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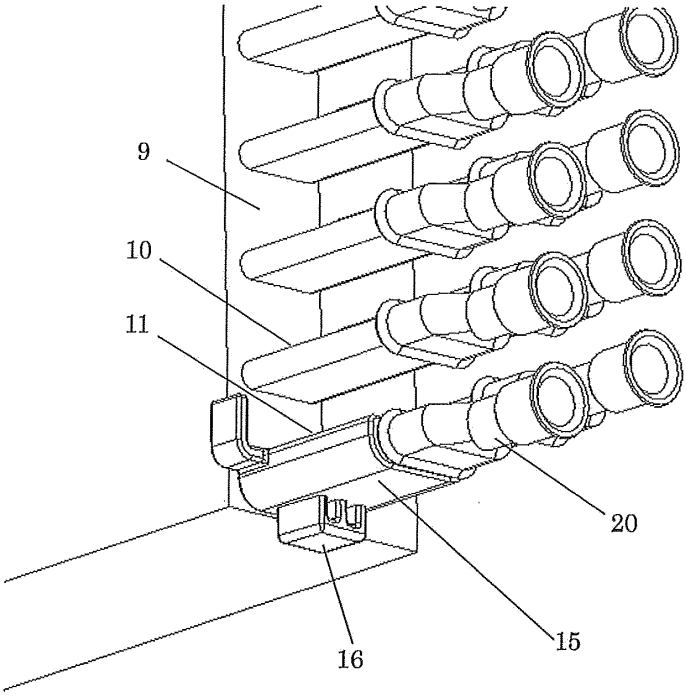
(54) OUTDOOR UNIT FOR AIR CONDITIONER AND PRODUCTION METHOD FOR OUTDOOR UNIT FOR AIR CONDITIONER

(57) An outdoor unit of an air-conditioning apparatus of the present invention is characterized by including: a heat exchanger 5 having a plurality of tubes 10; a bottom plate 6 provided below the heat exchanger 5; and a gap filling member 15 provided in a gap between a lowermost column tube 11 disposed at a lower end of the heat exchanger 5, among the plurality of tubes 10, and the bottom plate 6.

F I G. 4



EP 3 009 754 A1

Description

Technical Field

[0001] The present invention relates to an outdoor unit of an air-conditioning apparatus, and a method for manufacturing the same.

Background Art

[0002] In an outdoor unit of an air-conditioning apparatus installed in a building, a commercial facility, or the like, a heat exchanger is disposed on a back surface and a side surface, and a fan is further disposed on an upper surface. In the heat exchanger, fins for radiating heat transferred from circular tubes or flat tubes are vertically skewered to the circular tubes or the flat tubes through which refrigerant moves.

[0003] Conventionally, after the heat exchanger is disposed on a bottom plate, and bent into, for example, a substantially U-shape, an upper part of the heat exchanger is lifted, so that the heat exchanger is mounted on the outdoor unit of the air-conditioning apparatus.

[0004] However, because the heat exchanger is disposed on the bottom plate, the following problems are raised.

[0005] A distance between the bottom plate and a tube disposed on a lowermost column (hereinafter, referred to as a "lowermost column tube") among the tubes for allowing the refrigerant to flow into the heat exchanger is short.

[0006] Therefore, dew condensation water formed by condensing moisture containing air heat-exchanged by the heat exchanger sometimes stays between the lowermost column tube and the bottom plate. The staying dew condensation water causes the corrosion of the lowermost column tube. Additionally, when the staying dew condensation water is frozen, the volume of the dew condensation water is expanded, which causes the breakage and the damage of the lowermost column tube. Additionally, in a case where the lowermost column tube and the bottom plate are made of different kinds of materials, dissimilar metal corrosion (galvanic corrosion) is likely to be generated.

[0007] Additionally, when the lowermost column tube is vibrated by vibration during operation or conveyance of the outdoor unit, the lowermost column tube and the bottom plate come into contact with each other, which causes the breakage and the damage of the lowermost column tube.

[0008] To the tubes of the heat exchanger, connection tubes for supplying the refrigerant to the heat exchanger, or connection tubes such as U-bend tubes for mutually connecting a plurality of the tubes of the heat exchanger are connected by brazing. The brazing parts sometimes swell compared to the diameters of the tubes, and a distance between the bottom plate and the tube is further reduced. Therefore, the above problem is more remarkable.

[0009] In the outdoor unit of the conventional air-conditioning apparatus, the following techniques are proposed to prevent water staying on the bottom plate of the outdoor unit from being frozen.

[0010] In a technique described in Patent Literature 1, an outlet is provided at a position, facing a lower surface of a heat exchanger, of a bottom plate, and dew condensation water from the heat exchanger is discharged from the outlet.

[0011] In a technique described in Patent Literature 2, an outlet is provided at a position, corresponding to a compressor, of a bottom plate, and a water passage having a gradient for guiding water toward the outlet is provided.

[0012] In a technique described in Patent Literature 3, a plurality of louver-like cut-raised parts are provided at a position, corresponding to a heat exchanger, of a bottom plate, and dew condensation water is discharged.

