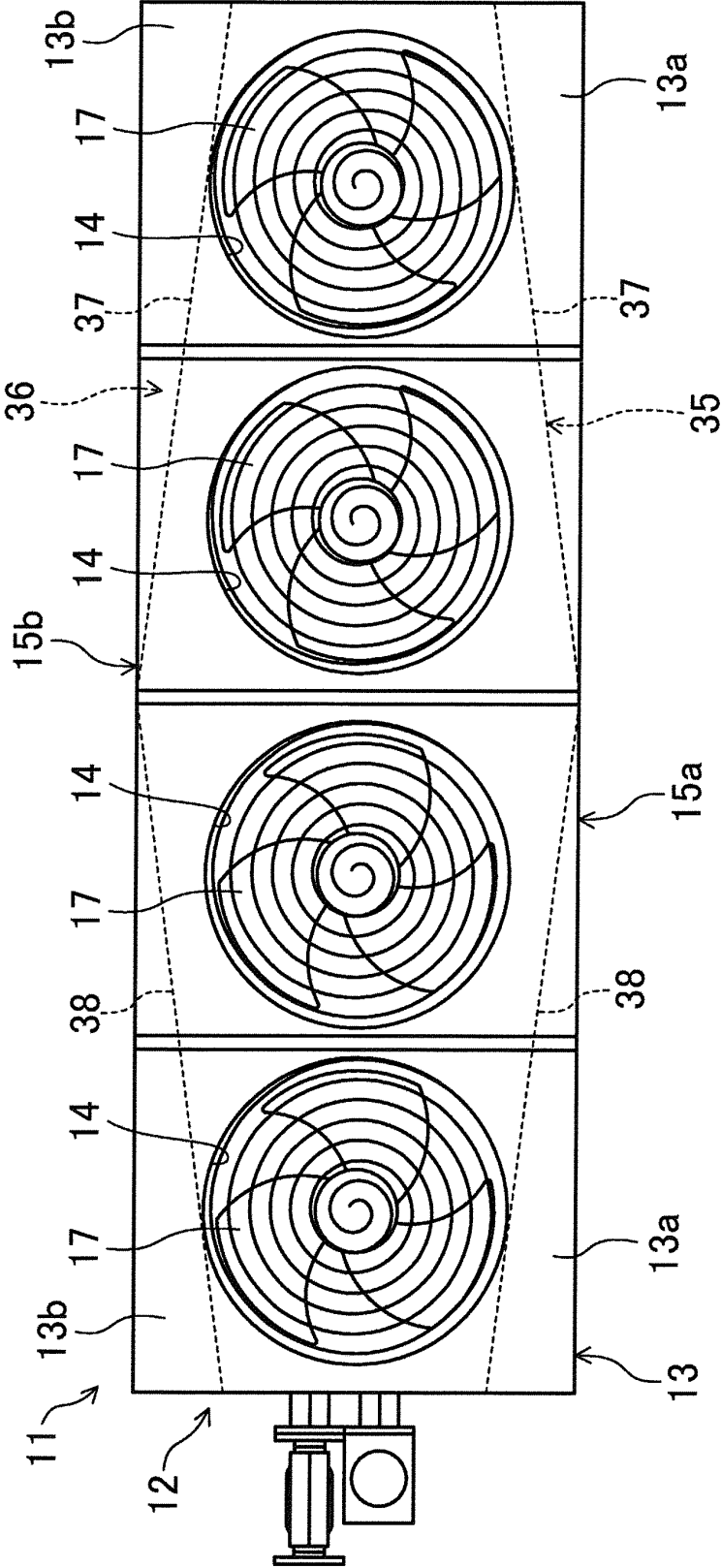


FIG.9

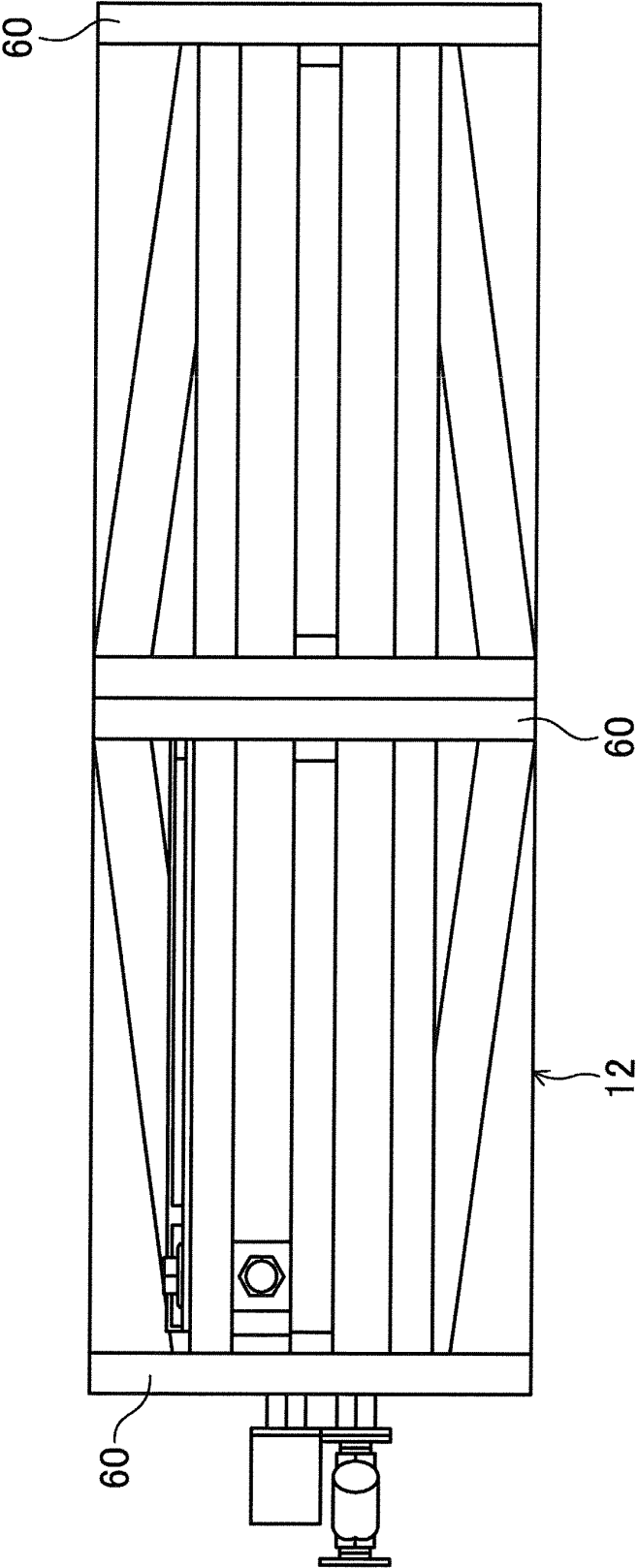


FIG.10

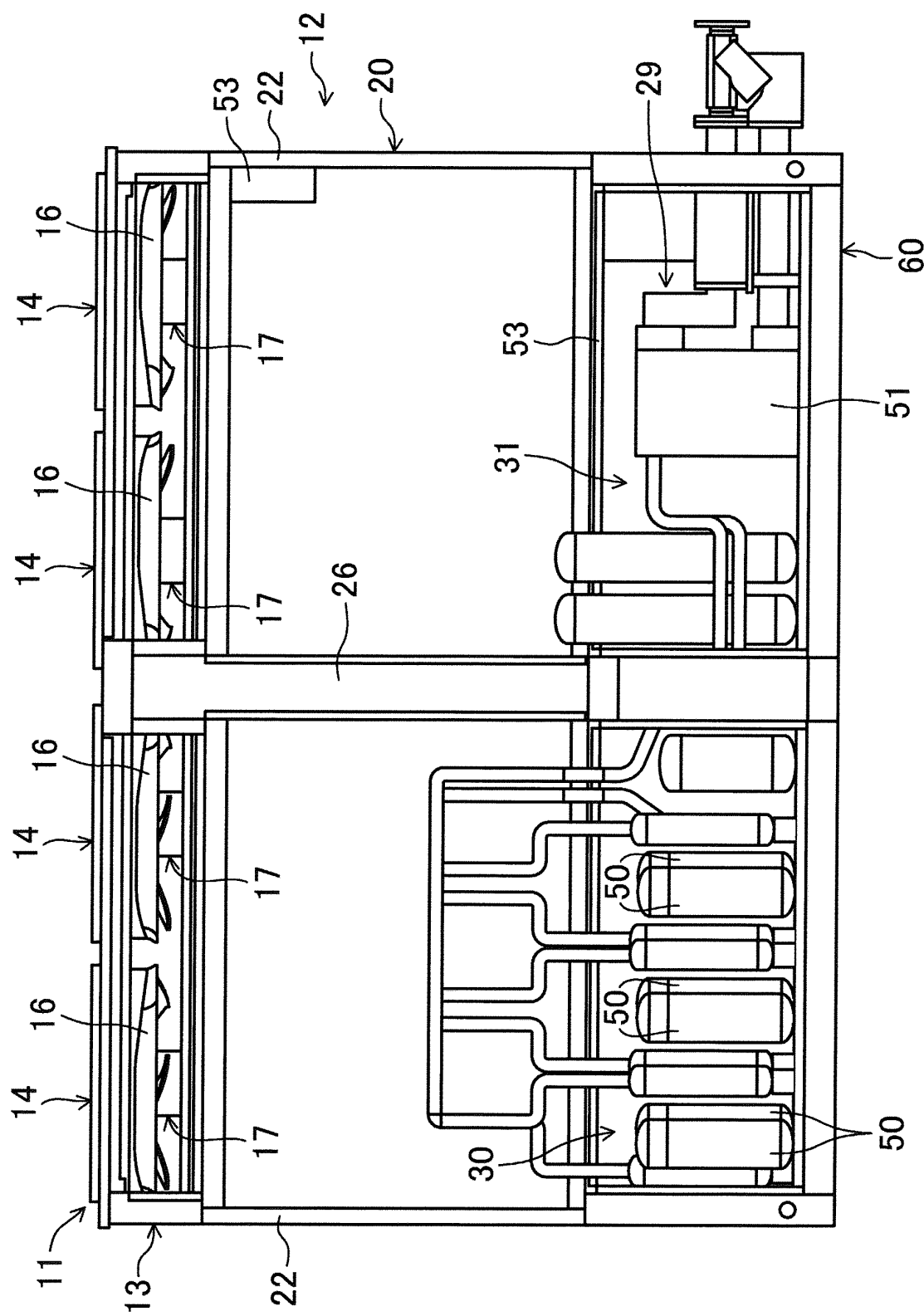


FIG.11

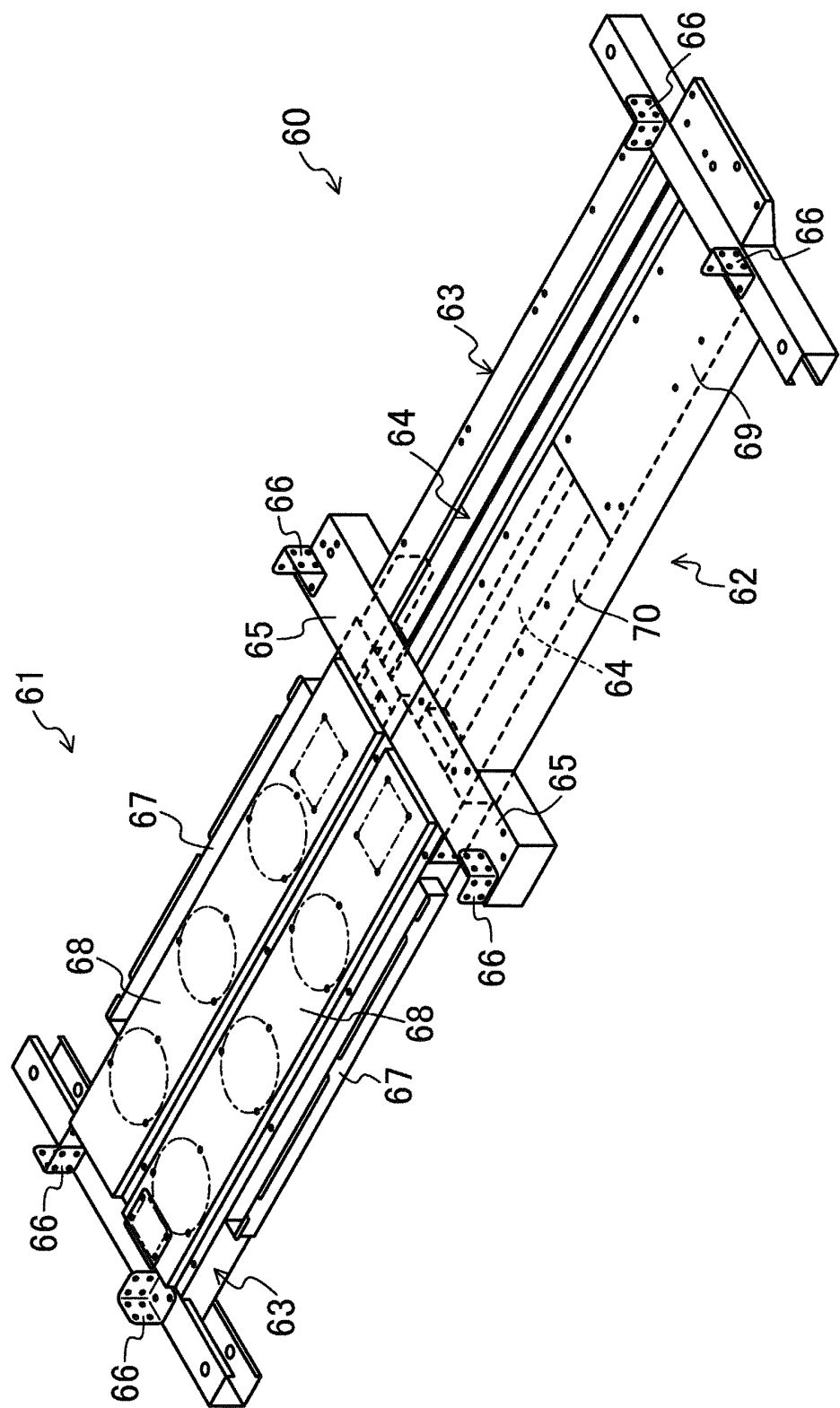


FIG.12

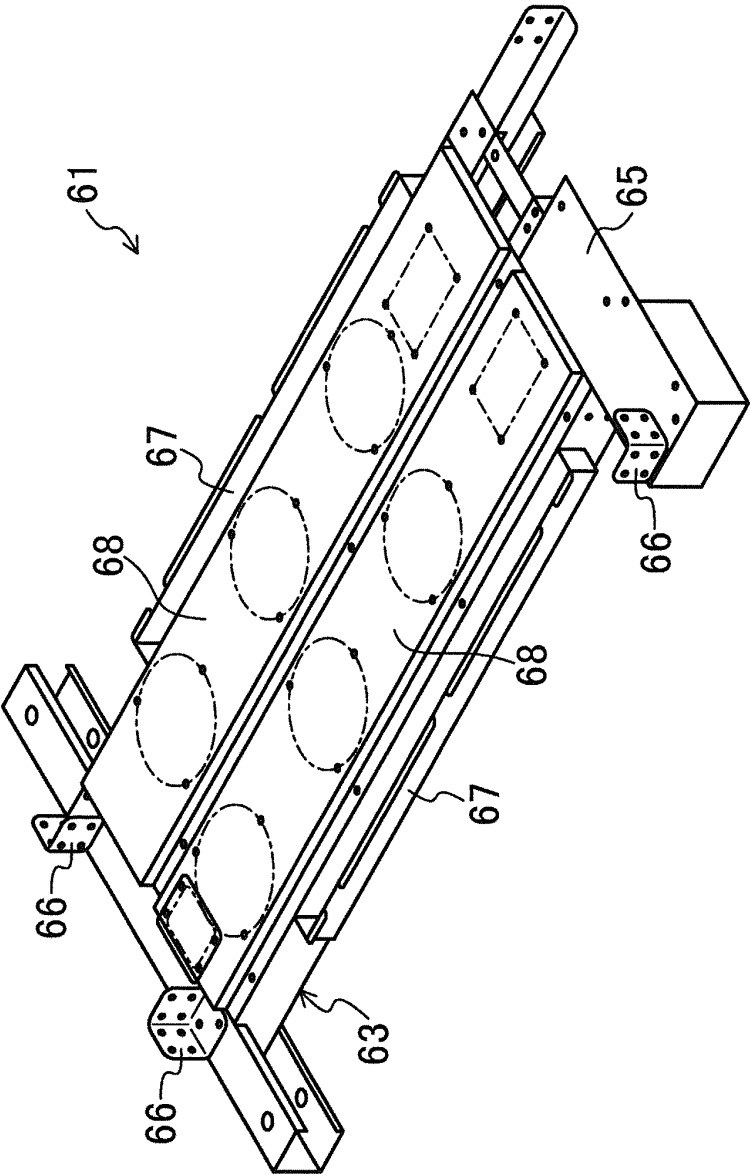


FIG.13

