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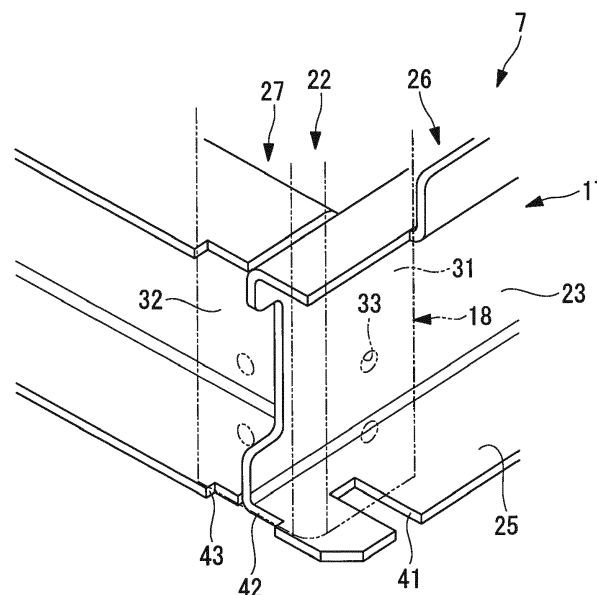
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(54) **REFRIGERATING CYCLE DEVICE**

(57) An object is to provide a refrigerating cycle device capable of suppressing occurrence of corrosion in a frame section. An air-cooled heat pump chiller includes a water heat exchanger, and a housing 7 that houses the water heat exchanger. The housing 7 has a bottom surface part 17 constituting a bottom surface. The bottom surface part 17 has a plate-like lower horizontal part 25,

and a frame section 18 placed on an upper surface of the lower horizontal part 25, and extending upward from the upper surface of the lower horizontal part 25. The lower horizontal part 25 is formed with a first cutout 41, a second cutout 42, and a third cutout 43 below a lower end of the frame section 18.

FIG. 4



Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to a refrigerating cycle device.

2. DESCRIPTION OF RELATED ART

[0002] Some refrigerating cycle devices are each provided with a casing that houses therein a heat exchanger constituting a part of the refrigerating cycle (for example, Japanese Unexamined Patent Application, Publication No. H09-4876).

[0003] Japanese Unexamined Patent Application, Publication No. H09-4876 discloses an outdoor freezer having a condenser (heat exchanger) housed in a body casing having a bottom plate and the like. In this freezer, the body casing has four columns constituting a framework of the body casing erected on four corners of the bottom plate.

[0004] {PTL 1}

Japanese Unexamined Patent Application, Publication No. H09-4876

BRIEF SUMMARY OF THE INVENTION

[0005] In a structure of Japanese Unexamined Patent Application, Publication No. H09-4876, in a case where condensed water (drain) is generated from the heat exchanger housed in the body casing, or in a case where water flows into the body casing, the water circulates in the body casing, and sometimes reaches lower end portions of the columns. The columns are erected on an upper surface of the bottom plate, and therefore sometimes block a flow of the water that reaches the lower end portions of the columns. Consequently, water stays in the lower end portions of the columns, and there is a possibility that the columns or the bottom plate is corroded.

[0006] The columns are erected on the upper surface of the bottom plate, and therefore the lower ends of the columns and the upper surface of the bottom plate are in contact with each other, but fine clearances are sometimes formed between the lower ends of the columns and the upper surface of the bottom plate by influence of machining or the like at the time of manufacturing the columns or the bottom plate, influence of a load acting on the columns, or other influence. When the water reaches portions where the fine clearances are formed, the water enters the fine clearances by surface tension, and is retained in the clearances. When the water is retained in the clearances, there is a possibility that lower end surfaces of the columns or the bottom plate is corroded.

[0007] Thus, in the structure of Japanese Unexamined Patent Application, Publication No. H09-4876, there is a

possibility that the columns or the bottom plate is corroded by the water that reaches the lower ends of the columns.

[0008] The present invention has been made in view of such circumstances, and an object of the present invention is to provide a refrigerating cycle device capable of suppressing occurrence of corrosion in a frame section.

[0009] In order to solve the above problem, a refrigerating cycle device of the present invention employs the following solutions.

[0010] A refrigerating cycle device according to an aspect of the present invention includes: a heat exchanger; and a housing that houses the heat exchanger, wherein the housing has a plate-like base part disposed at a lower end, and a frame section placed on an upper surface of the base part, and extending upward from the upper surface of the base part, and the base part is formed with a cutout or an opening below a lower end of the frame section.

[0011] The housing houses the heat exchanger, and therefore dew condensation occurs inside the housing. Depending on installation environment of the refrigerating cycle device, there is a possibility that water (for example, rainwater) flows into the housing from the outside. Condensed water that is dew-condensed in the housing, a part of water that flows into the housing drops to reach the lower end of the frame section placed on the upper surface of the base part. In the above configuration, the base part is formed with the cutout or the opening below the lower end of the frame section. Consequently, in a portion where the cutout or the opening is formed, a space is formed at the lower end of the frame section. Consequently, a part of the water that reaches the lower end of the frame section flows into this space (the cutout or the opening), and does not stay in the lower end of the frame section. Accordingly, a flow rate of the water that stays in the lower end of the frame section is reduced, and therefore it is possible to suppress occurrence of corrosion in the frame section and the base part. Even in a case where a fine clearance is generated between the lower end of the frame section and the upper surface of the base part in a region where the frame section is placed on the base part, the flow rate of the water that stays in the lower end of the frame section is reduced, so that it is possible to suppress inflow of water in the fine clearance. Therefore, it is possible to suppress a situation in which water is retained in the fine clearance, and to further suppress occurrence of corrosion in the frame section and the base part.

[0012] The frame section is placed on the upper surface of the base part, and therefore the base part can receive load to the frame section input from the upper side. Consequently, it is possible to improve rigidity of the housing.

[0013] As described above, in the above configuration, it is possible to suppress occurrence of corrosion in the frame section and the base part, and to improve rigidity

of the housing.

[0014] In the refrigerating cycle device according to an aspect of the present invention, on both sides of the cutout or the opening of the base part, installation surfaces on which the frame section is placed may be provided.

[0015] In the above configuration, on the both sides of the cutout or the opening of the base part, the installation surfaces on which the frame section is placed are provided. That is, an end of the lower edge of the frame section is placed on the installation surfaces of the base part without floating and being placed above the cutout or the opening. Consequently, when the load is input to the frame section from the upper side, the base part can receive load input in the end on which stress is concentrated, and therefore it is possible to improve rigidity of the frame section, and to further improve rigidity of the housing.