[0013] In a technique described in Patent Literature 4, a heat tube is laid between a heat exchanger and a bottom plate, and dew condensation water is heated, so that dew condensation water is prevented from being frozen.

Citation List

Patent Literature

[0014]

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2012-225563 (claim 1)
Patent Literature 2: Japanese Unexamined Patent Application Publication No. H07-41327 (claim 2)
Patent Literature 3: Japanese Unexamined Patent Application Publication No. H09-145095 (claim 1)
Patent Literature 4: Japanese Unexamined Patent Application Publication No. 2007-10269 (claim 1)

Summary of Invention

Technical Problem

[0015] In the technique of Patent Literature 1, it is necessary to form the outlet in the bottom plate below the heat exchanger. The bottom plate is a member for supporting a structure such as the heat exchanger, and there is a problem that the strength of the bottom plate is lowered when the outlet is formed in the bottom plate.

[0016] In the technique of Patent Literature 2, the water passage having the gradient for guiding water to the outlet is provided. However, dew condensation water stays on the bottom plate depending on the angle of the gradient. Therefore, there is a problem that dew condensation water stays between a lowermost column tube of the heat exchanger and the bottom plate.

[0017] In the technique of Patent Literature 3, the plurality of louver-like cut-raised parts are provided in the

bottom plate, and therefore the opening area of the bottom plate increases. Therefore, there is a problem that air flowing into the outdoor unit flows out from openings of the bottom plate, the air volume of air passing through the heat exchanger reduces, and heat exchange performance lowers. Additionally, the opening area of the bottom plate is large, and therefore there is a possibility that a small animal, snow, or the like are inclined to invade therein through the openings of the bottom plate.

[0018] In the technique of Patent Literature 4, the heat tube needs to be laid, and therefore there is a problem that a manufacturing cost increases. Additionally, there is a problem that dew condensation water is frozen in a case where a heater provided in the heat tube is broken.

[0019] In any of the techniques of Patent Literature 1 to 4, there is a problem that when the lowermost column tube is vibrated by vibration during operation or conveyance of the outdoor unit, the lowermost column tube and the bottom plate come into contact with each other, which facilitates the breakage and the damage of the lowermost column tube.

[0020] In the outdoor unit of the air-conditioning apparatus, when the heat exchanger is disposed on the bottom plate, the heat exchanger is disposed at a desired position, and therefore a member for positioning the heat exchanger (positioning member) is required. For example, a claw is formed in a metal plate provided in the heat exchanger, and this claw is inserted into an opening of the bottom plate, so that the positioning of the heat exchanger is performed. However, there is a problem that a manufacturing cost increases due to provision of such a positioning member.

[0021] The present invention has been made to solve the above problems, and a first object is to obtain an outdoor unit of an air-conditioning apparatus capable of making it difficult that dew condensation water stays between a lowermost column tube of a heat exchanger and a bottom plate, and a method for manufacturing an outdoor unit of an air-conditioning apparatus.

[0022] A second object is to obtain an outdoor unit of an air-conditioning apparatus capable of preventing contact between the lowermost column tube of the heat exchanger and the bottom plate, and a method for manufacturing an outdoor unit of an air-conditioning apparatus.

[0023] A third object is to obtain an outdoor unit of an air-conditioning apparatus capable of suppressing dissimilar metal corrosion, and a method for manufacturing an outdoor unit of an air-conditioning apparatus.

[0024] A fourth object is to obtain an outdoor unit of an air-conditioning apparatus capable of suppressing increase in a manufacturing cost, and a method for manufacturing an outdoor unit of an air-conditioning apparatus.

Solution to Problem

[0025] An outdoor unit of an air-conditioning apparatus according to the present invention including a heat exchanger having a plurality of tubes, a bottom plate provided below the heat exchanger, and a gap filling member provided in a gap between a lowermost column tube disposed at a lower end of the heat exchanger, among the plurality of tubes, and the bottom plate.

Advantageous Effects of Invention

[0026] The present invention is capable of making it difficult that dew condensation water stays between a lowermost column tube of a heat exchanger and a bottom plate. Additionally, it is possible to prevent contact between the lowermost column tube of the heat exchanger and the bottom plate.

Brief Description of Drawings

[0027]

[Fig. 1] Fig. 1 is a perspective view of an outdoor unit of an air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is a perspective view illustrating a state where a heat exchanger of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention is mounted on a bottom plate.

[Fig. 3] Fig. 3 is an enlarged perspective view of a part A of Fig. 2.

[Fig. 4] Fig. 4 is a perspective view illustrating a state where a gap filling member is mounted on the lowermost column tube of the heat exchanger of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a perspective view of the gap filling member of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 6] Fig. 6 is a perspective view of the gap filling member of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention.

Description of Embodiments

Embodiment 1.

[0028] Fig. 1 is a perspective view of an outdoor unit of an air-conditioning apparatus according to Embodiment 1 of the present invention.