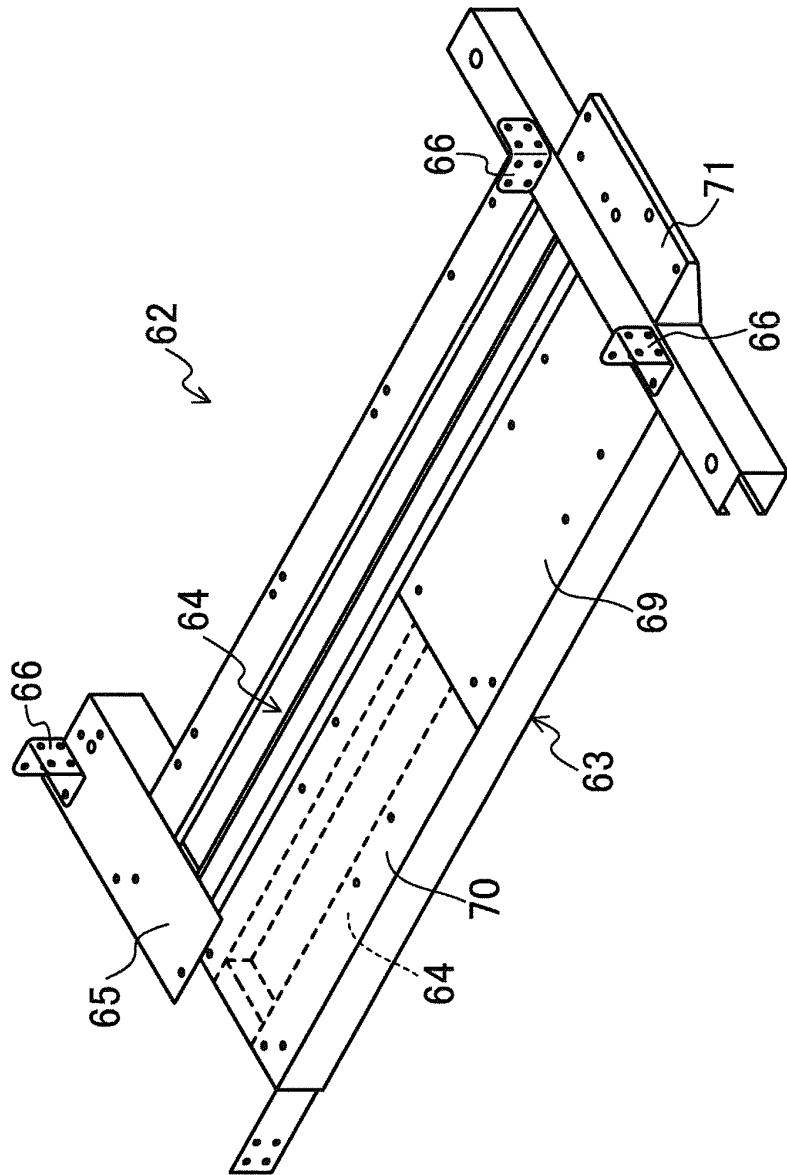


FIG.14

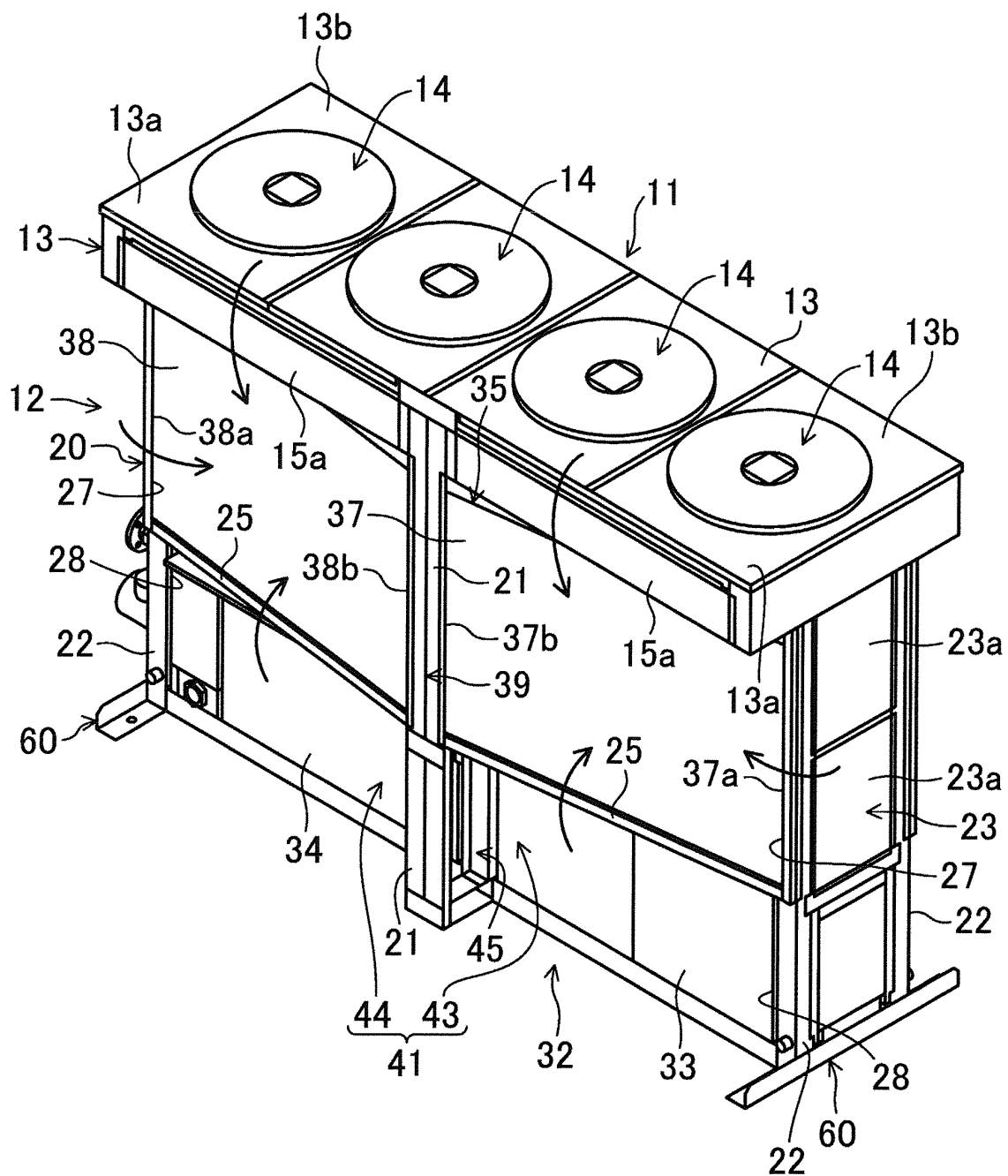


FIG.15

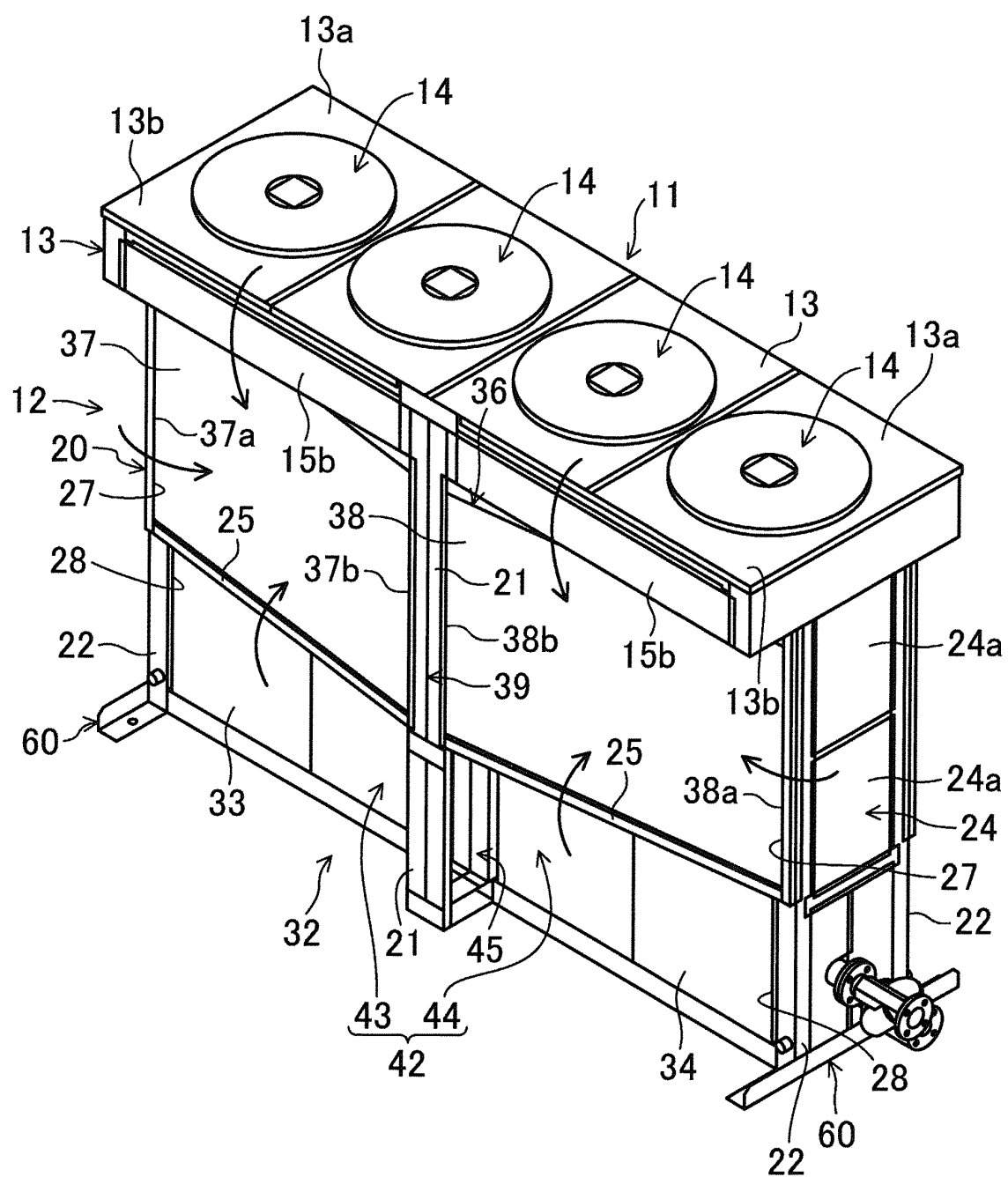


FIG.16

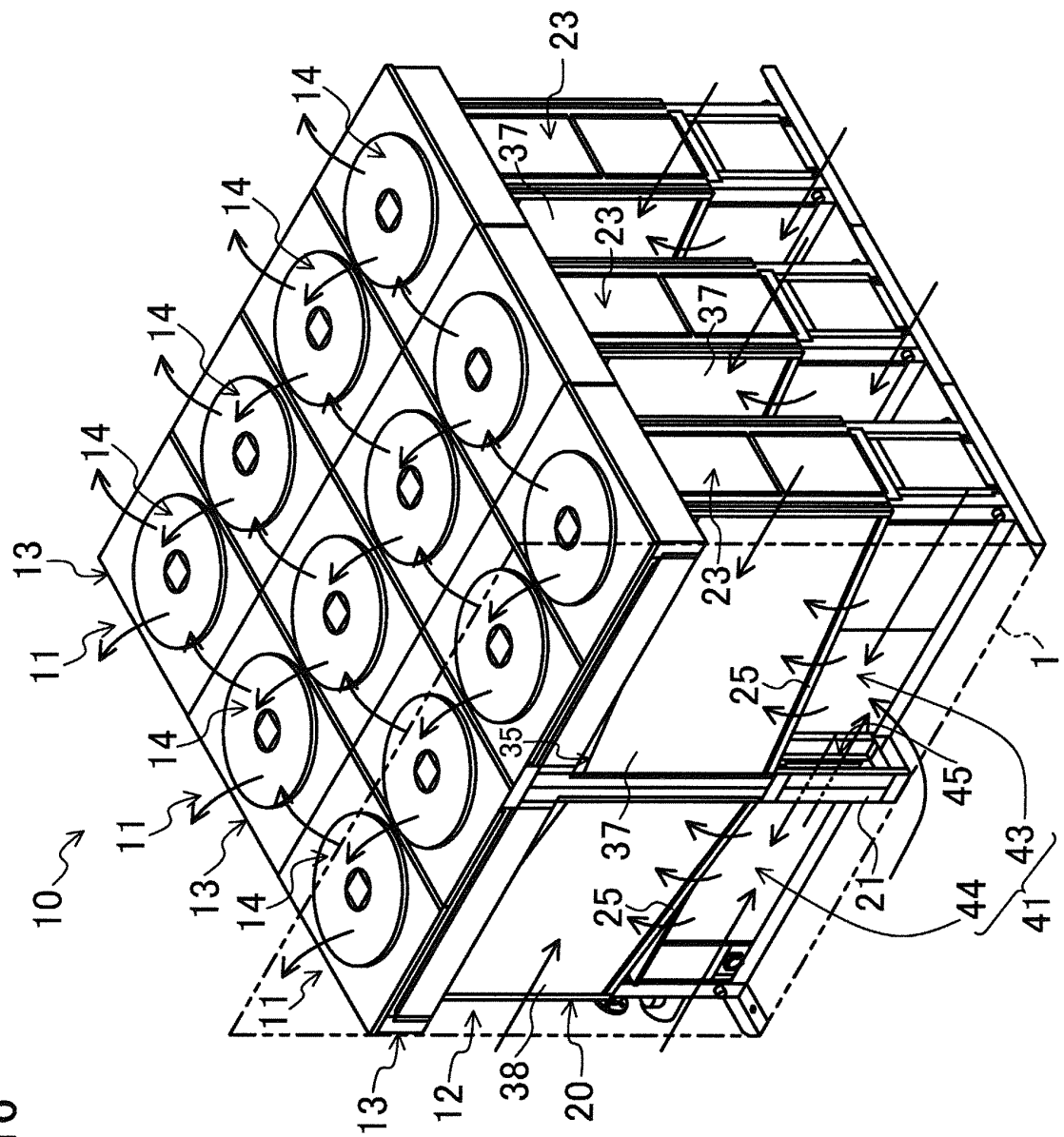


FIG.17

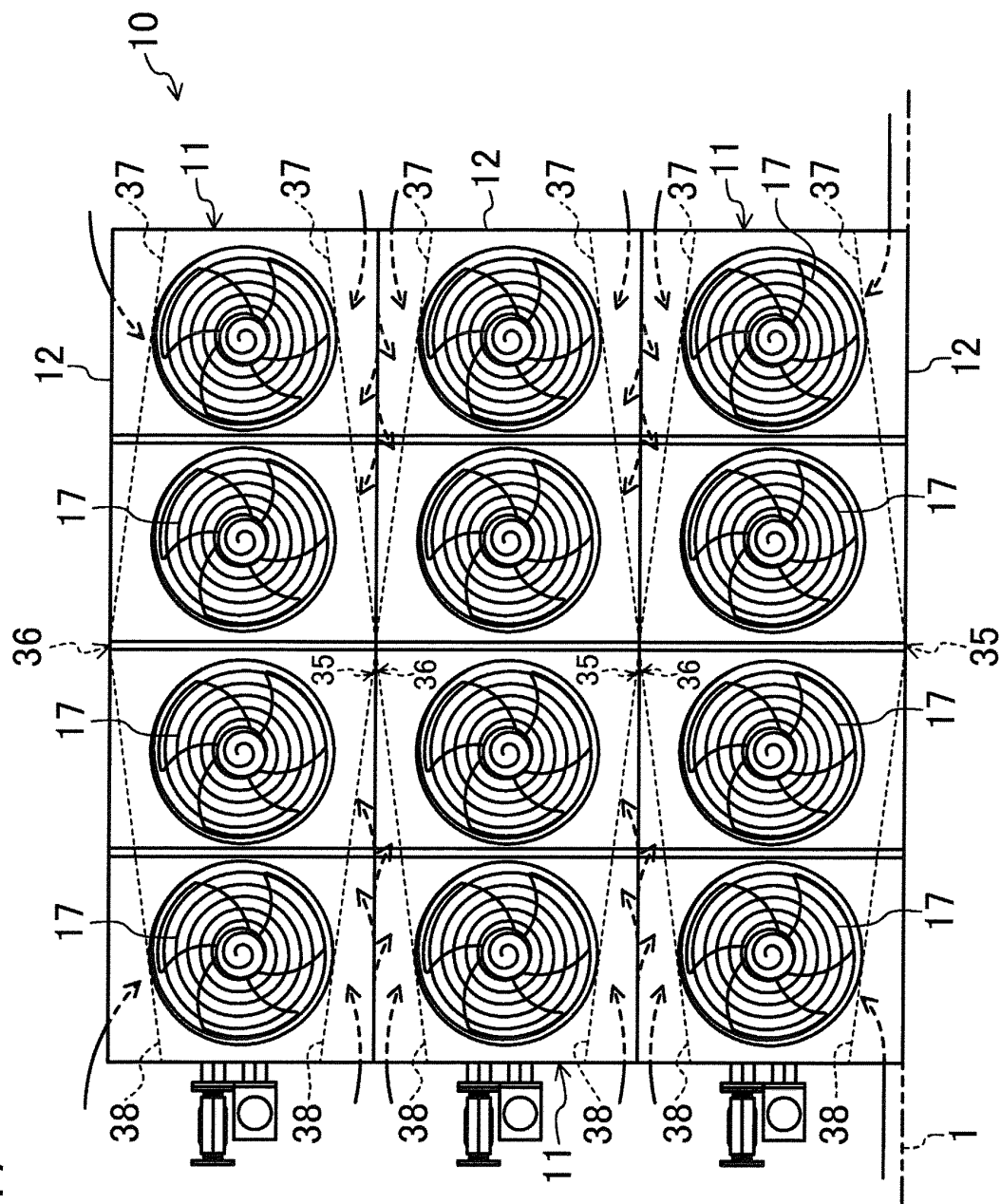


FIG.18

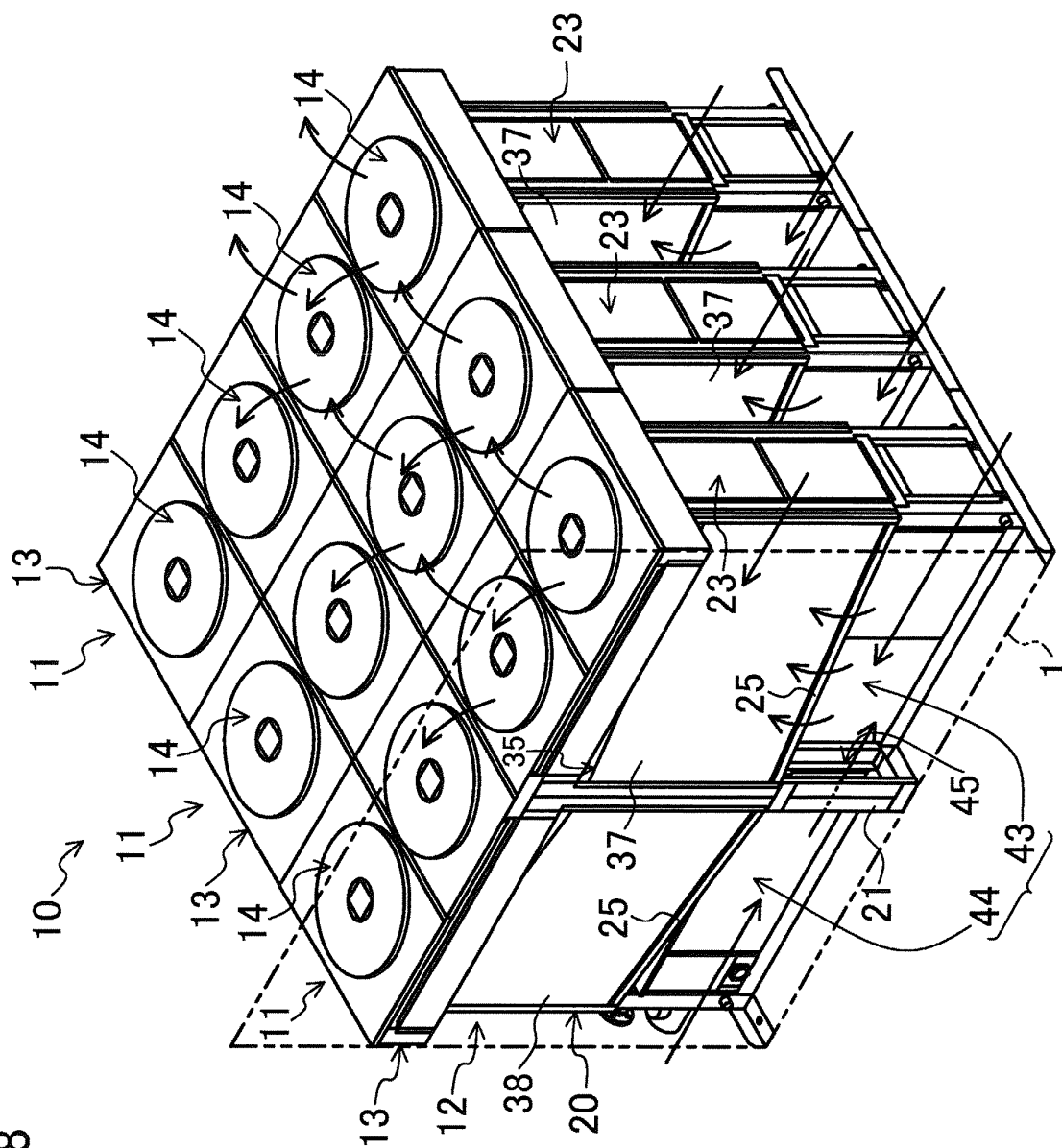