[0016] A refrigerating cycle device according to an aspect of the present invention includes: a heat exchanger; and a housing that houses the heat exchanger, wherein the housing may have a frame section placed on an installation surface, and extending upward from the installation surface, and, a cutout may be formed at a lower end of the frame section.

[0017] The housing houses the heat exchanger, and therefore dew condensation occurs inside the housing. Depending on installation environment of the refrigerating cycle device, there is a possibility that water (for example, rainwater) flows into the housing from the outside. Condensed water that is dew-condensed in the housing, a part of water that flows into the housing drops to reach the lower end of the frame section placed on the installation surface. In the above configuration, the cutout is formed at the lower end of the frame section. Consequently, in a portion where the cutout is formed, a space is formed between the lower end of the frame section and the installation surface. Consequently, water that reaches the lower end of the frame section passes through the space (cutout), and does not stay in the lower end of the frame section. Accordingly, a flow rate of the water that stays in the lower end of the frame section is reduced, and therefore it is possible to suppress occurrence of corrosion in the frame section. Even in a case where a fine clearance is generated between the lower end of the frame section and the installation surface, the flow rate of the water that stays in the lower end of the frame section is reduced, so that it is possible to suppress inflow of water in the fine clearance. Therefore, it is possible to prevent a situation in which water is retained in the fine clearance, and to further suppress occurrence of corrosion in the frame section.

[0018] The frame section is placed on the installation surface, and therefore the installation surface can receive load to the frame section input from the upper side. Consequently, it is possible to improve rigidity of the housing.

[0019] The installation surface on which the frame section is placed may be an upper surface of a plate-like base part disposed at a lower end of the housing. In a

case where the installation surface is the base part, it is also possible to suppress occurrence of corrosion in the base part.

[0020] As described above, in the above configuration, it is possible to suppress occurrence of corrosion in the frame section, and to improve rigidity of the housing.

[0021] The installation surface on which the frame section is placed may be an upper surface of a plate-like base part disposed at a lower end of the housing.

[0022] In the refrigerating cycle device according to an aspect of the present invention, a plurality of the cutouts may be formed.

[0023] In the above configuration, the plurality of cutouts are formed, and therefore contact portions of the frame section and the installation surface are also increased. Consequently, when load is input to the frame section from the upper side, the load can be received by a large number of the contact portions in the installation surface. Accordingly, it is possible to suppress concentration of stress on the frame section, and therefore it is possible to more suitably suppress deformation or the like of the frame section, and to improve rigidity of the housing.

[0024] According to the present invention, it is possible to suppress occurrence of corrosion in the frame section and the base part.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0025]

FIG. 1 is a perspective view illustrating appearance of an air-cooled heat pump chiller according to a first embodiment of the present invention;

FIG. 2 is a perspective view illustrating a principal part of the air-cooled heat pump chiller of FIG. 1;

FIG. 3 is a perspective view illustrating a principal part of FIG. 2;

FIG. 4 is a perspective view illustrating a principal part of FIG. 3;

FIGS. 5 are diagrams each illustrating a frame section of an air-cooled heat pump chiller according to a second embodiment of the present invention, FIG. 5A is a perspective view illustrating a principal part of the frame section, and FIG. 5B is a diagram illustrating a state in which the frame section of FIG. 5A is exploded;

FIG. 6 are diagrams each illustrating a modification of FIG. 5, FIG. 6A is a perspective view illustrating a principal part of the frame section, and FIG. 6B is a diagram illustrating a state in which the frame section of FIG. 6A is exploded; and

FIG. 7 are diagrams each illustrating a modification of FIG. 5, FIG. 7A is a perspective view illustrating a principal part of the frame section, and FIG. 7B is a diagram illustrating a state in which the frame section of FIG. 7A is exploded.

DETAILED DESCRIPTION OF THE INVENTION

[0026] Hereinafter, an embodiment of a refrigerating cycle device according to the present invention will be described with reference to the drawings.

[First Embodiment]

[0027] Hereinafter, a first embodiment of the present invention will be described with reference to FIG. 1 to FIG. 4.

[0028] As illustrated in FIG. 1, an air-cooled heat pump chiller (refrigerating cycle device) 1 according to this embodiment has a machine chamber 2, a heat exchange chamber 3 disposed above the machine chamber 2, a plurality of fans 5 (four fans in this embodiment) provided on a ceiling section of the heat exchange chamber 3, and a drain pan 6 provided between the machine chamber 2 and the heat exchange chamber 3.

[0029] In the machine chamber 2, an outer shell is constituted by a substantially rectangular parallelepiped housing 7 extending in one direction (Y direction of FIG. 1). In the housing 7, a compressor, a four-way selector valve, a water heat exchanger, an expansion valve, a refrigerant pipe, a water pipe, and a water circulation pump (all are not illustrated) are housed. Details of the housing 7 of the machine chamber 2 will be described below.

[0030] The compressor, the four-way selector valve, the water heat exchanger, and the expansion valve are connected by the refrigerant pipe, and constitutes a refrigerating cycle together with air heat exchangers 8 provided in the heat exchange chamber 3 described below.

[0031] The four-way selector valve is capable of switching a flow of a refrigerant that circulates in the refrigerant pipe, and the air-cooled heat pump chiller 1 is capable of performing both cooling operation and heating operation by switching the flow of the refrigerant.

[0032] The compressor includes, for example, a motor driven by an inverter. In the compressor, an amount of a refrigerant to be discharged to the refrigerant pipe is adjusted by controlling the number of revolutions of the motor.

[0033] The water heat exchanger changes heat between a refrigerant that flows in the refrigerant pipe, and water that flows in the water pipe.

[0034] The water pipe is composed of a first pipe that supplies water from the outside of the air-cooled heat pump chiller 1 to the water heat exchanger, and a second pipe that discharges water of the water heat exchanger to the outside of the air-cooled heat pump chiller 1. The water discharged from the second pipe is provided to various provision destination apparatuses (not illustrated) and the like, as hot water or chilled water. The water that is heat-changed by the various provision destination apparatuses and the like is supplied from the various provision destination apparatuses and the like to the water heat exchanger through the first pipe. Thus, the first

pipe and the second pipe constitute a part of a circulation flow passage that connects the air-cooled heat pump chiller and the provision destination apparatus and the like.

[0035] The expansion valve is provided between the water heat exchanger, and the air heat exchangers 8 provided in the heat exchange chamber 3.

[0036] The water circulation pump circulates water in the water pipe, and supplies the water to the water heat exchanger.