[0029] As illustrated in Fig. 1, the outdoor unit 1 of the air-conditioning apparatus has a large oblong housing. In side surfaces and a back surface of the housing, air inlets 2 for taking air inside are provided. The air inlets 2 are formed in three surfaces of the four side surfaces of the housing. In a front surface of the housing, a front upper panel 3_1 and a front lower panel 3_2 for opening and closing when the inside of the housing is maintained

are provided. Inside the housing, a heat exchanger 5 is disposed along the air inlets 2. In the upper surface of the housing, air outlets 4 for blowing out air are provided. A fan is installed in the vicinity of the air outlets 4. When the fan rotates, air is sucked from the air inlets 2 to pass through the heat exchanger 5, and thereafter is blown out from the air outlets 4.

[0030] In this Embodiment 1, a so-called top flow type outdoor unit, in which air is sucked from the air inlets 2 formed in the side surfaces of the housing, and the air is blow out from the air outlets 4 formed in the upper surface of the housing, will be described as an example. However, the present invention is not limited to this.

[0031] Fig. 2 is a perspective view illustrating a state where the heat exchanger of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention is mounted on a bottom plate.

[0032] Fig. 3 is an enlarged perspective view of a part A of Fig. 2. Fig. 3 illustrates a state where a gap filling member 15 described later is not mounted.

[0033] As illustrated in Fig. 2 and Fig. 3, the heat exchanger 5 is disposed on a bottom plate 6 made of, for example, iron. The heat exchanger 5 includes a plurality of radiation fins 8, and a plurality of heat transfer tubes 7. This heat exchanger 5 performs heat exchange between gas such as air that passes between the plurality of radiation fins 8, and the refrigerant that circulates inside the plurality of heat transfer tubes 7. The heat exchanger 5 is formed in, for example, a substantially U-shape, along the air inlets 2. The shape of the heat exchanger 5 is not limited to this.

[0034] The radiation fins 8 each are made of, for example, aluminum, or an alloy containing aluminum, and each have a plate-like shape. A plurality of the radiation fins 8 are stacked at predetermined intervals, and gas such as air circulates between the radiation fins. Additionally, openings for inserting the plurality of heat transfer tubes 7 are formed in the radiation fins 8, and the heat transfer tubes 7 are inserted into the respective openings, so that the openings are joined to the plurality of heat transfer tubes 7.

[0035] The plurality of heat transfer tubes 7 each are made of, for example, aluminum, or an alloy containing aluminum, and each are a heat transfer tube having a flat cross-sectional outline. The plurality of heat transfer tubes 7 are disposed at a plurality of columns in a column direction intersecting with an air circulating direction, and are disposed at a plurality of rows in a row direction along the air circulating direction. The heat transfer tubes 7 are disposed such that the direction of a long axis of each flat tube is parallel to the surface of the bottom plate 6. That is, the direction of the long axis of each flat shape is the direction of the air circulating direction (row direction), and the plurality of heat transfer tubes 7 are disposed at intervals in a direction of a short axis of each flat shape (column direction).

[0036] The heat transfer tubes 7 are connected to a plurality of tubes 10 for allowing the refrigerant to flow, at one end face 9 of the heat exchanger 5. The plurality of tubes 10 are made of, for example, aluminum, or an alloy containing aluminum. In this Embodiment 1, the tubes 10 are connected to the heat transfer tubes 7. However, the present invention is not limited to this, and the heat transfer tubes 7 and the tubes 10 may be integrally formed. That is, the heat transfer tubes 7 may extend beyond the end face 9 of the heat exchanger 5, and extending parts of the heat transfer tubes 7 may be formed as the tubes 10.

[0037] The other end face side (right side of Fig. 2) of the heat exchanger 5 has a shape in which the heat transfer tubes 7 are each bent into a U-shape on an axial end side. The heat transfer tubes 7 are each bent into the U-shape herein, but the present invention is not limited to this. For example, the axial ends of the heat transfer tubes 7 may be connected to the heat transfer tubes 7 disposed at other columns by using U-bend tubes or the like.

[0038] Lead tubes 20 are connected to the plurality of tubes 10, respectively. These lead tubes 20 are made of, for example, aluminum, or an alloy containing aluminum. The lead tubes 20 each function as, for example, a joint for connecting the flat tube and the circular tube. The lead tubes 20 are connected to the tubes 10 by brazing 14. To these lead tubes 20, the U-bend tubes connected to the heat transfer tubes 7 disposed at other columns, distributors for distributing refrigerant, refrigerant tubes for connecting the heat exchanger 5 and other components, and the like are connected.

[0039] Herein, a positional relation between a tube disposed at a lowermost column of the heat exchanger 5, and the bottom plate 6 will be described.

[0040] As illustrated in Fig. 3, the tube disposed at the lowermost column of the heat exchanger 5 (hereinafter, referred to as a "lowermost column tube 11 ") is located adjacent to the bottom plate 6.

[0041] In a state where the gap filling member 15 described later is not mounted, dew condensation water obtained by condensing moisture contained in heat-exchanged air sometimes stays in a gap 12 between the lowermost column tube 11 and the bottom plate 6. The staying dew condensation water causes corrosion of the lowermost column tube 11. Additionally, when the staying dew condensation water is frozen, the volume of the dew condensation water expands, which causes breakage and damage of the lowermost column tube 11.

