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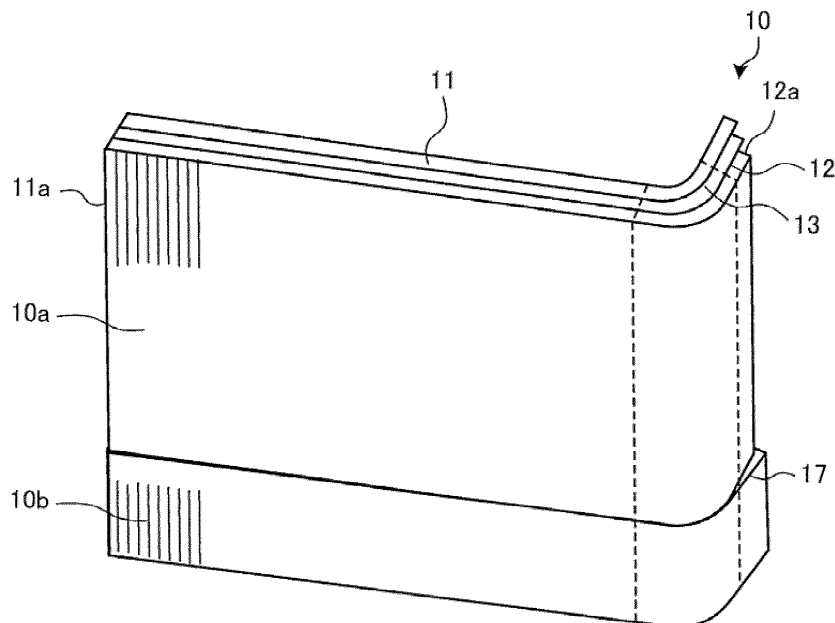
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(54) **AIR CONDITIONING DEVICE OUTDOOR UNIT**

(57) An outdoor unit for an air-conditioning apparatus includes a heat exchanger including a plurality of heat exchanger units. The plurality of heat exchanger units are vertically stacked and each include a long side portion, a short side portion, and a corner portion bent and connecting the long side portion and the short side portion

to each other. In the heat exchanger, deviation in an air flow direction that lies between ones of the plurality of heat exchanger units that are vertically adjacent to each other is larger at the short side portions than at the long side portions.

FIG. 8



Description

Technical Field

[0001] The present invention relates to an outdoor unit for an air-conditioning apparatus including a heat exchanger in which a plurality of heat exchanger units are vertically stacked.

Background Art

[0002] In a conventional outdoor unit for an air-conditioning apparatus, a holding part is interposed between each two of a plurality of heat exchanger units each bent into an L-shape or a U-shape at a part of the heat exchanger unit to stably and vertically stack the plurality of heat exchanger units.

[0003] There is disclosed a technology that a side surface of an upper heat exchanger unit and a side surface of a lower heat exchanger unit are supported by the holding part (see, for example, Patent Literature 1).

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2009-79851

Summary of Invention

Technical Problem

[0005] However, in the outdoor unit for an air-conditioning apparatus described in Patent Literature 1 described above, the holding part regulates a large range of linear portions and corner portions of the heat exchanger units that are each bent into an L-shape or a U-shape at a part of the heat exchanger unit. Consequently, when the heat exchanger units vary in bending angles, and the bending angles of the heat exchanger units that are vertically adjacent to each other are not equal, adjustment of the bending angles of the heat exchanger units is required at the time of assembly. As a result, the number of assembly steps is increased, or assembly time is elongated. Thus, there is a problem in assembly efficiency.

[0006] Further, for improvement in assembly efficiency, it is conceivable to increase dimensions of a support portion, which is provided on the holding part and regulates the side surfaces of the heat exchanger units, and vertically stack the heat exchanger units having various bending angles as they are. However, in this case, there is a problem in that an uneven surface due to deviation in an air flow direction of the heat exchanger units that are vertically stacked is caused at a part, such as a back surface of the outdoor unit, at which an installation worker or a user can touch the heat exchanger units that are vertically stacked.

[0007] The present invention has been made to solve the problems described above, and has an object to provide an outdoor unit for an air-conditioning apparatus that improves assembly efficiency through elimination of need for adjustment of bending angles of heat exchanger units at the time of assembly, and prevents an uneven surface due to deviation in an air flow direction of the heat exchanger units that are vertically stacked at a part, such as a back surface of the outdoor unit, at which an installation worker or a user can touch the heat exchanger units that are vertically stacked.