[0037] In the heat exchange chamber 3, an outer shell is formed by a heat exchange chamber housing 9 extending in one direction. A plurality of the air heat exchangers 8 (four air heat exchangers in this embodiment) are disposed in the heat exchange chamber housing 9. The heat exchange chamber housing 9 has a substantially rectangular ceiling plate 11 constituting an upper surface, a rectangular bottom plate 12 constituting a lower surface, and plate-like side walls 13 constituting side surfaces in the short direction (X direction of FIG. 1), and side surfaces in the longitudinal direction (Y direction in FIG. 1) are opened.

[0038] The four air heat exchangers 8 are disposed so as to be aligned along the side surfaces of the heat exchange chamber 3. The four air heat exchangers 8 each has a substantially L shape in plan view. The four air heat exchangers 8 have L-shaped corners disposed so as to correspond to four corner parts of the heat exchange chamber 3. L-shaped longitudinal portions of the four air heat exchangers 8 are each disposed along the side surfaces in the longitudinal direction of the heat exchange chamber 3.

[0039] The air heat exchangers 8 each are a so-called fin-and tube-type heat exchanger having a tube for allowing the refrigerant to circulate therein, and a fin provided in the tube. Each heat exchanger changes heat with outside air introduced from the opened side surfaces in the longitudinal direction of the heat exchange chamber housing 9, so that the refrigerant that circulates in the tube is cooled or heated.

[0040] The four fans 5 are provided on the ceiling plate 11 of the heat exchange chamber housing 9, and are disposed so as to be aligned at equal intervals along the longitudinal direction of the heat exchange chamber housing 9. The four fans 5 introduce outside air into the heat exchange chamber 3, and discharge the outside air heat-exchanged in the heat exchanger to the outside of the heat exchange chamber 3.

[0041] The drain pan 6 is disposed below the air heat exchangers 8, and recovers condensed water generated by the air heat exchangers 8.

[0042] Now, details of the housing 7 of the machine chamber 2 will be described with reference to FIG. 2 to FIG. 4. In FIG. 2, for the sake of illustration, frame sections 18 are omitted. In FIG. 3, the frame sections 18 are illustrated by a two-dot chain line, and frame supporting members 19 are omitted.

[0043] As illustrated in FIG. 2 and FIG. 3, the housing

7 has a ceiling surface part (not illustrated) that defines an upper side of the machine chamber 2, side surface parts 16 (refer to FIG. 1) that define lateral sides of the machine chamber 2, a bottom surface part 17 that defines a lower side of the machine chamber 2, a plurality of the frame sections 18 (four frame sections in this embodiment) that are disposed on four corners of the machine chamber 2, and connect the ceiling surface part and the bottom surface part 17, and the frame supporting members 19 that fix the frame sections 18 to the bottom surface part 17.

[0044] The bottom surface part 17 has a plate-like placement surface part 21 for placing the compressor and the like, and a substantially rectangular frame 22 that surrounds four sides of the placement surface part 21.

[0045] The frame 22 has long parts 26 corresponding to side portions in the longitudinal direction, and short parts 27 corresponding to side portions in the short direction. As illustrated in FIG. 3 and FIG. 4, longitudinal ends of the short parts 27 are configured to abut on vertical parts 23 of the long parts 26. While the long parts 26 and the short parts 27 are different in the longitudinal lengths, and a formation mode of cutouts described below, other structures are substantially the same.

[0046] The long parts 26 and the short parts 27 are disposed along an outer edge of the placement surface part 21, and integrally have the vertical parts 23 vertically extending, upper horizontal parts 24 extending substantially horizontally from upper ends of the vertical parts 23 toward the outside, lower horizontal parts (base parts) 25 extending substantially horizontally from lower ends of the vertical parts 23 toward the outside.

[0047] In the long parts 26, the lengths of the lower horizontal parts 25 from the vertical parts 23 are longer than the lengths of the upper horizontal parts 24 from the vertical parts 23. Additionally, in the short parts 27, the lengths of the upper horizontal parts 24 and the lengths of the lower horizontal parts 25 are substantially the same.

[0048] The four frame sections 18 each are a member made of stainless steel, extending in the vertical direction (Z direction of FIG. 1), and formed in a substantially L-shape in plan view, and are disposed such that respective corner portions of the L shapes correspond to four corner portions of the frame 22. More specifically, the frame sections 18 each integrally has a plate-like first plate section 31 that vertically extends along the upper horizontal part 24 of the long part 26 of the frame 22, and a plate-like second plate section 32 that vertically extends along a longitudinal end of the long part 26 and the upper horizontal part 24 of the short part 27 of the frame 22. A longitudinal side end of the first plate section 31, and a side end of the second plate section 32 are connected, so that each frame section 18 is formed in the substantially L shape in plan view.

[0049] Upper ends of the frame sections 18 are in contact with the ceiling surface part of the housing 7, and lower ends of the frame sections 18 are placed on the

lower horizontal parts 25 of the long parts 26 and the short parts 27. That is, the frame sections 18 support the ceiling surface part from the lower side. Additionally, a plurality of bolt holes 33 (four bolt holes in this embodiment) that penetrate horizontally are formed in the first plate section 31 and the second plate section 32 of each frame section 18. The frame sections 18 are fixed to the frame 22 by bolts 34 inserted into these bolt holes 33.

[0050] As illustrated in FIG. 3, each frame supporting member 19 integrally has a plate-like first member 36 that is in surface contact with an inner surface of the first plate section 31 of the frame section 18 (that is, a surface in which the first plate section 31 and the second plate section 32 face with a connecting portion therebetween), and a plate-like second member 37 that extends in the direction orthogonal from a first end of the first member 36 and is in surface contact with an inner surface of the second plate section 32 of the frame section 18. Additionally, the frame supporting member 19 integrally has a first flange section 38 that extends in the direction substantially orthogonal from a second end of the first plate section 31, and a second flange section 39 that extends in the direction orthogonal from a first end of the second plate section 32.

[0051] The vertical length of the frame supporting member 19 is almost the same as the length between a lower surface of the upper horizontal part 24 of the frame 22 and an upper surface of the lower horizontal part 25. The first flange section 38 and the second flange section 39 are fitted between the lower surface of the upper horizontal part 24 and the upper surface of the lower horizontal part 25, so that the frame supporting member 19 is fixed to the frame 22.

[0052] A plurality of bolt holes 40 (four bolt holes in this embodiment) that penetrate horizontally are formed in the first member 36 and the second member 37 of the frame supporting member 19. These four bolt holes 40 are disposed at such positions as to correspond to the four bolt holes 33 formed in each frame section 18.