[0042] In a case where the shape of the lowermost column tube 11 of the heat exchanger 5 is flat, the area of a part located adjacent to the bottom plate 6 increases compared to a case of the circular tube. That is, the amount of dew condensation water staying between the flat lowermost column tube 11 and the bottom plate 6 increases. Accordingly, the corrosion of the lowermost column tube 11 is likely to be accelerated compared to the circular tube. Additionally, the frozen area of the dew condensation water increases, and a possibility that the lowermost column tube 11 is broken increases compared to the circular tube.

[0043] In a case where the lowermost column tube 11 and the bottom plate 6 are made of different kinds of metals, the lowermost column tube 11 and the bottom plate 6 become conductive by the staying dew condensation water, and a potential difference occurs, which causes dissimilar metal corrosion.

[0044] When the lowermost column tube 11 is vibrated by vibration during operation or conveyance of the outdoor unit 1 as illustrated by a vibration width 13 of Fig. 3, the lowermost column tube 11 and the bottom plate 6 come into contact with each other, which may cause the breakage of the lowermost column tube 11.

[0045] Particularly, the lowermost column tube 11 and the lead tube 20 are connected by the brazing 14, and the brazing 14 swells beyond the tube diameter of the lowermost column tube 11. Therefore, the gap 12 between the brazing 14 and the bottom plate 6 further reduces. In a case where the lowermost column tube 11 is vibrated, the lowermost column tube 11 and the bottom plate 6 are likely to come into contact with each other.

[0046] From the above, the outdoor unit 1 of the air-conditioning apparatus according to this Embodiment 1 is provided with the gap filling member 15 in the gap 12 between at least one of the lowermost column tube 11 and the lead tube 20 connected to the lowermost column tube 11, and the bottom plate 6. Hereinafter, the detail of the gap filling member 15 will be described.

[0047] The lowermost column tube 11 and the lead tube 20 connected to the lowermost column tube 11 are equivalent to a "lowermost column tube" of the present invention.

[0048] Fig. 4 is a perspective view illustrating a state where the gap filling member is mounted on the lowermost column tube of the heat exchanger of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention.

[0049] Fig. 5 and Fig. 6 each are a perspective view of the gap filling member of the outdoor unit of the air-conditioning apparatus according to Embodiment 1 of the present invention.

[0050] The gap filling member 15 is made of, for example, resin. The gap filling member 15 is provided in the gap between the lowermost column tube 11 and the bottom plate 6. The gap filling member 15 may be provided in a gap between the lead tube 20 connected to the lowermost column tube 11 and the bottom plate 6. Additionally, the gap filling member 15 may be provided in both the gap between the lowermost column tube 11 and the bottom plate 6, and the gap between the lead tube 20 connected to the lowermost column tube 11 and the bottom plate 6.

[0051] Thus, the gap filling member 15 is provided in the gap between the lowermost column tube 11 and the bottom plate 6, so that it is possible to prevent dew condensation water from staying in the gap. Additionally, in a case where the lowermost column tube 11 is vibrated by the vibration during the operation or the conveyance of the outdoor unit 1, the gap filling member 15 functions as a buffer material, and can prevent contact between the lowermost column tube 11 and the bottom plate 6.

[0052] The material of the gap filling member 15 is not limited to resin. For example, the gap filling member 15 may be made of rubber. The gap filling member 15 is made of a material having an insulating property, so that the lowermost column tube 11 and the bottom plate 6 can be insulated, and dissimilar metal corrosion can be suppressed. Additionally, the gap filling member 15 is made of a material having elasticity, so that it is possible to suppress vibration of the lowermost column tube 11.

[0053] The gap filling member 15 is formed with a recess 18 having a U-shaped cross-section. Returning parts 17 that form both side surfaces of the recess 18 are formed such that a width between upper parts is narrow corresponding to the shape of the lowermost column tube 11. When the lowermost column tube 11 is fitted in the recess 18 of the gap filling member 15, the gap filling member 15 holds the lowermost column tube 11 to be fixed by the returning parts 17.

[0054] A fixing method of the gap filling member 15 is not limited to this. For example, a width between the returning parts 17 forming the both side surfaces of the recess 18 may be made to be slightly narrower than the outline of the lowermost column tube 11, and the lowermost column tube 11 may be held by elastic force of the returning parts 17. Additionally, for example, a cylindrical part having a flat cross-section may be formed in place of the recess 18, and an end of the lowermost column tube 11 may be inserted into the cylindrical part of the gap filling member 15, so that the gap filling member 15 may be fixed to the lowermost column tube 11.

[0055] Thus, the gap filling member 15 has a structure in which the gap filling member 15 can be fixed to the lowermost column tube 11 without using any tool.