Solution to Problem

[0008] According to an embodiment of the present invention, there is provided an outdoor unit for an air-conditioning apparatus, including a heat exchanger including a plurality of heat exchanger units, the plurality of heat exchanger units being vertically stacked and each including a long side portion, a short side portion, and a corner portion bent and connecting the long side portion and the short side portion to each other. In the heat exchanger, deviation in an air flow direction that lies between ones of the plurality of heat exchanger units that are vertically adjacent to each other is larger at the short side portions than at the long side portions.

Advantageous Effects of Invention

[0009] In the outdoor unit for an air-conditioning apparatus according to an embodiment of the present invention, in the heat exchanger, the deviation in the air flow direction that lies between the ones of the plurality of heat exchanger units that are vertically adjacent to each other is larger at the short side portions than at the long side portions. Consequently, assembly efficiency can be improved through elimination of need for adjustment of the bending angles of the heat exchanger units at the time of assembly. Further, it is possible to prevent the uneven surface due to the deviation in the air flow direction of the heat exchanger units that are vertically stacked at the part at which the long side portions are arranged, such as the back surface of the outdoor unit, at which an installation worker or a user can touch the heat exchanger units that are vertically stacked.

Brief Description of Drawings

[0010]

Fig. 1 is an exploded perspective view for illustrating an outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

Fig. 2 is a perspective view for illustrating a state of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention as viewed from a back surface of the outdoor unit.

Fig. 3 is an exploded perspective view for illustrating

a heat exchanger mounted to the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

Fig. 4 is a perspective view for illustrating a first regulating part in Embodiment of the present invention. Fig. 5 is a plan view for illustrating a range of regulation by the first regulating part in Embodiment of the present invention.

Fig. 6 is a perspective view for illustrating a second regulating part in Embodiment of the present invention.

Fig. 7 is a perspective view for illustrating a third regulating part in Embodiment of the present invention. Fig. 8 is a perspective view for illustrating a state of the heat exchanger to be mounted to the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention as viewed from a back surface of the heat exchanger.

Fig. 9 is a perspective view for illustrating a state of a heat exchanger to be mounted to an outdoor unit for an air-conditioning apparatus in the related art as viewed from a back surface of the heat exchanger.

Description of Embodiments

[0011] An embodiment of the present invention is described below with reference to the drawings. In each of the drawings, components denoted by the same reference signs correspond to the same or similar components. The reference signs are commonly used throughout the description herein. In addition, the modes of the components described herein are merely examples, and the components are not limited to the description herein.

Embodiment

[0012] Fig. 1 is an exploded perspective view for illustrating an outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention. As illustrated in Fig. 1, the outdoor unit 100 for an air-conditioning apparatus includes a bottom plate 1 and a heat exchanger 10. The heat exchanger 10 is placed on the bottom plate 1.

[0013] The outdoor unit 100 for an air-conditioning apparatus includes a compressor 2 and connection pipes 3. The connection pipes 3 connect the heat exchanger 10 and the compressor 2 to each other.

[0014] The outdoor unit 100 for an air-conditioning apparatus includes a fan 4, a motor (not shown), and a motor mounting base 5. The fan 4 is configured to send air to the heat exchanger 10. The motor is configured to drive the fan 4. The motor mounting base 5 fixes the fan 4 and the motor. The motor mounting base 5 is fixed to the bottom plate 1, and fixes the heat exchanger 10 in such a manner that the heat exchanger 10 is sandwiched between the motor mounting base 5 and the bottom plate 1. A flexible part made of a flexible material such as insulation (not shown) is bonded to the motor mounting

base 5 at a top surface of the motor mounting base 5 at which the motor mounting base 5 is held in contact with a top plate 9, and the motor mounting base 5 is pressed by the top plate 9.

[0015] The outdoor unit 100 for an air-conditioning apparatus includes a controller 6 above the compressor 2. The controller 6 has a flat plate shape, and is configured to control, for example, the compressor 2 and the motor.

[0016] The outdoor unit 100 for an air-conditioning apparatus includes a casing 7 that surrounds various components to accommodate the various components. The casing 7 includes an outdoor-unit-side-surface portion 7a and an outdoor-unit-front-surface portion 7b. The outdoor-unit-side-surface portion 7a covers a short side portion 12 of the heat exchanger 10. The outdoor-unit-front-surface portion 7b is located at a portion of the casing 7 opposite to a long side portion 11 of the heat exchanger 10, which is exposed as a back surface of the outdoor unit 100.