[0053] The frame sections 18 and the frame supporting member 19 are fastened and fixed to each other by the bolts 34 (refer to FIG. 2) that are inserted into the bolt holes 33 formed in the frame sections 18 and the bolt holes 40 formed in the frame supporting member 19. That is, the frame sections 18 are fixed to the frame 22 through the frame supporting member 19.

[0054] Thus, in this embodiment, the frame sections 18 are placed on the lower horizontal parts 25, so that the frame sections 18 are supported by the frame 22 from the lower side, and are fixed to the frame 22 by the bolts 34 inserted horizontally.

[0055] A first cutout 41 is formed at an edge in the longitudinal direction of the lower horizontal part 25 of each long part 26. A second cutout 42 is formed at an edge in the short direction of the lower horizontal part 25 of each long part 26. A third cutout 43 is formed at a corner part at which an edge in the longitudinal direction and an edge in the short direction of the lower horizontal

part 25 of each short part 27 are joined. The first cutout 41, the second cutout 42, and the third cutout 43 are formed substantially linearly extending from the edge of each lower horizontal part 25 up to the vertical part 23 side with respect to the frame section 18 and the frame supporting member 19.

[0056] The first plate section 31 of each frame section 18 is disposed across the first cutout 41. That is, in a lower edge of the first plate section 31, both ends are placed on an upper surface of the lower horizontal part 25, and a central part is located on the first cutout 41 without being in contact with the lower horizontal part 25.

[0057] The second plate section 32 of each frame section 18 is disposed across the second cutout 42 and the third cutout 43. That is, in a lower edge of the second plate section 32, both ends are placed on the upper surface of the lower horizontal part 25, and a central part is located on the second cutout 42 and the third cutout 43 without being in contact with the lower horizontal part 25.

[0058] The frame supporting members 19 are disposed so as to overlap on the first plate sections 31 and the second plate sections 32 of the frame sections 18 in front view. Consequently, similarly to the frame sections 18, the first member 36 are disposed across the first cutouts 41, and the second members 37 are disposed across the second cutouts 42 and the third cutouts 43.

[0059] According to this embodiment, the following effects and operation are produced.

[0060] In this embodiment, the water heat exchanger disposed in the housing 7 is housed. For example, in a case where chilled water is generated by the water heat exchanger, air inside the housing is cooled by the water heat exchanger, and therefore moisture in the air is condensed, dew condensation sometimes occurs in the housing (particularly, on an outer surface of the water heat exchanger, or the like). Depending on installation environment of the air-cooled heat pump chiller 1, there is a possibility that water (for example, rainwater) flows into the housing 7 from the outside.

[0061] The condensed water generated in the housing 7, or a part of water that flows into the housing 7 drops or runs along an inner surface of the housing 7 to reach the placement surface part 21 or an upper surface of the frame 22 (that is, upper surfaces of the upper horizontal parts 24). The water that reaches the upper surfaces of the upper horizontal parts 24 passes between outer edges of the upper horizontal parts 24 and inner surfaces of the frame sections 18, and reaches lower ends of the frame sections 18 placed on the upper surfaces of the lower horizontal parts 25.

[0062] Generally, a long members like the frame section 18 is machined by, for example, cutting a stainless steel material, and therefore non-conductor coating becomes weak on end surfaces (cut surfaces), and the long member is likely to be corroded.

[0063] In this embodiment, the first cutouts 41, the second cutouts 42, and the third cutouts 43 are formed in the lower horizontal parts 25 below the lower ends of the

frame sections 18. Consequently, in portions where the first cutouts 41, the second cutouts 42 and the third cutouts 43 are formed, spaces are formed below the lower ends of the frame sections 18. Consequently, a part of water that reaches the lower ends of the frame sections 18 flows into these spaces (the first cutouts 41, the second cutouts 42, and the third cutouts 43), and does not stay in the lower ends of the frame sections 18. Accordingly, a flow rate of the water that stays in the lower ends of the frame sections 18 is reduced, and therefore it is possible to suppress occurrence of corrosion in the frame sections 18 and the lower horizontal parts 25.

[0064] In this embodiment, even in a case where fine clearances are generated between the lower ends of the frame sections 18 and the upper surface of the lower horizontal part 25 due to a manufacturing error or the like, the flow rate of the water that stays in the lower ends of the frame sections 18 is reduced, so that it is possible to suppress inflow of water in the fine clearances. Therefore, it is possible to prevent a situation in which water is retained in the fine clearances, and to further suppress occurrence of corrosion in the frame sections 18 and the lower horizontal parts 25.

[0065] The frame sections 18 are placed on the upper surfaces of the lower horizontal parts 25 of the frame 22, and therefore the lower horizontal parts 25 can receive load to the frame sections 18 input from the upper side. Consequently, it is possible to improve rigidity of the housing 7.

[0066] In this embodiment, installation surfaces for placing each frame section 18 are provided on both sides of each of the first cutout 41, the second cutout 42, and the third cutout 43. That is, ends of the lower edges of the first plate sections 31 and the second plate sections 32 of the frame sections 18, and lower ends of the connecting portions of the first plate section 31 and the second plate section 32 are placed on the upper surfaces of the lower horizontal parts 25 without floating and being placed above the cutout. Consequently, when the load of the frame sections 18 is input from the upper side, the lower horizontal parts 25 can receive load input in the ends of the frame sections 18, on which stress is concentrated, and therefore it is possible to improve rigidity of the frame sections 18, and to further improve rigidity of the housing 7.

[Second Embodiment]

[0067] Hereinafter, a second embodiment of the present invention will be described with reference to FIGS. 5A and 5B.

[0068] An air-cooled heat pump chiller 1 according to this embodiment is mainly different from the air-cooled heat pump chiller of the first embodiment in that, instead of cutouts being formed in lower horizontal parts 25, cutouts are formed at lower ends of frame sections 45. Components similar to those of the first embodiment are denoted by the same reference numerals, and description

thereof is omitted.

[0069] In this embodiment, each lower horizontal part 25 of a frame 22 is formed in a substantially flat plate shape, and any cutouts and the like for allowing water to pass are not formed in the lower horizontal parts 25.

[0070] As illustrated in FIGS. 5A and 5B, each frame section 45 is formed with a plurality of cutouts 46 at the lower end. More specifically, the frame section 45 has a lower edge formed in a corrugated shape. In the lower edge of the frame section 45, mountain portions of the corrugated shape are in contact with the lower horizontal part 25, valley portions of the corrugated shape become cutouts 46, and are separated from the lower horizontal parts 25. That is, the plurality of cutouts 46 are continuously formed in substantially the same shape at the lower end of the frame section 45.