FIG.19

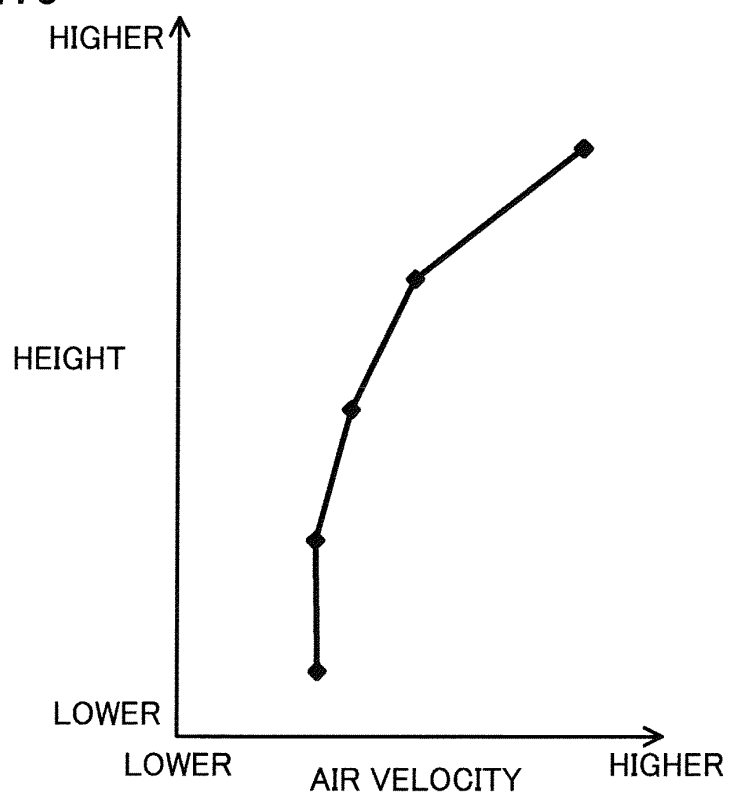


FIG.20

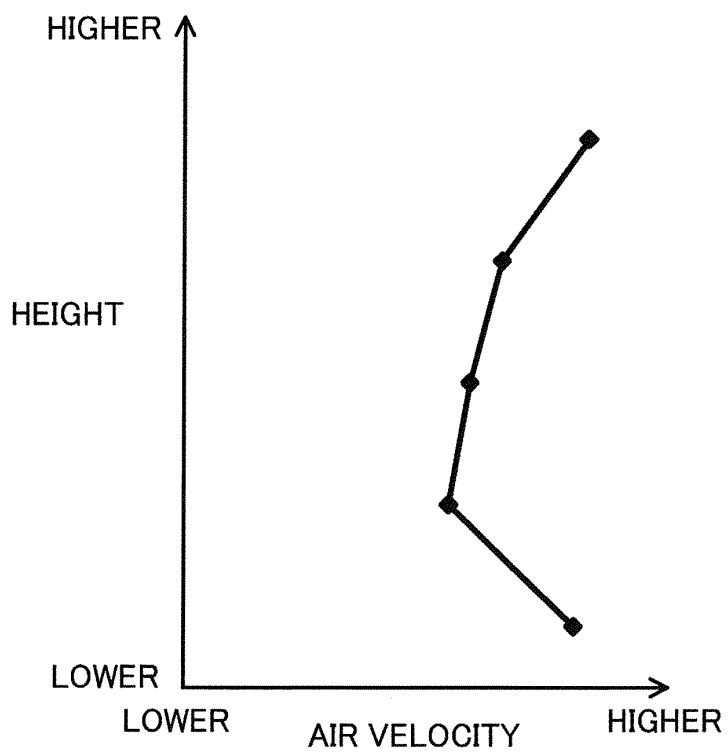
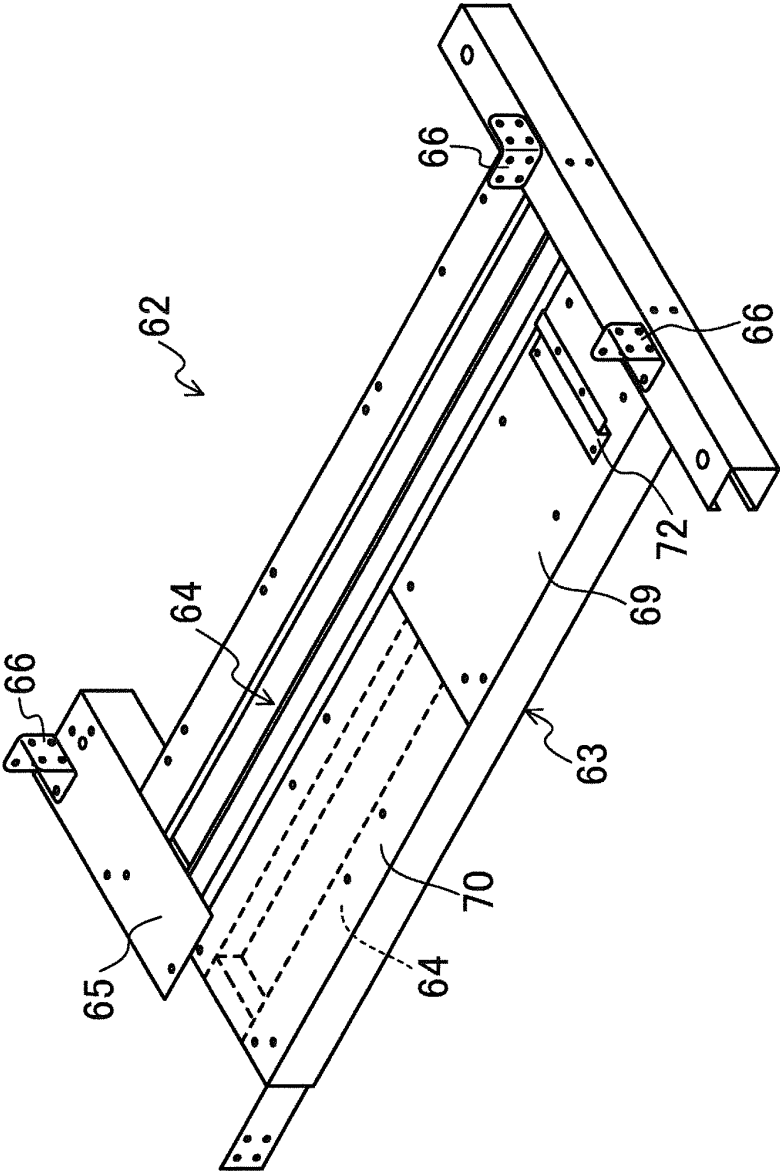


FIG.21



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/006256

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/16 (2011.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F1/16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2012

Kokai Jitsuyo Shinan Koho 1971-2012 Toroku Jitsuyo Shinan Koho 1994-2012

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-216798 A (Daikin Industries, Ltd.), 30 September 2010 (30.09.2010), entire text; all drawings & EP 2402665 A1 & WO 2010/095470 A1 & TW 201042217 A & CN 102317701 A	1-7
Y	JP 11-281195 A (Mitsubishi Heavy Industries, Ltd.), 15 October 1999 (15.10.1999), paragraphs [0041] to [0044]; fig. 2 to 4 (Family: none)	1-7

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

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Date of the actual completion of the international search
27 November, 2012 (27.11.12)Date of mailing of the international search report
11 December, 2012 (11.12.12)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2012/006256

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 63787/1988 (Laid-open No. 167528/1989) (Mitsubishi Electric Corp.), 24 November 1989 (24.11.1989), page 3, line 10 to page 4, line 17; fig. 2 (Family: none)	1-7
Y	JP 2008-82632 A (Sanyo Electric Co., Ltd.), 10 April 2008 (10.04.2008), paragraph [0020]; fig. 4 (Family: none)	5

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2010216798 A [0003]