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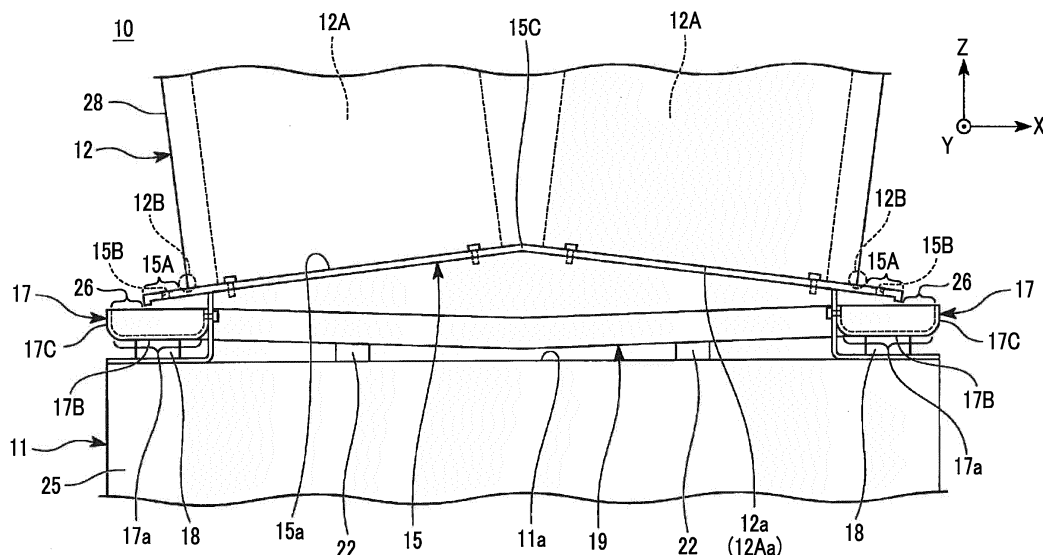
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(54) **AIR-COOLED CHILLER**

(57) The present invention comprises the following: a baffle plate (15) that is provided on a bottom end (12a) of a heat exchange chamber (12), and that is inclined downward toward both ends (15A) from the center (15C) thereof; and a pair of drain pans (17) that are disposed so as to extend in the Y direction between a machine

chamber (11) and the heat exchange chamber (12) and that can accommodate drained water that drips from the width-direction ends (15A) of the baffle plate (15). The pair of drain pans (17) are separated in the width direction of the drain pans (17).

FIG. 2



Description

Technical Field

[0001] The present invention relates to an air-cooled chiller.

[0002] Priority is claimed on Japanese Patent Application No. 2016-203001, filed October 14, 2016, the content of which is incorporated herein by reference.

Background Art

[0003] PTL 1 discloses a chilling unit (air-cooled chiller) which includes a machine chamber, an air heat exchange chamber which is disposed above the machine chamber and has a shape whose width is narrowed from an upper end toward a lower end, a fan which is disposed on an upper end of the air heat exchange chamber, and a drain pan which is disposed between the machine chamber and the air heat exchange chamber so as to come into contact with a lower end of the air heat exchange chamber.

[0004] The drain pan is formed in a V shape and has a drain port provided at a center portion of the drain pan. The drain pan discharges water, which is generated by heat exchange between a refrigerant flowing through a pipe in the air heat exchange chamber and air, to the outside of the chilling unit via the drain port.

Citation List

Patent Literature

[0005] [PTL 1] International Publication No. WO2011/099629

Summary of Invention

Technical Problem

[0006] The drain pan disclosed in PTL 1 comes into contact with the entire lower end of the air heat exchange chamber (in other words, there is no gap between the lower end of the air heat exchange chamber and the drain pan), and thus, in a case where dust, dirt, or the like is accumulated in the drain pan, there is a problem that it is impossible to clean the inside of the drain pan. Accordingly, there is a possibility that the drain port provided in the drain pan is clogged with the dust or the dirt.

[0007] In addition, in a case where the chilling unit (air-cooled chiller) disclosed in PTL 1 is used in a cold district, it is necessary to attach a heater to a surface of the drain pan facing an upper surface of the machine chamber such that water is not frozen.

[0008] However, it is difficult to attach the heater to the center portion of the drain pan having the width which is the same as the width of the lower end of the air heat exchange chamber. That is, it is difficult to perform work

with respect to the drain pan.

[0009] Accordingly, an object of the present invention is to provide an air-cooled chiller capable of easily cleaning an inside of the drain pan and easily performing the work with respect to the drain pan.

Solution to Problem

[0010] In order to achieve the object, according to an aspect of the present invention, there is provided an air-cooled chiller, including: a machine chamber which extends in a predetermined direction; a heat exchange chamber which is provided above the machine chamber in a state of being separated from the machine chamber, has the predetermined direction as a longitudinal direction, and performs heat exchange between a refrigerant and outside air; a baffle plate which is provided on a lower end of the heat exchange chamber, has the predetermined direction as a longitudinal direction, and is inclined downward from a center of the baffle plate toward end portions in a width direction orthogonal to the longitudinal direction; and a pair of drain pans which is provided between the machine chamber and the heat exchange chamber to face the end portions of the baffle plate in the width direction, has the predetermined direction as a longitudinal direction, and receives drain water falling from the end portions of the baffle plate in the width direction, in which the pair of drain pans is separated from each other in a width direction of the drain pan, the drain pans are disposed to face ends of the heat exchange chamber in a width direction, and in the width direction of the baffle plate, a gap is provided between an outer wall of the drain pan, the end of the heat exchange chamber in the width direction, and the end portion of the baffle plate in the width direction.

[0011] According to the present invention, the air-cooled chiller includes the baffle plate which is provided on the lower end of the heat exchange chamber, has the predetermined direction as the longitudinal direction, and is inclined downward from the center of the baffle plate toward end portions in the width direction orthogonal to the longitudinal direction, and a pair of drain pans which is provided between the machine chamber and the heat exchange chamber to face the end portions of the baffle plate in the width direction, has the predetermined direction as the longitudinal direction, and receives the drain water falling from the end portions of the baffle plate in the width direction, the pair of drain pans is separated from each other in the width direction of the drain pan, and thus, it is possible to narrow a width of each drain pan.

[0012] In addition, in the width direction of the baffle plate, the gap is provided between the outer wall of the drain pan, the end of the heat exchange chamber in the width direction, and the end portion of the baffle plate in the width direction, and thus, it is possible to easily clean dust or dirt accumulated in the drain pan having a narrow width via the gap.

[0013] In addition, as described above, the width of

each drain pan can be narrowed, and thus, when the air-cooled chiller is used in a cold district, it is possible to easily attach a heater (drain water freezing prevention heater) to a surface of each drain pan facing an upper surface of the machine chamber. That is, it is possible to easily perform work with respect to the drain pan.

[0014] Moreover, the air-cooled chiller according to the aspect of the present invention further includes a connection drain pan which connects one end of both ends of the drain pan disposed in the longitudinal direction of the drain pan; and a discharge port which is provided in the connection drain pan and through which the drain water is discharged.

[0015] In this way, the air-cooled chiller includes the connection drain pan which connects the one end of both ends of the drain pan disposed in the longitudinal direction of the drain pan, and the discharge port which is provided in the connection drain pan and through which the drain water is discharged. Accordingly, only one discharge port may be provided, and thus, compared to a case where a plurality of discharge ports are cleaned, it is possible to shorten a cleaning time of the discharge port.

[0016] In addition, in the air-cooled chiller according to the aspect of the present invention, the drain pan is disposed to be inclined such that the one end of the drain pan is closer to an upper surface of the machine chamber than the other end.

[0017] In this way, the drain pan is disposed to be inclined such that the one end of the drain pan is closer to the upper surface of the machine chamber than the other end, and thus, the drain water can be easily guided to the connection drain pan.

[0018] Moreover, in the air-cooled chiller according to the aspect of the present invention, a shape of the connection drain pan has a shape in which a vertical height of a center of the connection drain pan is lower than vertical heights of both ends of the connection drain pan to which the drain pan is connected, and the discharge port is disposed at the center of the connection drain pan.