[0071] The plurality of cutouts 46 are formed in a first plate section 31 and a second plate section 32 of the frame section 45. The cutout 46 is also formed in a connecting portion of the first plate section 31 and the second plate section 32. Additionally, the cutout 46 is also formed at an end opposite to the connecting portion of lower edges of the first plate section 31 and the second plate section 32.

[0072] Positions where the cutouts are formed are an example, and the positions where the cutouts are formed are not limited to this. For example, any cutout may not be formed in the connecting portion of the first plate section 31 and the second plate section 32, and a plurality of cutouts may be formed so as to avoid the connecting portion. Additionally, any cutout may not be formed at the end opposite to the connecting portion of the lower edges of the first plate section 31 and the second plate section 32, and a plurality of cutouts may be formed so as to avoid the end opposite to the connecting portion of the lower edges of the first plate section 31 and the second plate section 32.

[0073] In a case where frame supporting members 19 (refer to FIG. 3) are provided, cutouts (not illustrated) are also formed at a lower edge of each frame supporting member 19. The cutouts formed at the lower edge of each frame supporting member 19 are formed at such positions as to correspond to the cutouts formed in the frame sections 45. That is, in a case where the respective cutouts are formed at substantially the same position, and the frame section 45 and the frame supporting member 19 are disposed so as to be aligned, the cutouts are formed so as to penetrate horizontally.

[0074] According to this embodiment, the following effects and operation are produced.

[0075] In this embodiment, the cutouts 46 are formed at the lower ends of the frame sections 45. Consequently, in portions where the cutouts 46 are formed, spaces are formed between the lower ends of the frame sections 45 and upper surfaces of the lower horizontal parts 25. Consequently, water that reaches the lower ends of the frame sections 45 passes through these spaces (cutouts 46), and does not stay in the lower ends of the frame sections

45. Accordingly, a flow rate of the water that stays in the lower ends of the frame sections 45 is reduced, and therefore it is possible to suppress occurrence of corrosion in the frame sections 45 and the lower horizontal parts 25. Even in a case where fine clearances are generated between the lower ends of the frame sections 45 and the upper surface of the lower horizontal part 25, the flow rate of the water that stays in the lower ends of the frame sections 45 is reduced, so that it is possible to suppress inflow of water in the fine clearances. Therefore, it is possible to prevent a situation in which water is retained in the fine clearances, and to further suppress occurrence of corrosion in the frame sections 45 and the lower horizontal parts 25.

[0076] The plurality of cutouts are formed, and therefore contact portions of the frame sections 45 and the lower horizontal parts 25 are increased. Consequently, when load is input to the frame sections 45 from the upper side, the load can be received by a large number of the contact portions in the lower horizontal parts 25. Accordingly, it is possible to suppress concentration of stress on the frame sections 45, and therefore it is possible to more suitably suppress deformation or the like of the frame sections 45, and to improve rigidity of the housing 7.

[First Modification]

[0077] Hereinafter, a first modification of the second embodiment of the present invention will be described with reference to FIGS. 6A and 6B.

[0078] As illustrated in FIGS. 6A and 6B, cutouts 46a are each formed in a substantially rectangular shape, and the single large cutout 46a may be formed in each of a first plate section 31 and a second plate section 32. Any cutout is not formed in a connecting portion of the first plate section 31 and the second plate section 32 of each frame section 45a, and horizontal ends of the frame sections 45a. Therefore, the connecting portions and the horizontal ends are placed on upper surfaces of lower horizontal parts 25.

[Second Modification]

[0079] Hereinafter, a second modification of the second embodiment of the present invention will be described with reference to FIGS. 7A and 7B.

[0080] As illustrated in FIGS. 7A and 7B, cutouts 46b are formed at a lower end of each of frame sections 45b may be formed in a plurality of substantially rectangular shapes. A plurality of the cutouts 46b may be formed in each of a first plate section 31 and a second plate section 32. Any cutout 46b is not formed in a connecting portion of the first plate section 31 and the second plate section 32. Any cutout 46b is not formed at an end opposite to a connecting portion of lower edges of the first plate section 31 and the second plate section 32 too. Therefore, the

connecting portions and horizontal ends are placed on upper surfaces of lower horizontal part 25.

[0081] Also in the first modification and the second modification, similarly to the case where the lower edge of each frame section 45 is formed in the corrugated shape, it is possible to suppress occurrence of corrosion in the frame sections 45a, 45b and lower horizontal surfaces, to suppress deformation or the like of the frame sections 45a, 45b, and to improve rigidity of the housing 7.

[0082] The present invention is not limited to the above embodiments, and can be suitably changed without departing from the scope.

[0083] For example, in the above embodiments, the frame 22 and the frame sections are connected through the frame supporting members 19. However, the frame supporting members 19 may be eliminated, and the frame 22 and the frame sections may be directly connected.

[0084] In the first embodiment, the cutouts (the first cutouts 41, the second cutouts 42, and the third cutouts 43) are formed in the lower horizontal parts 25. However, in place of the cutouts, openings may be formed. Even in a case where the openings are formed in place of the cutouts, effects and operation similar to those in the case where the cutouts are formed are produced. In the case where the openings are formed, it is more suitable that flow passages for guiding condensed water flowing into the openings are formed below the openings.

[0085] In the above second embodiment, the frame sections 45 are placed on the upper surfaces of the lower horizontal parts 25. However, the frame sections 45 may be placed on other members. Even in the case where the frame sections are placed on other members, water can be discharged by the cutouts formed at the lower ends of the frame sections 18.

[0086] In the above each embodiment, the refrigerating cycle device according to the present invention is applied to the air-cooled heat pump chiller. However, the refrigerating cycle device according to the present invention is also applicable to a device having other refrigerating cycle such as a heat source machine, a water heater, and an air conditioning apparatus.