[0056] The gap filling member 15 is formed with a protrusion 16 on a side close to the bottom plate 6. The protrusion 16 has a shape corresponding to the opening 19 (see Fig. 3) formed at a position, facing the gap filling member 15, of the bottom plate 6. When the heat exchanger 5 is formed on the bottom plate 6, the protrusion 16 of the gap filling member 15 is fitted in the opening 19 of the bottom plate 6, so that the position at which the heat exchanger 5 is disposed is determined.

[0057] The opening 19 of the bottom plate 6 is formed in, for example, a quadrangle. The protrusion 16 of the gap filling member 15 is formed in a cube corresponding to the opening 19. The shapes of the opening 19 and the protrusion 16 are not limited to the above. For example, the opening 19 may be formed in a circle, and the protrusion 16 may be formed in a columnar. The opening 19 may be formed in a circle, and the protrusion 16 may be formed in a columnar. Additionally, each shape may be an arbitrary shape such as a trapezoid. That is, the shapes of the opening 19 and the protrusion 16 may be arbitrary shapes as long as the shapes can be satisfactorily used for positioning.

[0058] Thus, the gap filling member 15 has a structure

as a member for positioning when the heat exchanger 5 is disposed on the bottom plate 6.

[0059] Now, a method for manufacturing the outdoor unit 1 of the air-conditioning apparatus according to this Embodiment 1.

[0060] The method for manufacturing the outdoor unit 1 of the air-conditioning apparatus includes at least the following steps.

[0061] Before the heat exchanger 5 is disposed on the bottom plate 6, the gap filling member 15 is fitted to at least one of the lowermost column tube 11, and the lead tube 20 connected to the lowermost column tube 11 to be fixed.

[0062] Next, the protrusion 16 of the gap filling member 15 is fitted in the opening 19 of the bottom plate 6, so that positioning of the heat exchanger 5 on the bottom plate 6 is implemented.

[0063] Thus, the gap filling member 15 functions as a member for positioning when the heat exchanger 5 is disposed on the bottom plate 6. Accordingly, the member for positioning does not need to be separately provided, and a manufacturing cost can be suppressed.

[0064] As described above, in this Embodiment 1, the gap filling member 15 is provided in the gap between the lowermost column tube 11 and the bottom plate 6.

[0065] Therefore, it is possible to make it difficult that dew condensation water from the heat exchanger 5 stays between the lowermost column tube 11 of the heat exchanger 5 and the bottom plate 6. Additionally, it is possible to prevent contact between the lowermost column tube 11 of the heat exchanger 5 and the bottom plate 6 due to the vibration during the operation or the conveyance of the outdoor unit 1. Accordingly, it is possible to prevent corrosion, breakage, and damage of the lowermost column tube 11.

[0066] In this Embodiment 1, the gap filling member 15 is formed with the recess 18 having the U-shaped cross-section, and the lowermost column tube 11 is fitted in the recess 18 to be fixed.

[0067] Therefore, the gap filling member 15 can be fixed to the lowermost column tube 11 without using any tool. Accordingly, it is possible to suppress increase in a manufacturing cost.

[0068] In this Embodiment 1, the bottom plate 6 is formed with the opening 19 at the position facing the gap filling member 15, and the gap filling member 15 is formed with the protrusion 16 fitted in the opening 19, on the side close to the bottom plate 6.

[0069] Therefore, the gap filling member 15 functions as the member for positioning when the heat exchanger 5 is disposed on the bottom plate 6. Accordingly, the member for positioning does not need to be separately provided, and a manufacturing cost can be suppressed.

[0070] In this Embodiment 1, the gap filling member 15 is a material having an insulating property.

[0071] Therefore, the lowermost column tube 11 and the bottom plate 6 can be insulated. Even when the lowermost column tube 11 and the bottom plate 6 are made of different kinds of metals, it is possible to suppress dissimilar metal corrosion.

[0072] In this Embodiment 1, the lowermost column tube 11 is a flat tube, and is disposed such that the direction of the long axis of the flat tube is parallel to the surface of the bottom plate 6.

[0073] Thus, even in a case where dew condensation water is likely to stay between the flat lowermost column tube 11 and the bottom plate 6, compared to the circular tube, the gap filling member 15 is provided in the gap between the lowermost column tube 11 and the bottom plate 6, and therefore it is possible to make it difficult that dew condensation water from the heat exchanger 5 stays. Accordingly, it is possible to prevent the corrosion, the breakage, and the damage of the lowermost column tube 11.

Reference Signs List

[0074] 1 outdoor unit 2 air inlet 3_1 front upper panel 3_2 front lower panel 4 air outlet 5 heat exchanger 6 bottom plate 7 heat transfer tube 8 radiation fin 9 end face 10 tube 11 lowermost column tube 12 gap 13 vibration width 14 brazing 15 gap filling member 16 protrusion 17 returning part 18 recess 19 opening 20 lead tube

Claims

1. An outdoor unit of an air-conditioning apparatus, comprising:

   a heat exchanger having a plurality of tubes;
   a bottom plate provided below the heat exchanger; and
   a gap filling member provided in a gap between a lowermost column tube disposed at a lower end of the heat exchanger, among the plurality of tubes, and the bottom plate.