[0019] In this way, the shape of the connection drain pan has a shape in which a vertical height of a center of the connection drain pan is lower than vertical heights of both ends of the connection drain pan to which the drain pan is connected, and thus, the drain water can be easily guided to the drain port.

[0020] In the air-cooled chiller according to the aspect of the present invention, the end portion of the baffle plate in the width direction extends to face the drain pan in a vertical direction, and a plurality of through portions disposed in the longitudinal direction of the baffle plate are provided in the end portion of the baffle plate in the width direction.

[0021] In this way, the plurality of through portions disposed in the longitudinal direction of the baffle plate are provided in the end portion of the baffle plate in the width direction and the drain water can be introduced to the drain pans via the plurality of through portions. Accord-

ingly, it is possible to prevent the drain water from overflowing from both ends of the baffle plate in the width direction.

5 Advantageous Effects of Invention

[0022] According to the present invention, it is possible to easily clean a drain pan, and it is possible to easily perform a work with respect to the drain pan.

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Brief Description of Drawings

[0023]

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Fig. 1 is a perspective view showing an appearance of an air-cooled chiller according to a first embodiment of the present invention.

Fig. 2 is a front view showing a region A shown in Fig. 1 in an enlarged manner.

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Fig. 3 is a plan view of a baffle plate shown in Fig. 2. Fig. 4 is a side view showing a region B shown in Fig. 1 in an enlarged manner.

Fig. 5 is a plan view of a pair of drain pans and a connection drain pan shown in Fig. 2.

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Fig. 6 is a front view of a main portion of an air-cooled chiller according to a second embodiment of the present invention.

Fig. 7 is a plan view of a baffle plate shown in Fig. 6. Fig. 8 is a front view of a main portion of an air-cooled chiller according to a third embodiment of the present invention.

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Fig. 9 is a plan view of a pair of drain pans shown in Fig. 8.

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Description of Embodiments

[0024] Hereinafter, embodiments to which the present invention is applied will be described in detail with reference to the drawings. In addition, the drawings used in the following descriptions are for explaining configurations of the embodiments of the present invention, and sizes, thicknesses, dimensions, and the like of the respective portions shown in the drawings may be different from those of actual air-cooled chillers.

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[First Embodiment]

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[0025] Fig. 1 is a perspective view showing an appearance of an air-cooled chiller according to a first embodiment of the present invention. In Fig. 1, an X direction is a width direction (a direction orthogonal to a predetermined direction) of each of a machine chamber 11, a heat exchange chamber 12, a baffle plate 15, and a drain pan 17, a Y direction is a longitudinal direction (the predetermined direction) of each of the machine chamber 11, the heat exchange chamber 12, the baffle plate 15, and the drain pan 17 orthogonal to the X direction, and a Z direction is a vertical direction orthogonal to an XY

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plane.

[0026] Fig. 2 is a front view showing a region A shown in Fig. 1 in an enlarged manner. In Fig. 2, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 1.

[0027] Referring to Figs. 1 and 2, an air-cooled chiller 10 of the first embodiment includes the machine chamber 11, the heat exchange chamber 12, a plurality of fans 13, the baffle plate 15, a pair of drain pans 17, support portions 18 and 22, a connection drain pan 19, and a discharge pipe 24.

[0028] The machine chamber 11 includes a casing 25 which extends in the Y direction, and a compressor, a four-way switching valve, a water heat exchanger, an expansion valve, a refrigerant pipe, a water piping, and a water circulation pump (not shown) which are accommodated in the casing 25.

[0029] The compressor, the four-way switching valve, the water heat exchanger, and the expansion valve are connected to each other via a refrigerant pipe. The water piping is connected to the water heat exchanger and the water circulation pump.

[0030] By switching the four-way switching valve, the air-cooled chiller 10 can cope with both operations of a cooling operation and a heating operation.

[0031] For example, the compressor includes a motor which is driven by an inverter. In the compressor, an amount of a refrigerant which is discharged to the refrigerant pipe is adjusted by controlling a rotating speed of the motor.

[0032] The water heat exchanger performs heat exchange between the refrigerant flowing through the refrigerant pipe and water flowing through the water piping.

[0033] The water piping includes a first water piping through which water is supplied from the outside of the air-cooled chiller 10 to the water heat exchanger and a second water piping through which the water in the water heat exchanger is discharged to the outside of the air-cooled chiller 10.

[0034] The expansion valve is provided between the water heat exchanger and the heat exchange chamber 12. The expansion valve is connected to a plurality of heat exchange portions 12A constituting the heat exchange chamber 12.

[0035] The water circulation pump supplies water to a plurality of water heat exchangers constituting the machine chamber 11.

[0036] The heat exchange chamber 12 is provided above the machine chamber 11 in a state of being separated from the machine chamber 11. The heat exchange chamber 12 includes a casing 28 which extends in the Y direction and the plurality of (four in the case of Fig. 1) heat exchange portions 12A which are accommodated in the casing 28. Two heat exchange portions 12A are disposed in each of the X direction and the Y direction. The lower ends 12aa of the two heat exchange portions 12A disposed in the X direction form an inverted V shape. That is, the shape of the lower end 12a of the heat ex-

change chamber 12 has an inverted V shape.

[0037] A side wall portion of the casing 28 supports the heat exchange chamber 12 with respect to the machine chamber 11. The casing 28 includes side wall portions 28A which suck outside air (air). The plurality of fans 13 are rotated, the outside air (air) is sucked to the casing 28 via the side wall portions 28A.

[0038] Each of the heat exchange portions 12A is an air type heat exchanger. The heat exchange portion 12A includes a space (not shown) into which the outside air (air) sucked from the side wall portions 28A is introduced and a plurality of heat transfer tubes (not shown) which are disposed in the space and are connected to the compressor.

[0039] The refrigerant circulates through the plurality of heat transfer tubes by the compressor. In the heat exchange portion 12A, heat exchange is performed between the plurality of heat transfer tubes and the outside air (air) sucked via the side wall portions 28A.

[0040] The plurality of fans 13 are installed on an upper end of the heat exchange chamber 12. The plurality of fans 13 are disposed at predetermined intervals in the Y direction. The plurality of fans B sucks the outside air into the space in the heat exchange portion 12A and discharge the outside air subjected to the heat exchange to portions above the fans 13.

[0041] Fig. 3 is a plan view of a baffle plate shown in Fig. 2. In Fig. 3, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 2.

[0042] With reference to Figs. 2 and 3, the baffle plate 15 extends in the Y direction (longitudinal direction). A width (width in the X direction) of the baffle plate 15 is wider than a width of the heat exchange chamber 12. A shape of the baffle plate 15 has an inverted V shape which is inclined downward from a center 15C thereof toward both outer sides in the X direction (width direction). The shape of the baffle plate 15 corresponds to the shape of the lower end 12a of the heat exchange chamber 12.

[0043] The baffle plate 15 includes a surface 15a which comes into contact with the lower end 12a (the lower ends 12aa of the plurality of heat exchange portions 12A) of the heat exchange chamber 12 and two end portions 15A which are disposed in the X direction. The surface 15a of the baffle plate 15 is a surface on which drain water generated in the heat exchange chamber 12 flows. The drain water flowing on the surface 15a of the baffle plate 15 is guided to the end portions 15A. Moreover, in the following descriptions, the two end portions 15A may be referred to as both end portions 15A.

[0044] The baffle plate 15 is fixed to the lower end 12a of the heat exchange chamber 12. For example, the baffle plate 15 can be fixed to the heat exchange chamber 12 using a bolt, a screw, or the like.

[0045] In a state where the baffle plate 15 is fixed to the lower end 12a of the heat exchange chamber 12, both end portions 15A extend outward in the width direc-

tion (X direction) of the heat exchange chamber 12. Each end portion 15A of the baffle plate 15 is disposed to face the drain pan 17 disposed below the end portion 15A. Each of both end portions 15A of the baffle plate 15 has an L shape whose tip is bent in a direction downward.

[0046] Each of both end portions 15A of the baffle plate 15 includes a plurality of through portions 15B which are disposed in the Y direction. The plurality of through portions 15B face inner surfaces of the drain pans 17. The drain water generated in the plurality of heat exchange portions 12A drips (falls) on the drain pans 17 disposed below the plurality of through portions 15B through the through portions 15B.