REFERENCE SIGNS LIST

[0087]

- | | | |
|----|---|----|
| 1 | Air-cooled heat pump chiller (refrigerating cycle device) | 50 |
| 2 | Machine chamber | |
| 3 | Heat exchange chamber | |
| 5 | Fan | |
| 6 | Drain pan | |
| 7 | Housing | |
| 8 | Air heat exchanger | |
| 9 | Heat exchange chamber housing | |
| 16 | Side surface part | |

- | | |
|-------|-----------------------------------|
| 17 | Bottom surface part |
| 18 | Frame section |
| 19 | Frame supporting member |
| 21 | Placement surface part |
| 5 22 | Frame |
| 23 | Vertical part |
| 24 | Upper horizontal part |
| 25 | Lower horizontal part (base part) |
| 26 | Long part |
| 10 27 | Short part |
| 31 | First plate section |
| 32 | Second plate section |
| 36 | First member |
| 37 | Second member |
| 15 41 | First cutout |
| 42 | Second cutout |
| 43 | Third cutout |

Claims

1. A refrigerating cycle device (1) comprising:

a heat exchanger (8); and
a housing (7) that houses the heat exchanger (8), wherein
the housing (7) has a plate-like base part (25) disposed at a lower end, and a frame section (18) placed on an upper surface of the base part (25), and extending upward from the upper surface of the base part (25), and
the base part (25) is formed with a cutout (41, 42, 43) or an opening below a lower end of the frame section (18).

2. The refrigerating cycle device according to claim 1, wherein
on both sides of the cutout (41, 42, 43) or the opening of the base part (25), installation surfaces on which the frame section (18) is placed are provided.

3. A refrigerating cycle device comprising:

a heat exchanger (8); and
a housing (7) that houses the heat exchanger (8), wherein
the housing (7) has a frame section (18) placed on an installation surface, and extending upward from the installation surface, and,
a cutout (41, 42, 43) is formed at a lower end of the frame section (18).