[0017] The outdoor-unit-side-surface portion 7a of the casing 7 has a plurality of openings 7a1, which serve as air inlets and allow passage of air.

[0018] The outdoor-unit-front-surface portion 7b of the casing 7 has an air outlet 7b1 to which a fan guard is mounted.

[0019] The outdoor-unit-side-surface portion 7a and the outdoor-unit-front-surface portion 7b of the casing 7 may be formed as separate components.

[0020] The outdoor unit 100 for an air-conditioning apparatus includes a pillar portion 8. The pillar portion 8 forms an outdoor-unit-opposite-side-surface portion at a portion of the outdoor unit 100 opposite to the outdoor-unit-side-surface portion 7a of the casing 7, and a side edge portion 11a of the long side portion 11 of the heat exchanger 10 is fixed to the pillar portion 8. The pillar portion 8 is a cover having an L-shape that is bent and connecting a part of the back surface of the outdoor unit 100 and the outdoor-unit-opposite-side-surface portion. At an inner portion than the pillar portion 8, the compressor 2, the connection pipes 3, and the controller 6 are placed. Consequently, the pillar portion 8 does not have an opening that allows passage of air.

[0021] The outdoor unit 100 for an air-conditioning apparatus includes the top plate 9. The top plate 9 is placed over the casing 7 and the pillar portion 8, and fixes the heat exchanger 10 by pressing the motor mounting base 5 of the heat exchanger 10 downward to sandwich the heat exchanger 10 between the top plate 9 and the bottom plate 1. The top plate 9 has a shape along four side surfaces of a rectangular shape of the outdoor unit having a contour formed by the heat exchanger 10, the casing 7, and the pillar portion 8.

[0022] The heat exchanger 10 has an L-shape including one long side portion 11, one short side portion 12, and a corner portion 13 that is bent and connecting the long side portion 11 and the short side portion 12 to each other. That is, the heat exchanger 10 is formed into such an L-shape that the short side portion 12 is continuous

from the long side portion 11 through the corner portion 13.

[0023] In the heat exchanger 10, the long side portion 11 is exposed as the back surface of the outdoor unit 100, and the heat exchanger 10 is placed along the contour of the outdoor unit 100.

[0024] In Embodiment, the heat exchanger 10 having the L-shape including the one short side portion 12 is described as an example. However, the heat exchanger in the present invention may be formed into a U-shape including two short side portions each continuous to a corresponding one of both side edge portions of one long side portion through a corresponding one of corner portions.

[0025] Fig. 2 is a perspective view for illustrating a state of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention as viewed from the back surface of the outdoor unit 100. As illustrated in Fig. 2, the outdoor unit 100 for an air-conditioning apparatus allows, by the fan 4, air outside the outdoor unit 100 to pass through the heat exchanger 10 from a part covered by the back surface of the outdoor unit 100 and the outdoor-unit-side-surface portion 7a of the casing 7 and flow through the air outlet 7b1 in a front surface of the outdoor unit 100. Consequently, the part covered by the back surface of the outdoor unit 100 and the outdoor-unit-side-surface portion 7a of the casing 7 forms an inflow-surface portion. Further, a part facing the inside of the outdoor unit 100 forms an outflow-surface portion. In the heat exchanger 10, air flows in an air flow direction directed from the inflow-surface portion to the outflow-surface portion.

[0026] In the outdoor unit 100 for an air-conditioning apparatus, the long side portion 11 of the heat exchanger 10, which cannot be easily touched by a user due to, for example, presence of a wall surface of a house directly behind the outdoor unit 100 after installation, is exposed as a back-surface-side opening of an air inlet. With this configuration, a contour component such as a frame that hinders flow of air is not provided on the back surface of the outdoor unit 100, and hence air sending efficiency is excellent.

[0027] Further, in the outdoor unit 100 for an air-conditioning apparatus, a user can easily touch the side surface of the outdoor unit 100 at which the short side portion 12 of the heat exchanger 10 is present. Thus, the side surface of the outdoor unit 100 is covered by the outdoor-unit-side-surface portion 7a of the casing 7. The outdoor-unit-side-surface portion 7a of the casing 7 has the plurality of openings 7a1, which serve as the air inlets and allow passage of air.