[0047] The plurality of through portions 15B having the above-described configuration are provided in the baffle plate 15, and thus, the drain water can be introduced to the drain pans 17 through the plurality of through portions 15B, and it is possible to prevent the drain water from overflowing from both end portions 15A of the baffle plate 15.

[0048] The baffle plate 15 having the above-described inverted V shape guides the drain water generated from the heat exchange portion 12A to the end portions 15A and the plurality of through portions 15B. In addition, the drain water guided to the end portions 15A and the plurality of through portions 15B flows to the drain pans 17 disposed below the tip of the baffle plate 15 and falls on the drain pans 17, and thus, the drain water is recovered in the drain pans 17.

[0049] For example, a material of the above-described baffle plate 15 can use stainless steel having improved water resistance.

[0050] In addition, in Fig. 3, as an example, the case where the plurality of through portions 15B are provided in the Y direction is described. However, as the through portion 15B, one through groove extending in the Y direction may be provided. In this case, it is possible to obtain effects similar to those of the case where the plurality of through portions 15B are provided.

[0051] Fig. 4 is a side view showing a region B shown in Fig. 1 in an enlarged manner. In Fig. 4, the same reference numerals are assigned to the same configurations as the structures shown in Figs. 1 and 2.

[0052] Fig. 5 is a plan view of the pair of drain pans and a connection drain pan shown in Fig. 2. In Fig. 5, the same reference numerals are assigned to the same configurations as the structures shown in Figs. 1, 2, and 4.

[0053] With reference to Figs. 2, 4, and 5, two drain pans 17 are provided between the machine chamber 11 and the heat exchange chamber 12 so as to face one end portion 15A of the baffle plate 15. The pair of the drain pans 17 extends in the Y direction in a plan view. The two drain pans 17 are disposed in a state of being separated from each other in the X direction. A width of each drain pan 17 is sufficiently narrower than the width of the heat exchange portion 12A.

[0054] In this way, the pair (two) of the drain pans 17 which is separated from each other in the X direction is

provided, and thus, the width of each drain pan 17 can be sufficiently narrower than the width of the heat exchange portion 12A. Accordingly, when the air-cooled chiller 10 is used in a cold district, an operator easily can attach a heater (not shown, a drain water freezing prevention heater) to the surface 17a (outer surface) of each drain pan facing the upper surface 11a of the machine chamber 11. That is, it is possible to easily perform work with respect to the drain pans 17.

[0055] Each drain pan 17 receives the drain water falling from the end portion 15A of the baffle plate 15. The drain pans 17 are disposed to face ends 12B of the heat exchange chamber 12 in the X direction (width direction). The drain pan 17 includes one end 17A and the other end 17B which are disposed in the Y direction.

[0056] In addition, in the following descriptions, in a case where both one end 17A and the other end 17B are referred, it may be described to as both ends 17A and 17B.

[0057] One end 17A of the pair of drain pans 17 is connected to a connection drain pan 19. The drain pan 17 is disposed to be inclined such that one end 17A is closer to the upper surface 11a of the machine chamber 11 than the other end 17B.

[0058] In this way, the drain pan 17 is disposed to be inclined such that the one end 17A is closer to the upper surface 11a of the machine chamber 11 than the other end 17B, and thus, the drain water is easily guided to the connection drain pan 19.

[0059] In addition, a gap 26 which is disposed in the X direction is provided between an outer wall 17C of the drain pan 17, the end 12B of the heat exchange chamber 12, and the end portion 15A of the baffle plate 15 in the width direction (X direction). The gap 26 is a gap which has the Y direction as a longitudinal direction.

[0060] In this way, in the X direction, the gap 26 is provided between the outer wall 17C of the drain pan 17, the end 12B of the heat exchange chamber 12, and the end portion 15A of the baffle plate 15 in the width direction, and thus, it is possible to easily clean dust or dirt accumulated in the drain pan 17 having a narrow width via the gap 26.

[0061] A width of the gap 26 is set to such a size that a cleaning tool used for cleaning the inside of the drain pans 17 can be inserted. For example, the width of the gap 26 may be 12 mm or more.

[0062] A plurality of support portions 18 are provided between the surfaces 17a of the drain pans 17 and the upper surface 11a of the machine chamber 11. The support portions 18 connect the drain pans 17 and the machine chamber 11 to each other so as to support the drain pans 17.

[0063] Referring to Figs. 2 and 5, the connection drain pan 19 is provided between the one end 17A of the one drain pan 17 and the one end 17A of the other drain pan 17. The connection drain pan 19 includes ends 19A and 19B (both ends) which are disposed in the X direction.

[0064] In the connection drain pan 19, the end 19A is

connected to the one end 17A of the one drain pan 17 and the end 19B is connected to the one end 17A of the other drain pan 17.

[0065] A discharge port 19C connected to the discharge pipe 24 is provided at the center portion of the connection drain pan 19. The drain water passing through the drain pan 17 is discharged to the outside of the air-cooled chiller 10 via the discharge pipe 24 through the discharge port 19C.

[0066] In this way, the connection drain pan 19 connected to the one end 17A of the two drain pans 17 and the discharge port 19C provided in the connection drain pan are provided, and thus, the number of the discharge port 19C can be one. Accordingly, compared to a case where a plurality of discharge ports are provided, it is possible to easily clean the discharge port 19C.

[0067] A shape of the connection drain pan 19 has a V shape in which a height at a center of the connection drain pan 19 is lower than a height of each of the ends 19A and 19B of the connection drain pan 19 in the Z direction (vertical direction).

[0068] In this way, the shape of the connection drain pan 19 is the V shape, and thus, the drain water via the drain pans 17 is effectively guided to the discharge port 19C which is provided at the center of the connection drain pan 19.

[0069] A plurality of support portions 22 are provided between the upper surface 11a of the machine chamber 11 and the connection drain pan 19. The plurality of support portions 22 support the connection drain pan 19.

[0070] According to the air-cooled chiller 10 of the first embodiment, the air-cooled chiller 10 includes the baffle plate 15 which is provided on a lower end 12a of the heat exchange chamber 12 and is inclined downward from the center 15C toward the end portion in the X direction, and the pair of drain pans 17 which is disposed between the machine chamber 11 and the heat exchange chamber 12 so as to face the end portions 15A of the baffle plate 15 and can accommodate the drain water falling from the end portions 15A of the baffle plate 15 in the width direction, the pair of the drain pans 17 are separated from each other in the width direction of the drain pan 17, and thus, it is possible to narrow the width of each drain pan 17.

[0071] In addition, in the X direction, the gap 26 is provided between the outer wall 17C of each drain pan 17, the end 12B of the heat exchange chamber 12, and the end portion 15A of the baffle plate 15, and thus, it is possible to easily clean dust or dirt accumulated in the narrow drain pan 17 via the gap 26.

[0072] In addition, as described above, the width of each drain pan 17 can be narrowed, and thus, when the air-cooled chiller 10 is used in a cold district, it is possible to easily attach a heater (drain water freezing prevention heater) (not shown) to the surface 17a of each drain pan 17 facing the upper surface 11a of the machine chamber 11. That is, it is possible to easily perform the work with respect to the drain pan 17.

[0073] In addition, in the first embodiment, as an example, the case where the connection drain pan 19 formed in the V shape is used is described. However, the shape of the connection drain pan 19 may be a shape which linearly extends in the X direction.

[0074] Moreover, in the first embodiment, the case where each drain pan 17 is inclined is described. However, the drain pan 17 may be disposed to be horizontal with respect to the XY plane. In this case, from the viewpoint of effectively extracting the accumulated drain water from the drain pans 17, a plurality of discharge ports 19C may be provided in each drain pan 17 in the Y direction.

[Second Embodiment]

[0075] Fig. 6 is a front view of a main portion of an air-cooled chiller according to a second embodiment of the present invention. In Fig. 6, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 2.

[0076] Fig. 7 is a plan view of a baffle plate shown in Fig. 6. In Fig. 7, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 6.

[0077] Referring to Figs. 6 and 7, an air-cooled chiller 30 of the second embodiment is similarly configured to the air-cooled chiller 10 except that the width of the heat exchange chamber 12 of the second embodiment is wider than the width of the heat exchange chamber 12 constituting the air-cooled chiller 10 of the first embodiment and a baffle plate 31 is provided instead of the baffle plate 15.