2. The outdoor unit of an air-conditioning apparatus of claim 1, wherein
   the gap filling member is formed with a recess having a U-shaped cross-section, and
   the lowermost column tube is fitted in the recess to be fixed.

3. The outdoor unit of an air-conditioning apparatus of claim 1 or 2, wherein
   the bottom plate is formed with an opening at a position facing the gap filling member, and
   the gap filling member is formed with a protrusion fitted in the opening, on a side close to the bottom plate.

4. The outdoor unit of an air-conditioning apparatus of any one of claims 1 to 3, wherein
   the gap filling member is made of a material having

an insulating property, and
the lowermost column tube and the bottom plate are made of different kinds of metals.

5. The outdoor unit of an air-conditioning apparatus of claim 4, wherein
the lowermost column tube is made of aluminum, or an alloy containing aluminum, and
the bottom plate is made of iron.

6. The outdoor unit of an air-conditioning apparatus of any one of claims 1 to 5, wherein
the lowermost column tube is a flat tube, and
the lowermost column tube is disposed such that a direction of a cross-sectional long axis of the flat tube is parallel to a surface of the bottom plate.

7. A method for manufacturing an outdoor unit of an air-conditioning apparatus, the outdoor unit including a heat exchanger having a plurality of tubes, and a bottom plate, the method for manufacturing the outdoor unit of the air-conditioning apparatus comprising:

fitting a gap filling member to a lowermost column tube to fix the gap filling member, the gap filling member being formed with a recess having a U-shaped cross-section, the lowermost column tube being disposed at a lower end of the heat exchanger among the plurality of tubes; and
fitting a protrusion into an opening of the bottom plate to implement positioning of the heat exchanger on the bottom plate, the protrusion being formed on a side, close to the bottom plate, of the gap filling member.