[0028] Further, as illustrated in Fig. 2, the heat exchanger 10 is formed by vertically stacking two heat exchanger units 10a and 10b.

[0029] Three or more heat exchanger units may be vertically stacked to form a heat exchanger.

[0030] Further, as illustrated in Fig. 2, the side edge portion 11a of the long side portion 11 of the heat ex-

changer 10 is fixed to the pillar portion 8 at a plurality of positions with screws 20a and 20b. In the fixing with the screws at the plurality of positions, the two heat exchanger units 10a and 10b vertically stacked are each fixed.

[0031] The short side portion 12 of the heat exchanger 10 is not fixed to a set part with, for example, screws or a hooking part. The short side portion 12 of the heat exchanger 10 is pressed and fixed to the bottom plate 1 by the top plate 9.

[0032] Fig. 3 is an exploded perspective view for illustrating the heat exchanger 10 mounted to the outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention. As illustrated in Fig. 3, in each of the two heat exchanger units 10a and 10b vertically stacked, a plurality of metal pipes 14, which are each made of, for example, copper or aluminum and formed into a U-shape, are stacked. Further, in each of the two heat exchanger units 10a and 10b vertically stacked, a plurality of metal plates 15, which are each made of, for example, aluminum and have holes for the plurality of metal pipes 14, are formed at intervals. Each of the two heat exchanger units 10a and 10b vertically stacked is formed by subjecting the plurality of metal pipes 14 and the plurality of metal plates 15 to close-contact processing.

[0033] Further, each of the two heat exchanger units 10a and 10b vertically stacked is formed into such an L-shape that the short side portion 12 is continuous from the long side portion 11 through the corner portion 13. The two heat exchanger units 10a and 10b vertically stacked have different heights, and have an L-shape having deviation in the air flow direction such as shape errors caused by manufacture variation. The deviation in the air flow direction is caused mainly due to manufacture variation, namely, a difference in bending R dimension caused at the time of a bending step.

[0034] In each of the two heat exchanger units 10a and 10b vertically stacked, the plurality of metal pipes 14 are connected to the connection pipes 3 of the outdoor unit 100 at the side edge portion 11a of the long side portion 11.

[0035] In each of the two heat exchanger units 10a and 10b vertically stacked, the plurality of metal pipes 14 each make a U-turn at a side edge portion 12a of the short side portion 12 to form U-turn portions 16 at an end surface.

[0036] The heat exchanger 10 includes a first regulating part 30 regulating relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other.

[0037] The heat exchanger 10 includes a second regulating part 40 regulating the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other.

[0038] The heat exchanger 10 includes a third regulating part 50 regulating the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other.

[0039] Fig. 4 is a perspective view for illustrating the first regulating part 30 in Embodiment of the present invention. As illustrated in Fig. 4, the first regulating part 30 regulates the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other by sandwiching the inflow-surface portions and the outflow-surface portions in the air flow direction of the heat exchanger units 10a and 10b vertically adjacent to each other in a range between a part of the long side portion 11 and a part of the corner portion 13 continuous from the long side portion 11. The first regulating part 30 is held in contact with a part of the long side portion 11 and a part of the corner portion 13 continuous to the long side portion 11. However, the first regulating part 30 is not held in contact with a part of the short side portion 12 and a part of the corner portion 13 continuous to the short side portion 12. The first regulating part 30 is made of metal.

[0040] Two ribs 31 and 32 are formed on the first regulating part 30. The two ribs 31 and 32 regulate the position of the heat exchanger unit 10a, which is the upper heat exchanger unit, by sandwiching the inflow-surface portion and the outflow-surface portion in the air flow direction of the heat exchanger unit 10a, which is the upper heat exchanger unit. The two ribs 31 and 32 protrude upward from a base portion 33 located between the heat exchanger units 10a and 10b vertically adjacent to each other. A bent portion 32a is formed on the rib 32 held in contact with the outflow-surface portion. The bent portion 32a has an angle increased at an upper distal end of the rib 32 so that the heat exchanger unit 10a, which is the upper heat exchanger unit, can be smoothly inserted.

[0041] A plurality of drain water passage holes 34 are opened in the base portion 33 of the first regulating part 30. The plurality of drain water passage holes 34 allow dew generated in the heat exchanger unit 10a, which is the upper heat exchanger unit, to flow downward as drain water.