[0078] The two ends 12B (hereinafter, the two ends 12B may be referred to "both ends 12B") of the heat exchange chamber 12 extend outward from end portions 31A of the baffle plate 31. The ends 12B of the heat exchange chamber 12 face the drain pans 17 in the Z direction.

[0079] In this way, the ends 12B of the heat exchange chamber 12 and the drain pans 17 are disposed to face each other in the Z direction, and thus, drain water moved outward from the end portions 31A of the baffle plate 31 can fall on the drain pans 17 via the ends 12B of the heat exchange chamber 12.

[0080] In the X direction, a gap 33 into which the cleaning tool used when the inside of the drain pan 17 is cleaned can be inserted is formed between each end 12B of the heat exchange chamber 12 and the outside of each drain pan 17.

[0081] The baffle plate 31 is formed in an inverted V shape corresponding to the shape of the lower end 12a of the heat exchange chamber 12. A width of the baffle plate 31 in the X direction is narrower than a width of the heat exchange chamber 12 in the X direction. The baffle plate 31 is fixed to the lower end 12a of the heat exchange chamber 12. For example, the baffle plate 31 can be fixed to the heat exchange chamber 12 using a bolt, a screw,

or the like.

[0082] In the baffle plate 31 includes the two end portions 31A (hereinafter, the two end portions 31A may be referred to as "both end portions 31A") which are disposed in the X direction. In a state where the baffle plate 31 is fixed to the lower end 12a of the heat exchange chamber 12, both end portions 31A are disposed inside the two ends 12B of the heat exchange chamber 12.

[0083] Each of both end portions 31A of the baffle plate 31 has an L shape whose tip is bent downward. The tip of the baffle plate 31 comes into contact with an inner surface of a side wall of the drain pan 17. For example, the tip of the baffle plate 31 is fixed to the drain pan 17 using a bolt or a screw.

[0084] The air-cooled chiller 30 of the second embodiment having the above-described configuration has effects which are similar to those of the air-cooled chiller 10 of the above-described first embodiment.

[Third Embodiment]

[0085] Fig. 8 is a front view of a main portion of an air-cooled chiller according to a third embodiment of the present invention. In Fig. 8, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 2.

[0086] Fig. 9 is a plan view of a pair of drain pans shown in Fig. 8. In Fig. 9, the same reference numerals are assigned to the same configurations as the structures shown in Fig. 8.

[0087] Referring to Figs. 8 and 9, an air-cooled chiller 40 of the third embodiment is similarly configured to the air-cooled chiller 10 except that the connection drain pan 19 constituting the air-cooled chiller 10 of the first embodiment is removed from the components and the discharge port 19C is provided in each drain pan 17. The discharge port 19C is provided in one end 17A (end which is positioned lower than the other end 17B in the Z direction) of each drain pan 17.

[0088] In the air-cooled chiller 40 of the third embodiment having the above-described configuration, the width of each drain pan 17 can be narrowed, and thus, when the air-cooled chiller 40 is used in a cold district, it is possible to easily attach a heater (drain water freezing prevention heater) (not shown) to the surface 17a of each drain pan 17 facing the upper surface 11a of the machine chamber 11. That is, it is possible to easily perform the work with respect to the drain pan 17.

[0089] In addition, in the X direction, the gap 26 is provided between the outer wall 17C of each drain pan 17, the end 12B of the heat exchange chamber 12, and the end portion 15A of the baffle plate 15, and thus, it is possible to easily clean dust or dirt accumulated in the narrow drain pan 17 via the gap 26.

[0090] Moreover, in the third embodiment, the case where each drain pan 17 is inclined is described. However, the drain pan 17 may be disposed to be horizontal with respect to the XY plane. In this case, from the view-

point of effectively extracting the drain water accumulated in the drain pans 17 from the drain pans 17, a plurality of discharge ports 19C may be provided in each drain pan 17 in the Y direction.

[0091] Hereinbefore, preferred embodiments of the present invention are described. However, the present invention is not limited to a specific embodiment, and various modifications and changes can be realized within a scope of the gist of the present invention described in claims.

[0092] For example, in the first embodiment, the case where both end portions 15A of the baffle plate 15 are disposed outside the two ends 12B of the heat exchange chamber 12 is described as an example, and in the second embodiment, the case where both end portions 31A of the baffle plate 31 are disposed inside both ends 12B of the heat exchange chamber 12 is described as an example. However, the two ends 12B of the heat exchange chamber 12 and the tips of the end portions 15A and 31A of the baffle plates 15 and 31 may be disposed at the same position as each other. Even in this case, it is possible to obtain effects similar to those of the air-cooled chillers 10 and 30 of the first and second embodiments.

Industrial Applicability

[0093] The present invention can be applied to an air-cooled chiller.

Reference Signs List

[0094]

- 10, 30, 40: air-cooled chiller
- 11: machine chamber
- 11a: upper surface
- 12: heat exchange chamber
- 12a, 12aa: lower end
- 12A: heat exchange portion
- 12B, 19A, 19B: end
- 13: fan
- 15, 31: baffle plate
- 15a, 17a: surface
- 15A, 31A: end portion
- 15B: through portion
- 15C: center
- 17: drain pan
- 17A: one end
- 17B: other end
- 17C: outer wall
- 18, 22: support portion
- 19: connection drain pan
- 19C: discharge port
- 24: discharge pipe
- 25, 28: casing
- 26, 33: gap
- 28A: side wall portion

A, B: region

Claims

1. An air-cooled chiller, comprising:

a machine chamber which extends in a predetermined direction;
 a heat exchange chamber which is provided above the machine chamber in a state of being separated from the machine chamber, has the predetermined direction as a longitudinal direction, and performs heat exchange between a refrigerant and outside air;
 a baffle plate which is provided on a lower end of the heat exchange chamber, has the predetermined direction as a longitudinal direction, and is inclined downward from a center of the baffle plate toward end portions in a width direction orthogonal to the longitudinal direction; and
 a pair of drain pans which is provided between the machine chamber and the heat exchange chamber to face the end portions of the baffle plate in a width direction, has the predetermined direction as a longitudinal direction, and receives drain water falling from the end portions of the baffle plate in the width direction, wherein the pair of drain pans is separated from each other in the width direction of the drain pan, wherein the drain pans are disposed to face ends of the heat exchange chamber in a width direction, and
 wherein in the width direction of the baffle plate, a gap is provided between an outer wall of the drain pan, the end of the heat exchange chamber in the width direction, and the end portion of the baffle plate in the width direction.

2. The air-cooled chiller according to claim 1, further comprising:

a connection drain pan which connects one end of both ends of the drain pan disposed in the longitudinal direction of the drain pan; and
 a discharge port which is provided in the connection drain pan and through which the drain water is discharged.

3. The air-cooled chiller according to claim 2, wherein the drain pan is disposed to be inclined such that the one end of the drain pan is closer to an upper surface of the machine chamber than the other end.

4. The air-cooled chiller according to claim 2 or 3, wherein a shape of the connection drain pan has a shape in which a vertical height of a center of the connection drain pan is lower than vertical heights

of both ends of the connection drain pan to which the drain pan is connected, and wherein the discharge port is disposed at the center of the connection drain pan.

5. The air-cooled chiller according to any one of claims 1 to 4, wherein the end portion of the baffle plate in the width direction extends to face the drain pan in a vertical direction, and wherein a plurality of through portions disposed in the longitudinal direction of the baffle plate are provided in the end portion of the baffle plate in the width direction.

Amended claims under Art. 19.1 PCT

1. (Amended) An air-cooled chiller, comprising:

a machine chamber which extends in a predetermined direction;
 a heat exchange chamber which is provided above the machine chamber in a state of being separated from the machine chamber, has the predetermined direction as a longitudinal direction, and performs heat exchange between a refrigerant and outside air;
 a baffle plate which is provided on a lower end of the heat exchange chamber, has the predetermined direction as a longitudinal direction, and is inclined downward from a center of the baffle plate toward end portions in a width direction orthogonal to the longitudinal direction; and
 a pair of drain pans which is provided between the machine chamber and the heat exchange chamber to face the end portions of the baffle plate in the width direction, has the predetermined direction as a longitudinal direction, and receives drain water falling from the end portions of the baffle plate in the width direction, wherein the pair of drain pans is separately formed from the baffle plate and is separated from each other in the width direction of the drain pan, wherein the drain pans are disposed to face ends of the heat exchange chamber in the width direction, wherein in the width direction of the baffle plate, a gap is provided between an outer wall of the drain pan, the end of the heat exchange chamber in the width direction, and the end portion of the baffle plate in the width direction, and wherein both end portions of the baffle plate have an L shape which is bent downward.