FIG. 1

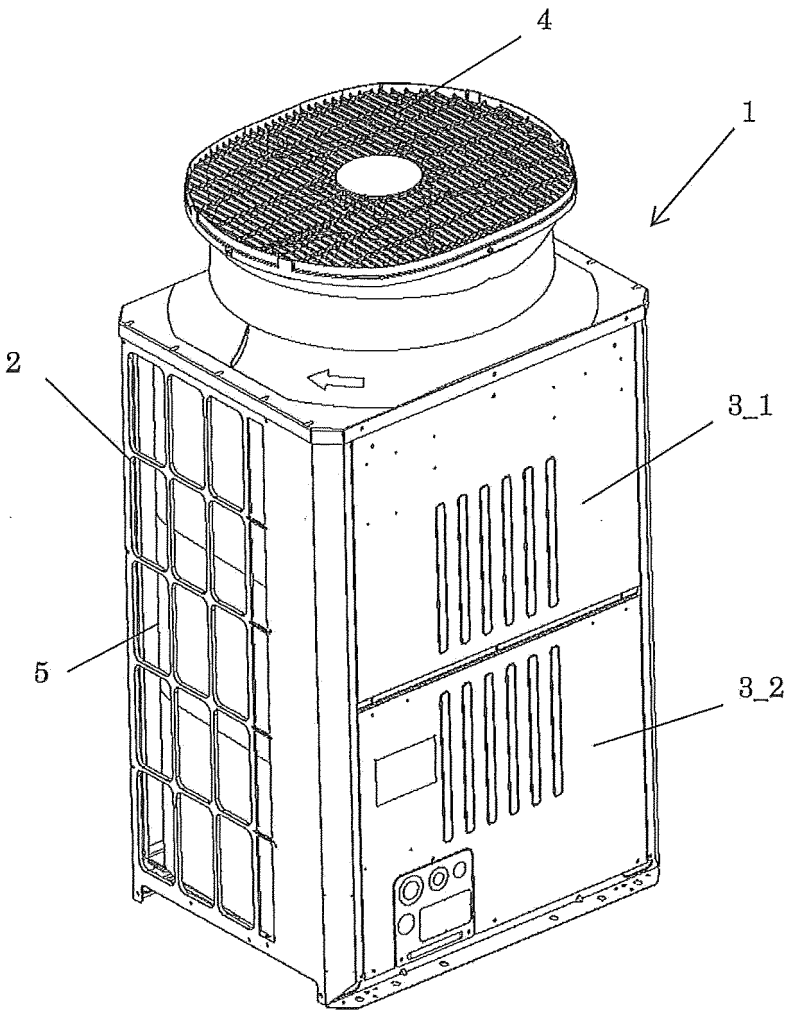


FIG. 2

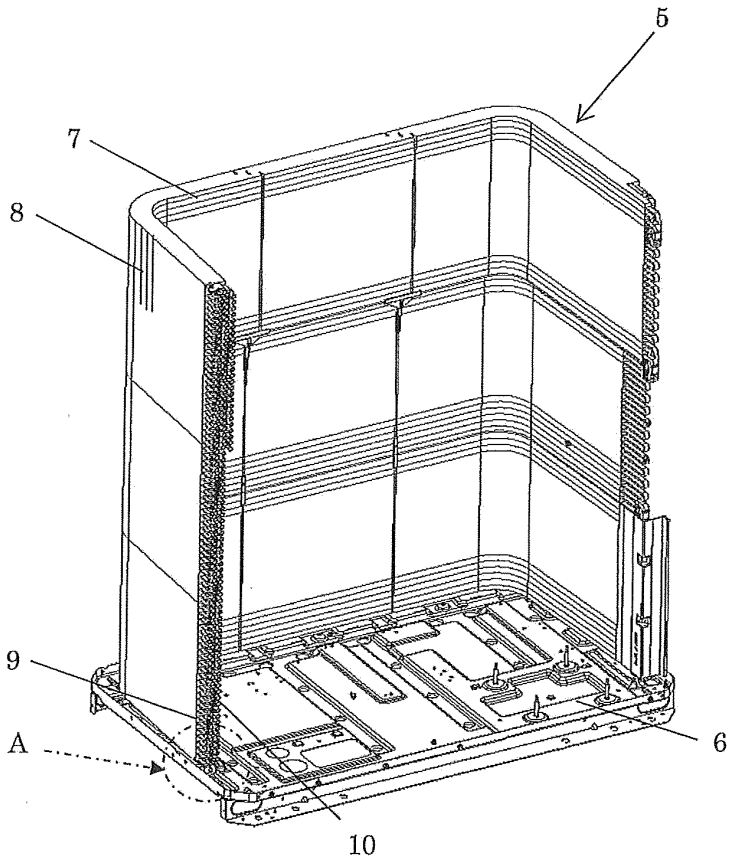


FIG. 3

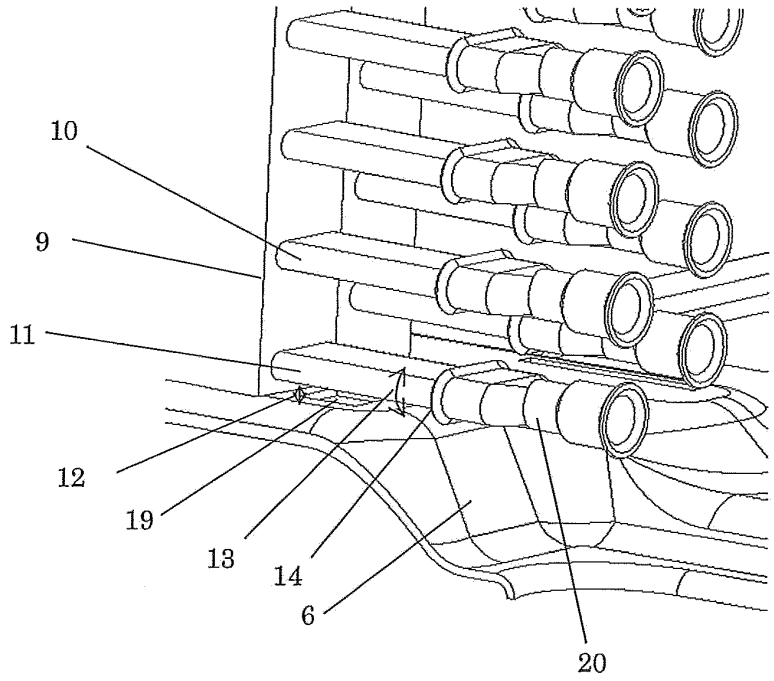


FIG. 4

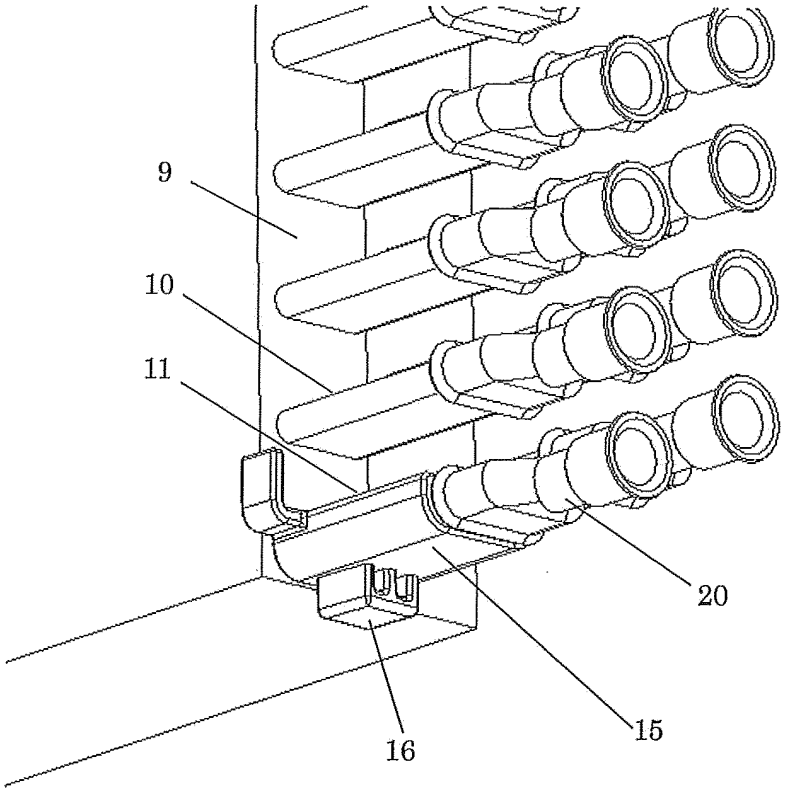


FIG. 5

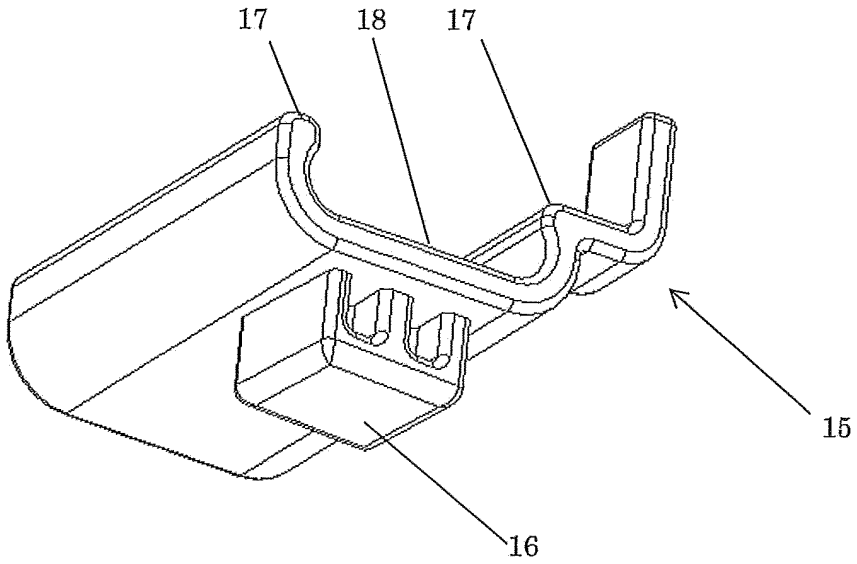
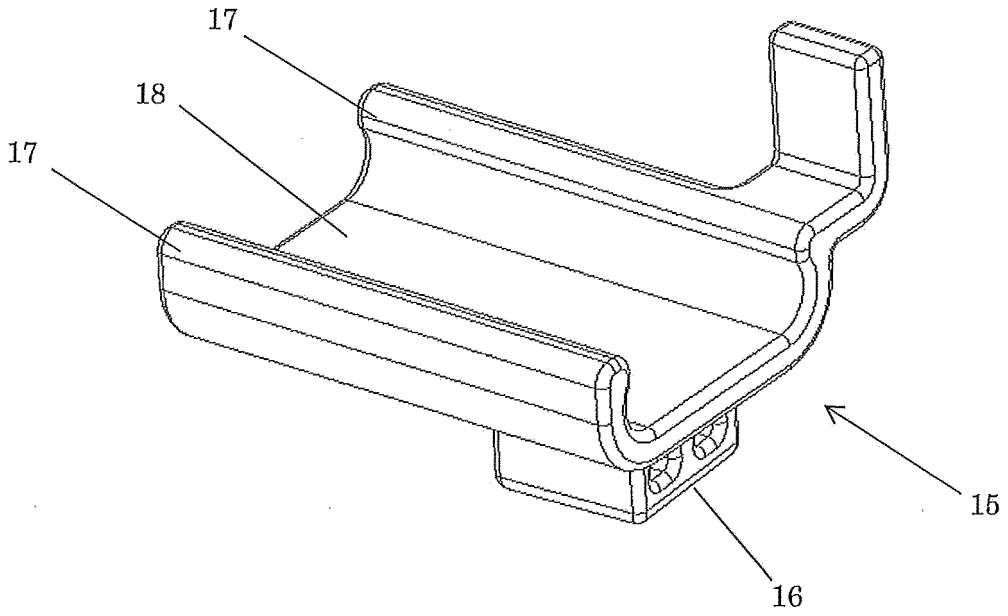


FIG. 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/066476

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 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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.
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 106196/1983(Laid-open No. 014426/1985) (Kabushiki Kaisha General), 31 January 1985 (31.01.1985), page 1, line 1 to page 3, line 9; fig. 1 to 2 (Family: none)	1,2 3-7
X Y	JP 02-050033 A (Mitsubishi Electric Corp.), 20 February 1990 (20.02.1990), page 2, upper right column, line 3 to lower right column, line 16; fig. 1 to 5 (Family: none)	1,2 3-7

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

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	JP 2010-169357 A (Mitsubishi Electric Corp.), 05 August 2010 (05.08.2010), paragraph [0012]; fig. 2 to 4 (Family: none)	4-6
Y	JP 2011-145029 A (Sharp Corp.), 28 July 2011 (28.07.2011), paragraphs [0025] to [0041]; fig. 6 to 7 (Family: none)	4-6

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REFERENCES CITED IN THE DESCRIPTION

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