4. The refrigerating cycle device according to claim 3, wherein
a plurality of the cutouts (41, 42, 43) are formed.

FIG. 1

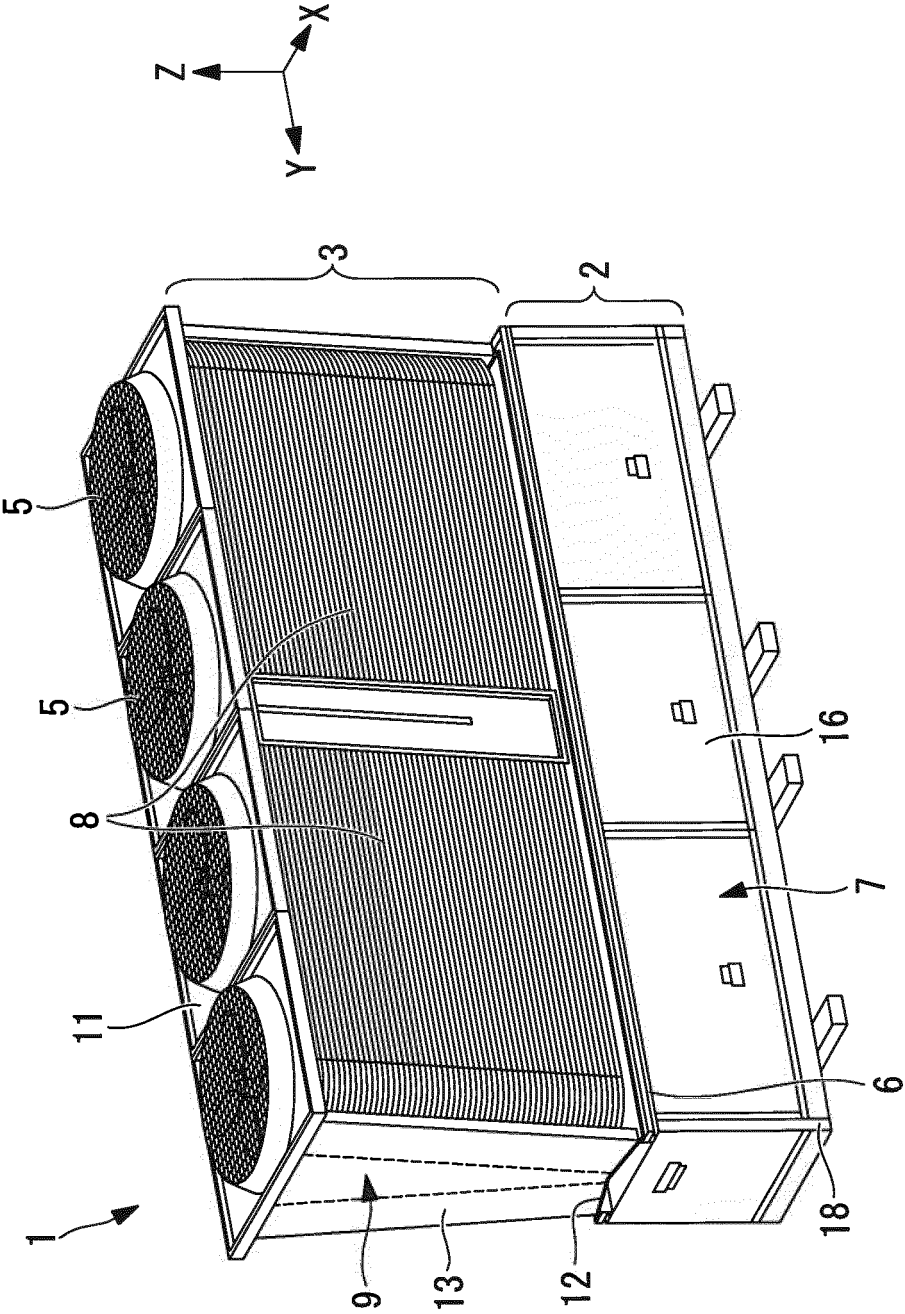


FIG. 2

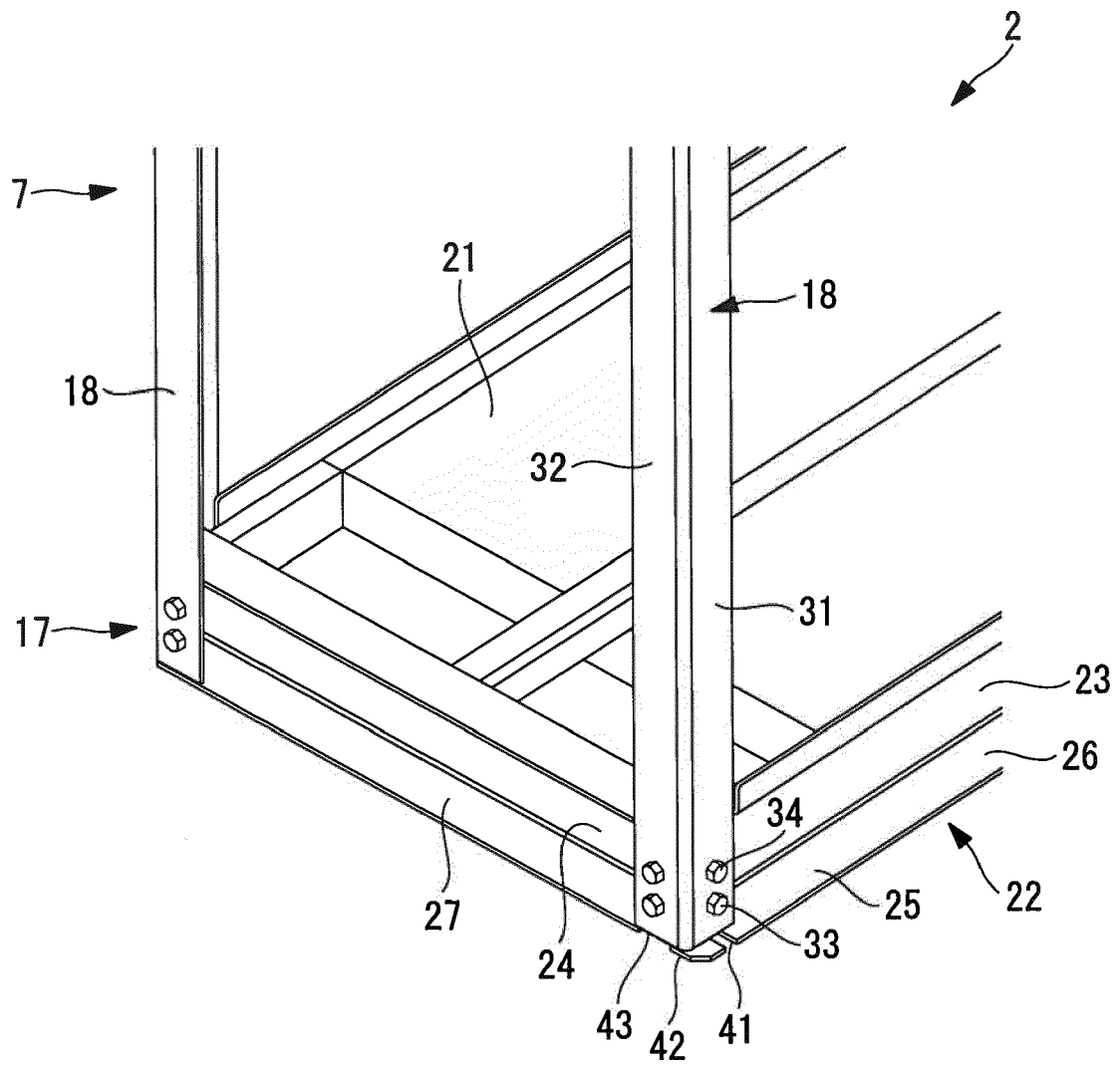


FIG. 3

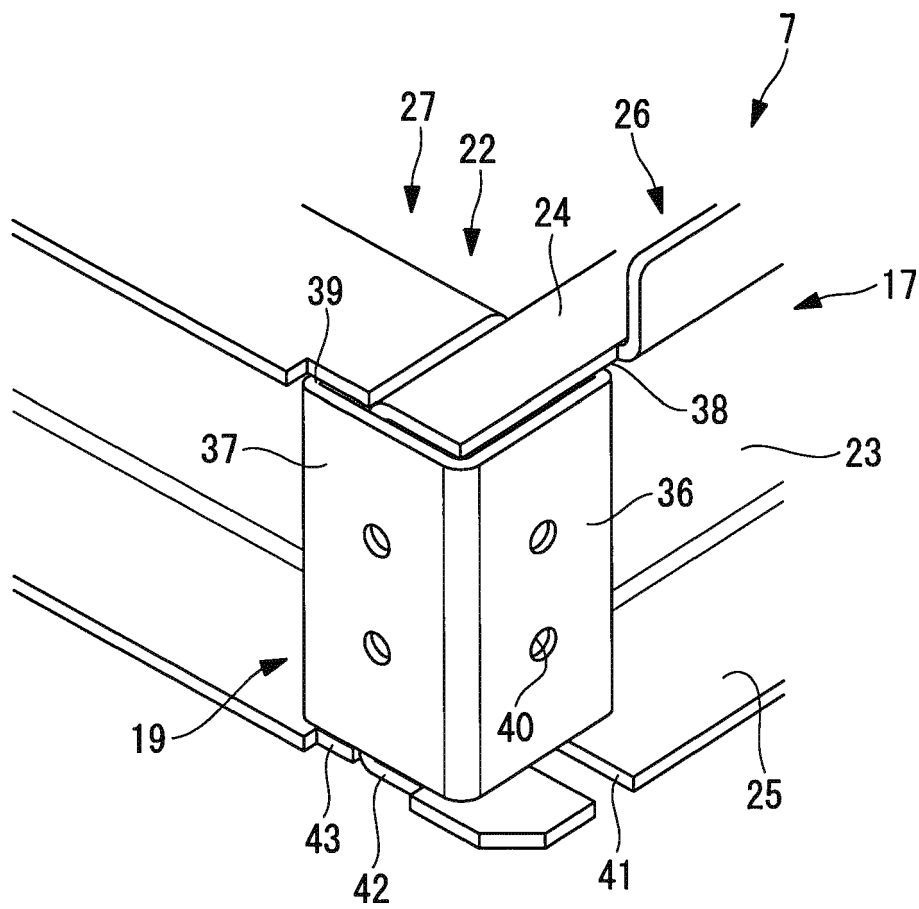


FIG. 4

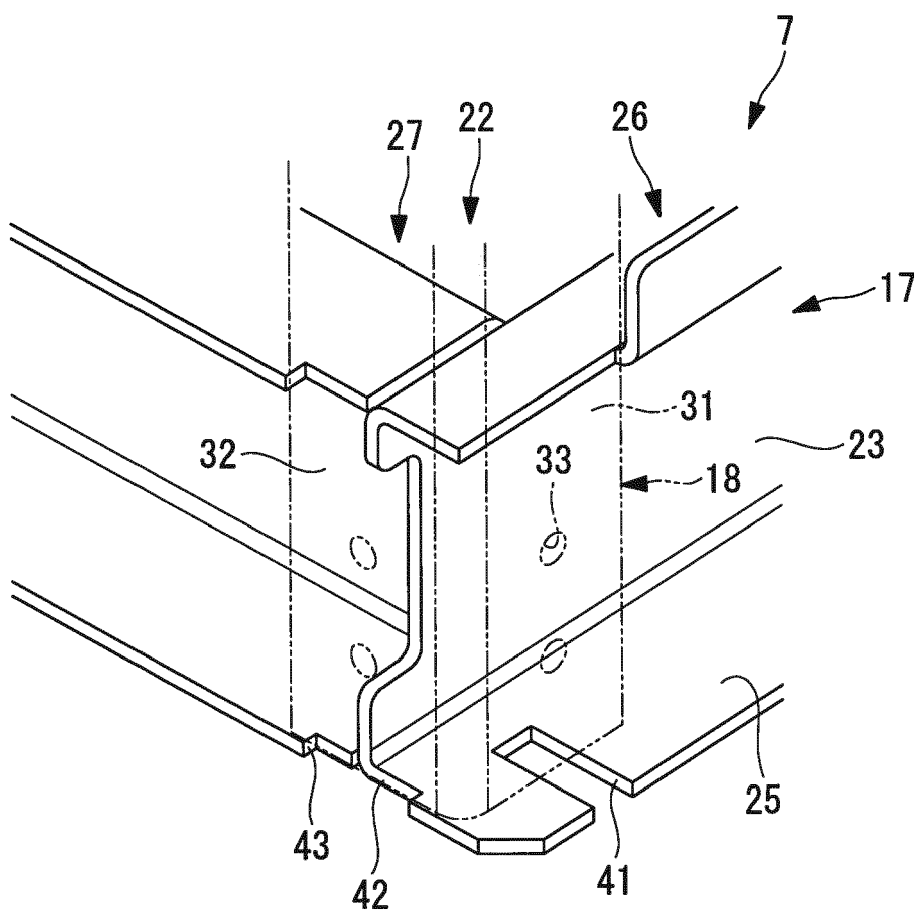
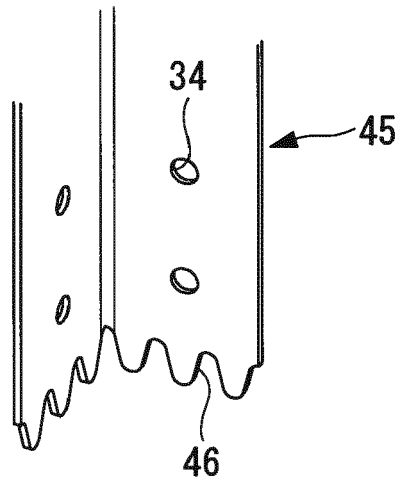