2. The air-cooled chiller according to claim 1, further comprising:

a connection drain pan which connects one end of both ends of the drain pan disposed in the longitudinal direction of the drain pan; and a discharge port which is provided in the connection drain pan and through which the drain water is discharged. 5

3. The air-cooled chiller according to claim 2, wherein the drain pan is disposed to be inclined such that the one end of the drain pan is closer to an upper surface of the machine chamber than the other end. 10
4. The air-cooled chiller according to claim 2 or 3, wherein a shape of the connection drain pan has a shape in which a vertical height of a center of the connection drain pan is lower than vertical heights of both ends of the connection drain pan to which the drain pan is connected, and wherein the discharge port is disposed at the center of the connection drain pan. 15 20
5. The air-cooled chiller according to any one of claims 1 to 4, wherein the end portion of the baffle plate in the width direction extends to face the drain pan in a vertical direction, and 25 wherein a plurality of through portions disposed in the longitudinal direction of the baffle plate are provided in the end portion of the baffle plate in the width direction. 30

Statement under Art. 19.1 PCT

Claim 1 is amended as described in the attached sheet. That is, a limitation (base of the amendment; Paragraph 0056) is added to Claim 1 before the amendment. 35

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FIG. 1

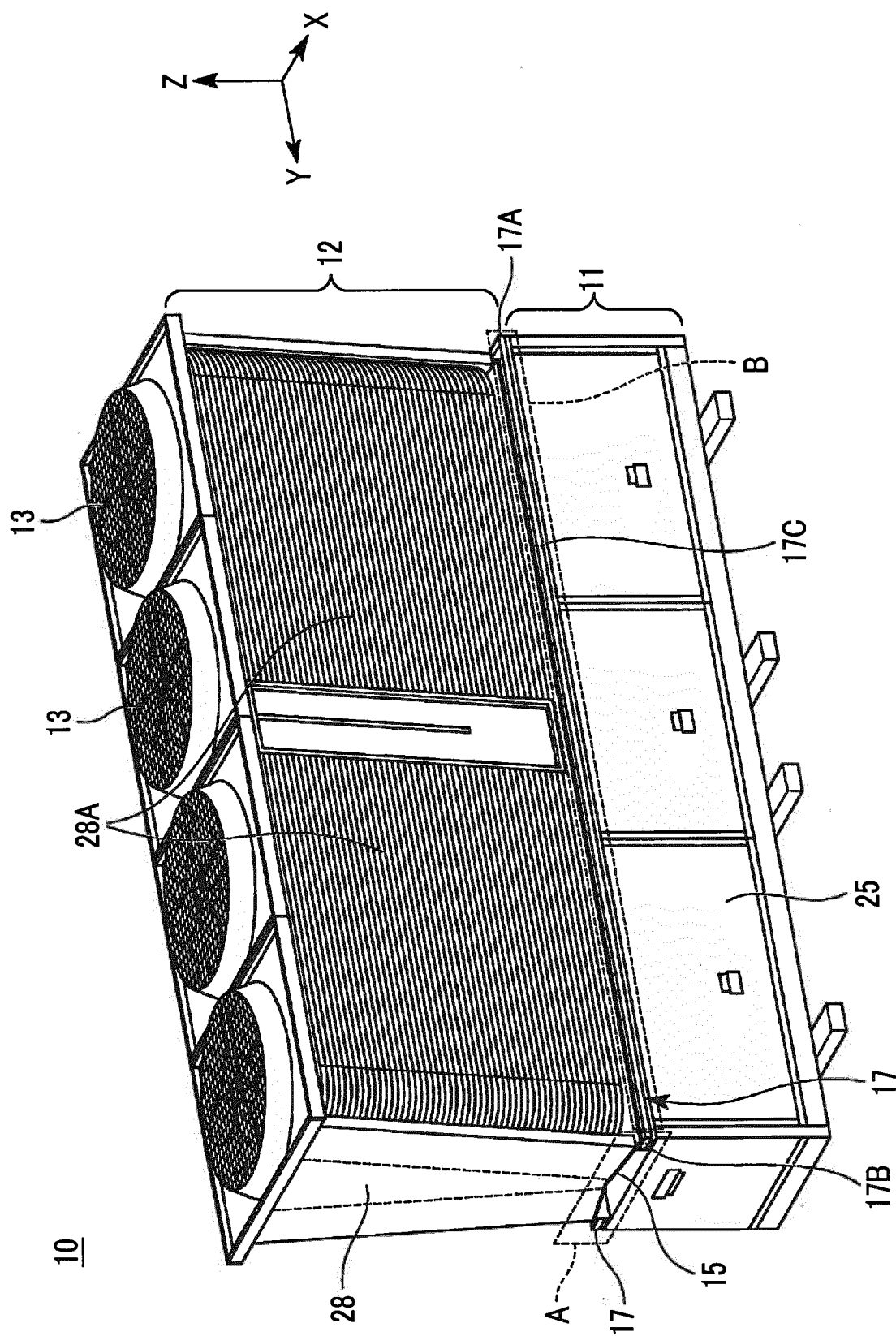


FIG. 2

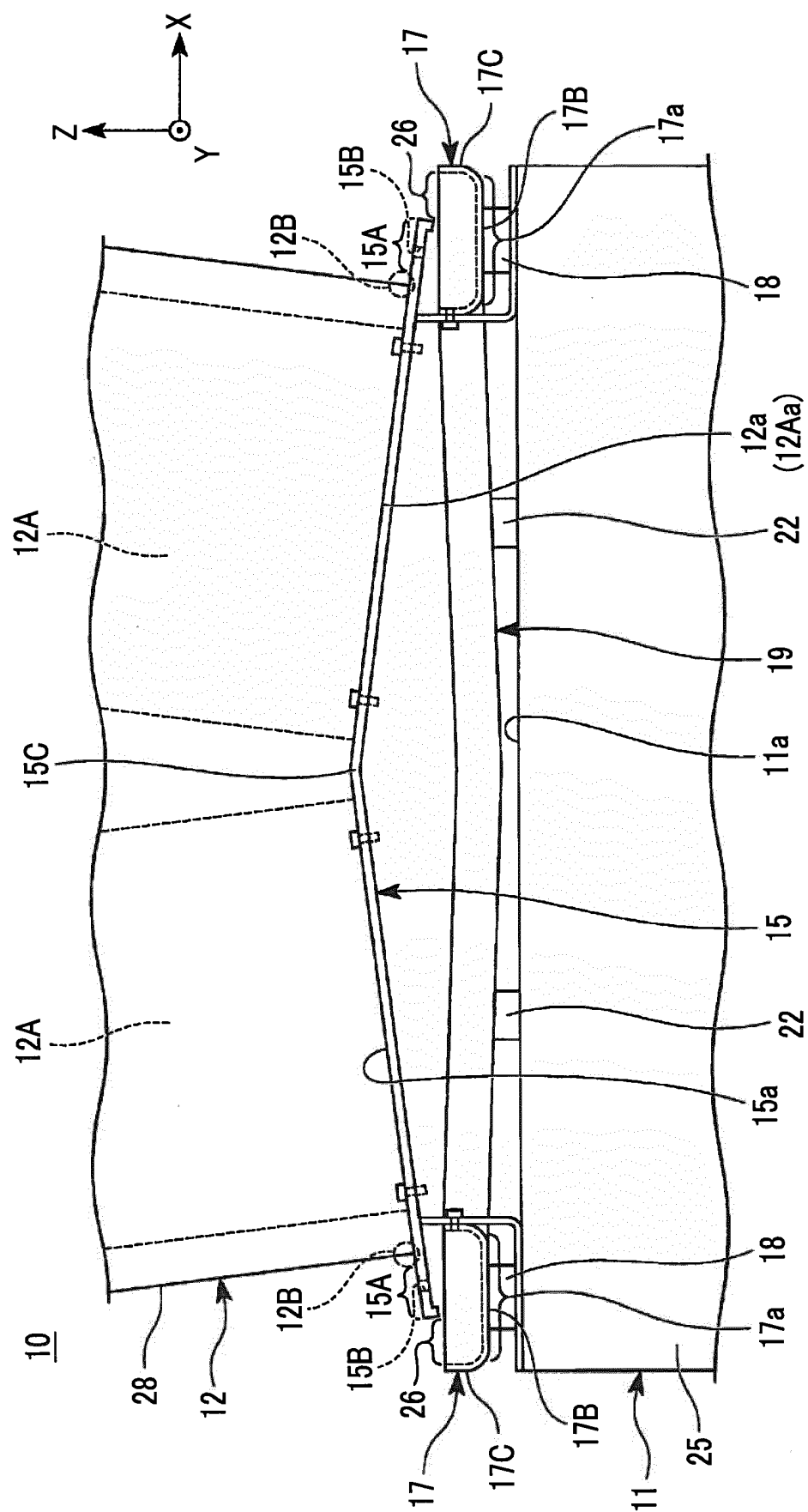


FIG. 3

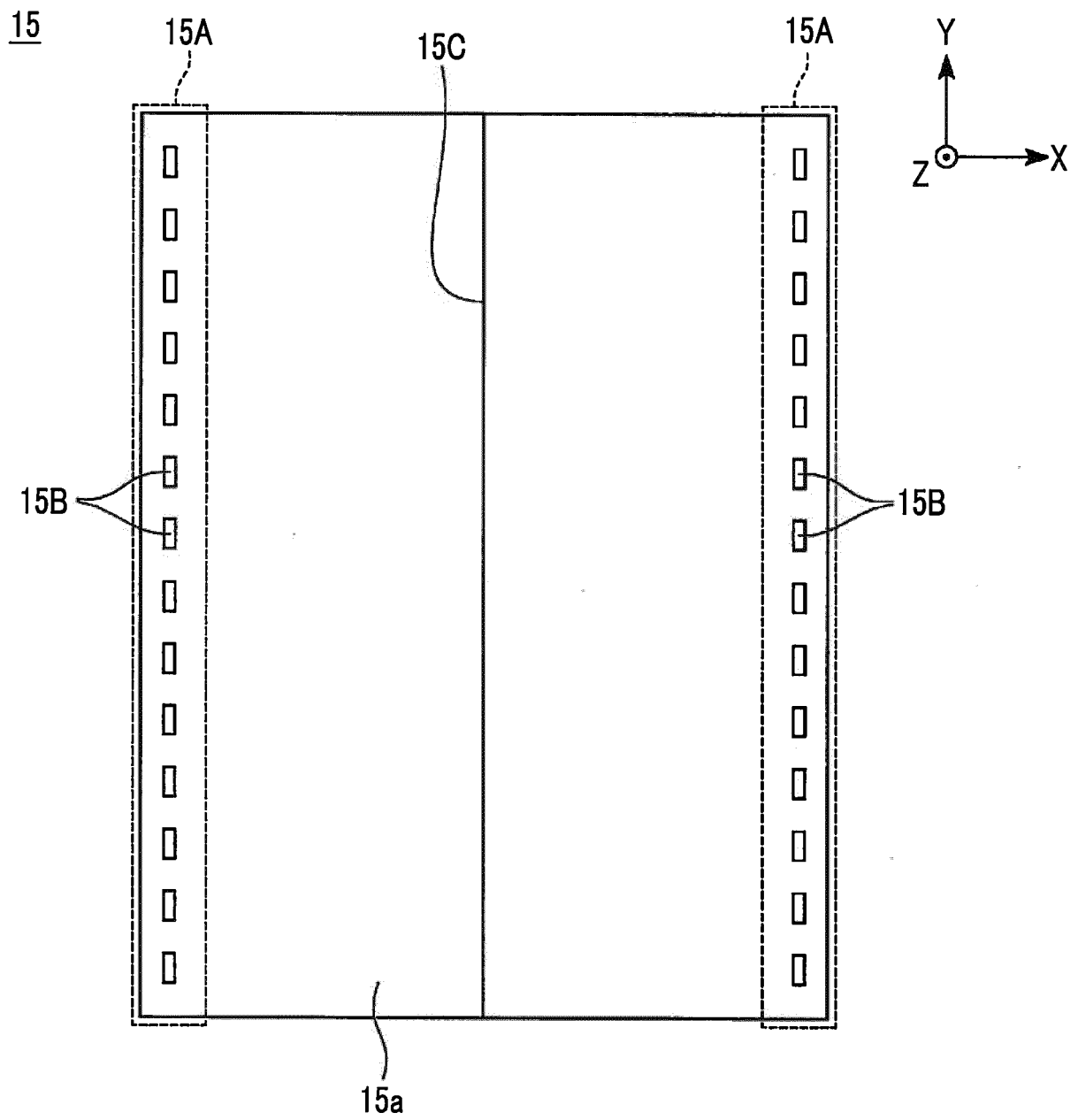


FIG. 4

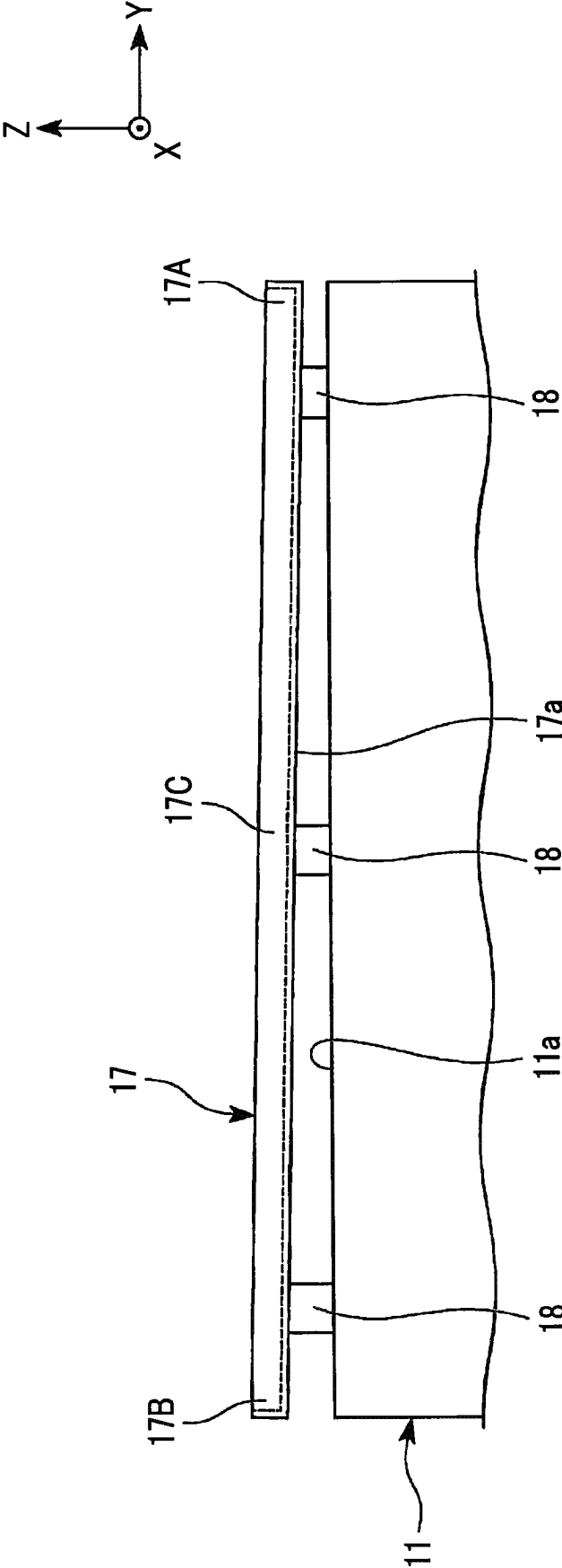