FIG. 5

(a)



(b)

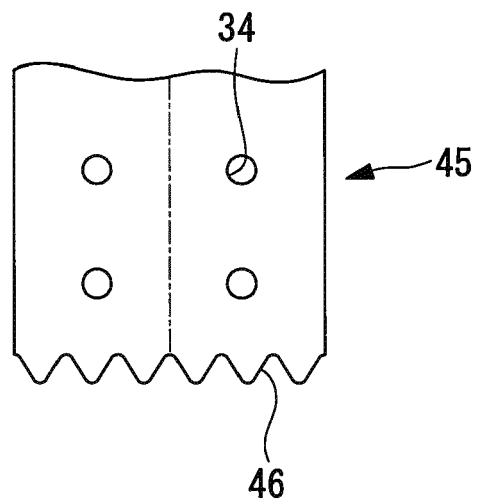
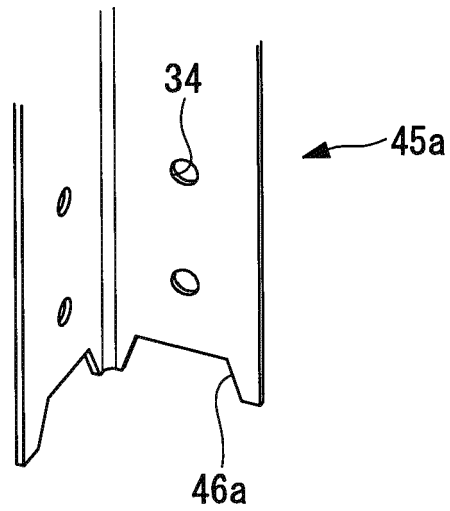


FIG. 6

(a)



(b)

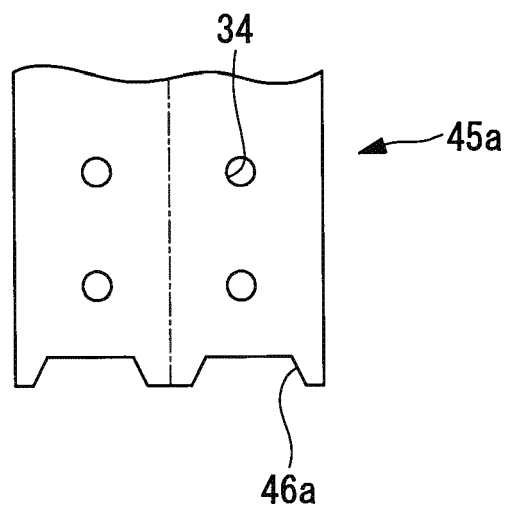
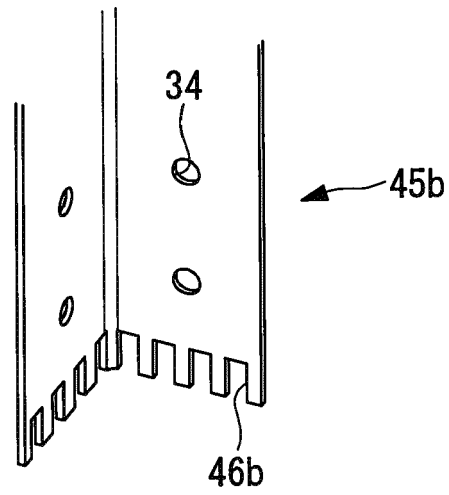
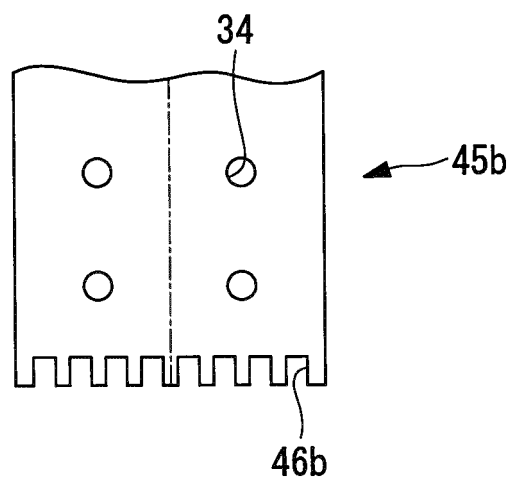


FIG. 7

(a)



(b)





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