FIG. 5

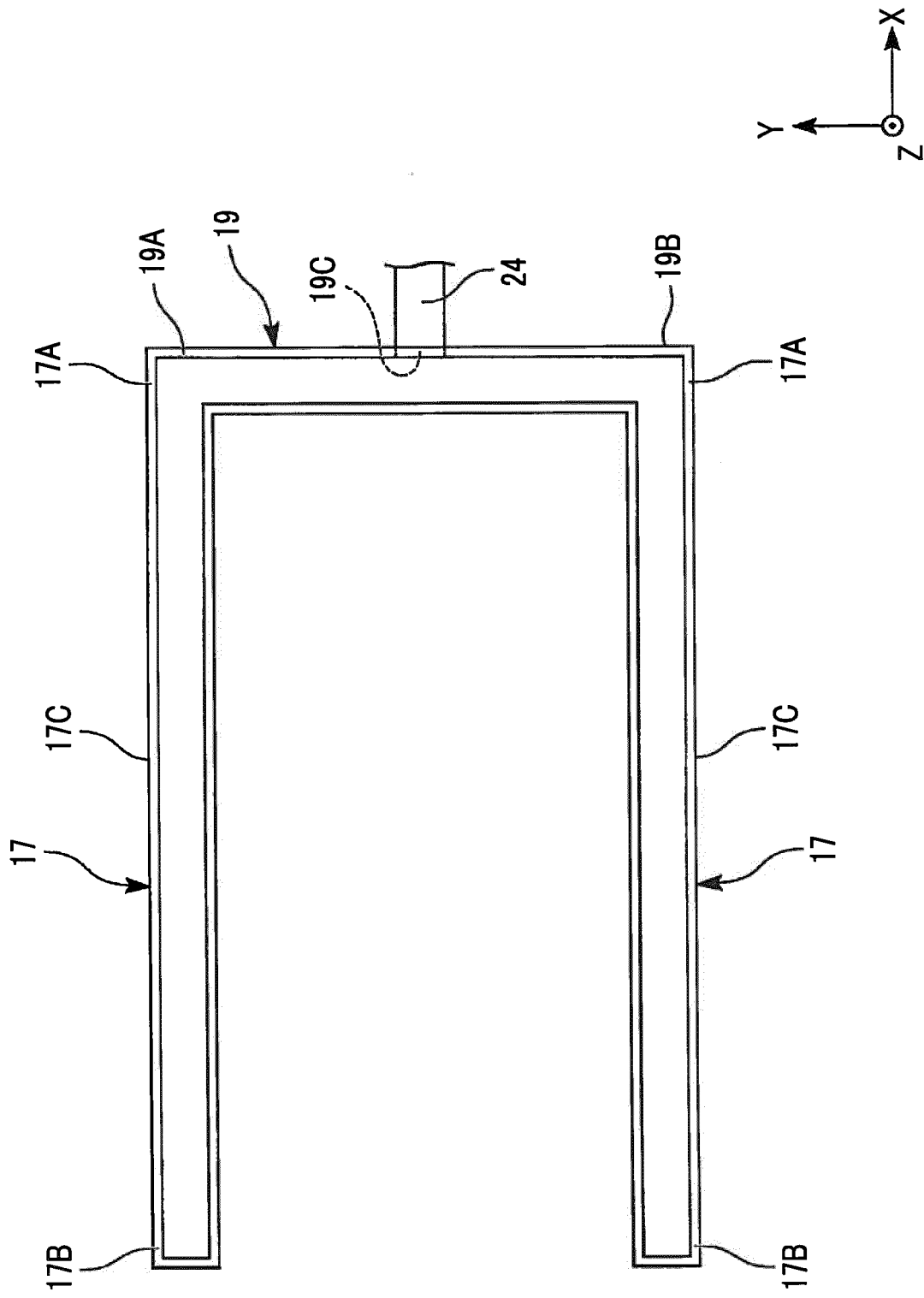


FIG. 6

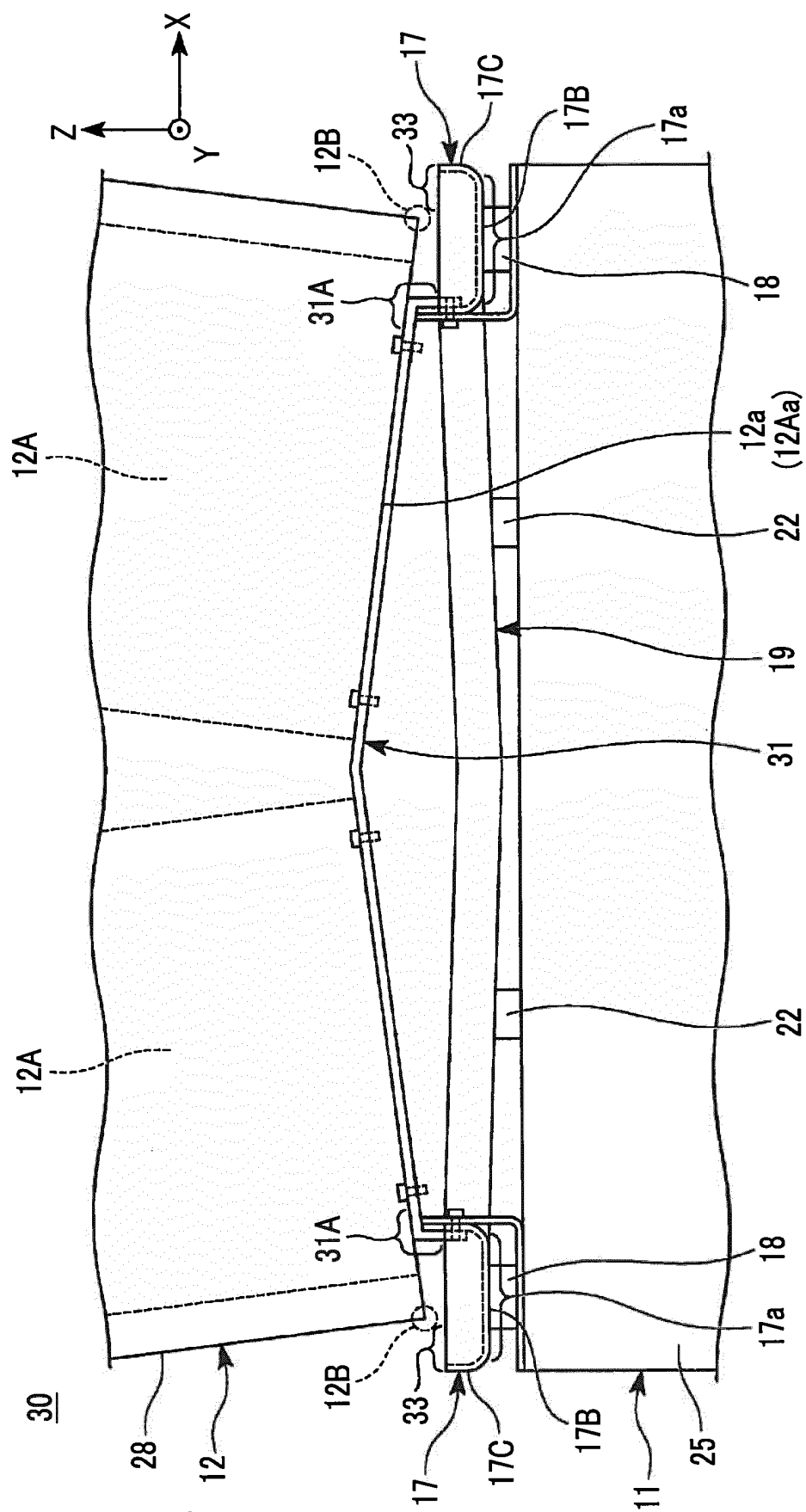


FIG. 7

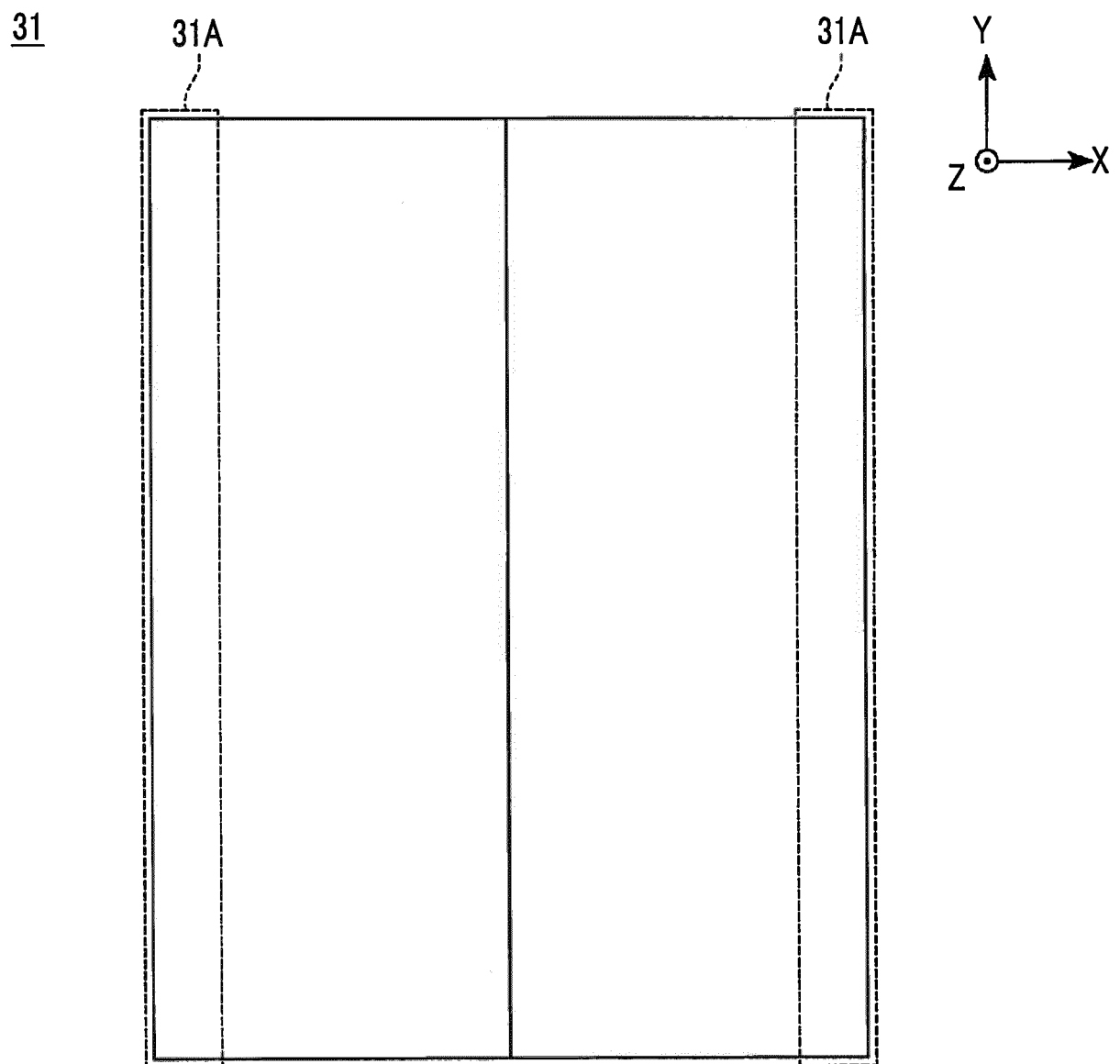
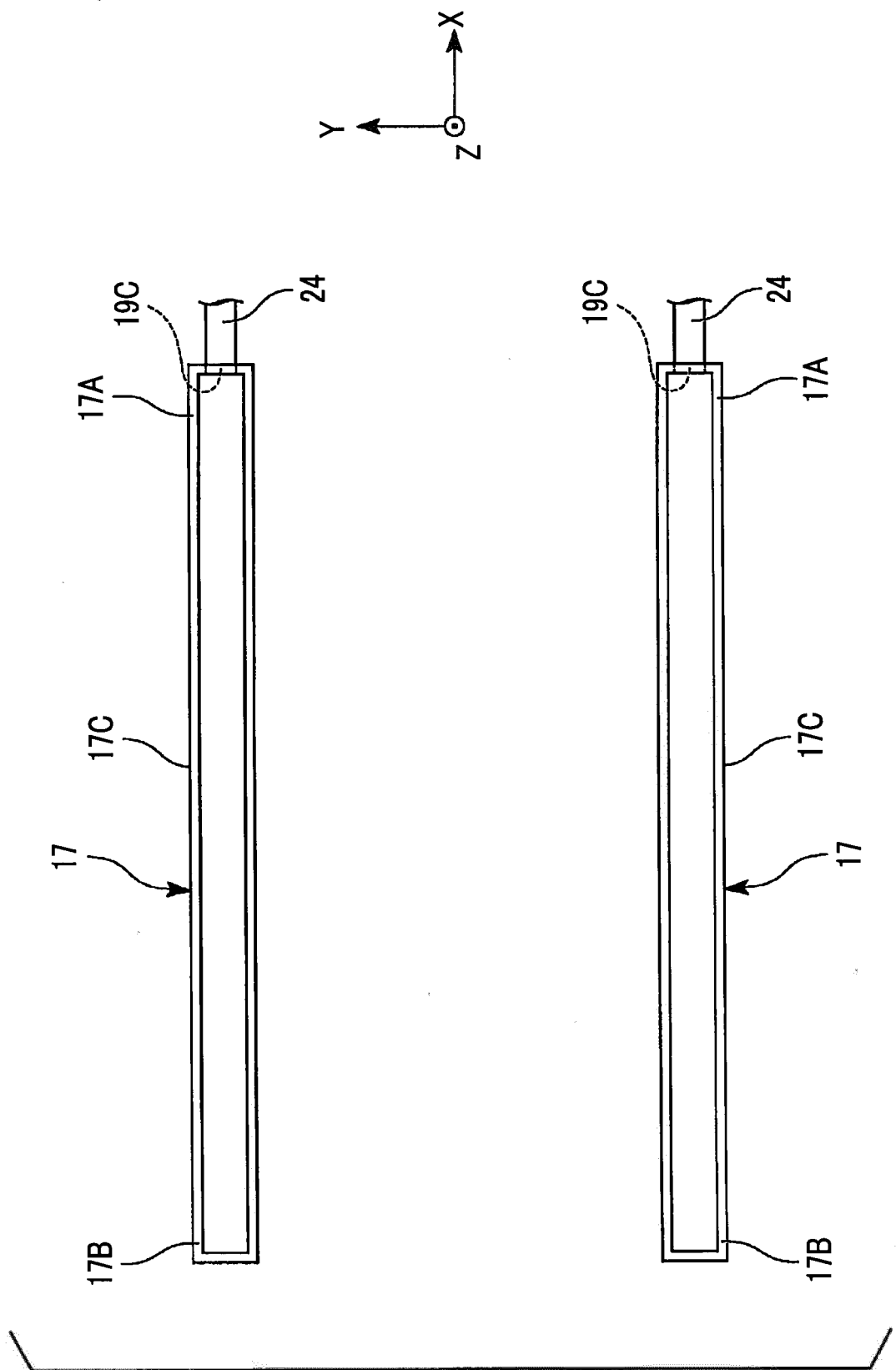


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/032084

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/36 (2011.01) i, F24F5/00 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F1/36, F24F5/00

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

Published examined utility model applications of Japan 1922-1996

Published unexamined utility model applications of Japan 1971-2017

Registered utility model specifications of Japan 1996-2017

Published registered utility model applications of Japan 1994-2017

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 59-56065 A (MATSUSHITA SEIKO CO., LTD.) 31 March 1984, page 2, upper left column, line 4 to same page, lower right column, line 20, fig. 2-5 (Family: none)	1-5
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 63786/1988 (Laid-open No. 167527/1989) 24 November 1989, page 1, line 15 to page 2, line 11, fig. 3-4 (Family: none)	1-5



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

Date of mailing of the international search report

Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2017/032084
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 6-94263 A (HITACHI, LTD.) 05 April 1994, paragraphs [0012]-[0013], fig. 3-4 (Family: none)	2-5
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 85509/1980 (Laid-open No. 8479/1982) 16 January 1982, page 3, line 3 to page 5, line 5, fig. 1-9 (Family: none)	5

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2016203001 A [0002]
- WO 2011099629 A [0005]