[0042] Two ribs 35 and 36 are formed on the first regulating part 30. The two ribs 35 and 36 regulate the position of the heat exchanger unit 10b, which is the lower heat exchanger unit, by sandwiching the inflow-surface portion and the outflow-surface portion in the air flow direction of the heat exchanger unit 10b, which is the lower heat exchanger unit. The two ribs 35 and 36 protrude downward from the base portion 33 located between the heat exchanger units 10a and 10b vertically adjacent to each other. A bent portion 36a is formed on the rib 36 held in contact with the outflow-surface portion. The bent portion 36a has an angle increased at a lower distal end of the rib 36 so that the heat exchanger unit 10b, which is the lower heat exchanger unit, can be smoothly inserted.

[0043] The two ribs 31 and 35 held in contact with the inflow-surface portions are cut from a part of one plate. From the base portion 33, the rib 31 is bent upward and the rib 35 is bent downward. A cut hole 31a, which is opened when the rib 35 is cut out, is opened in the rib

31. The two ribs 32 and 36 held in contact with the outflow-surface portions are cut from a part of the one plate. From the base portion, the rib 32 is bent upward and the rib 36 is bent downward. In this manner, the four ribs 31, 32, 35, and 36 regulate the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other with a small amount of material.

[0044] The first regulating part 30 includes a projecting portion 37. The projecting portion 37 is inserted between adjacent metal plates 15 of the heat exchanger unit 10a, which is the upper heat exchanger unit among the heat exchanger units 10a and 10b vertically adjacent to each other. The projecting portion 37 is inserted between the metal plates 15 at the long side portion 11 of the heat exchanger unit 10a, which is the upper heat exchanger unit. With this configuration, the projecting portion 37 prevents positional deviation of the first regulating part 30 in a lateral direction. Consequently, the first regulating part 30 is movable in a right-and-left direction that is a longitudinal direction of the long side portion 11 together with the heat exchanger unit 10a, which is the upper heat exchanger unit.

[0045] When a projecting portion is formed also for the heat exchanger unit 10b, which is the lower heat exchanger unit, there is a problem in that the plurality of metal plates 15 of the heat exchanger 10 are deformed due to impact from an outside, and that the two heat exchanger units 10a and 10b vertically stacked are fixed with lateral deviation due to impact. As in Embodiment, the projecting portion 37 is provided only for the heat exchanger unit 10a, which is the upper heat exchanger unit. Thus, even when impact occurs, the first regulating part 30 is moved together with the heat exchanger unit 10a, which is the upper heat exchanger unit, but is not moved together with the heat exchanger unit 10b, which is the lower heat exchanger unit. Consequently, deformation of the metal plates 15 can be prevented, the first regulating part 30 and the heat exchanger unit 10a, which is the upper heat exchanger unit, can be returned to original positions after the impact, and positional deviation in the right-and-left direction, which is the longitudinal direction of the long side portion 11, can be thus prevented.

[0046] In Embodiment, the projecting portion is inserted between the adjacent metal plates of the upper heat exchanger unit. However, the projecting portion may be inserted between the adjacent metal plates of the lower heat exchanger unit, in place of the upper heat exchanger unit.

[0047] Fig. 5 is a plan view for illustrating a range of regulation by the first regulating part 30 in Embodiment of the present invention. As illustrated in Fig. 5, the first regulating part 30 has a start point 30a at a part of the long side portion 11 of the heat exchanger 10 indicated by the hatched portion, and has an end point 30b at a position of a half of an R-curve of the corner portion 13 of the heat exchanger 10. That is, the first regulating part 30 aligns the relative positions of the heat exchanger

units 10a and 10b vertically adjacent to each other in a range between the start point 30a at a part of the long side portion 11 and the end point 30b at a position of the half of the corner portion 13 continuous from the long side portion 11. As described above, the first regulating part 30 does not fix the entire region of the corner portion 13 of the heat exchanger 10 with the four ribs, and is provided in a range to a middle of the corner portion 13. With this configuration, the difference in bending R dimension (manufacture variation) that is caused at the time of the bending step for the two heat exchanger units 10a and 10b to be vertically stacked can be absorbed, and hence the deviation in the air flow direction can be made larger at the short side portion 12 than at the long side portion 11. The short side portion 12 indicated by the broken line in Fig. 5 indicates one of the heat exchanger units 10a and 10b that is deviated in the air flow direction.

[0048] Fig. 6 is a perspective view for illustrating the second regulating part 40 in Embodiment of the present invention. As illustrated in Fig. 6, the second regulating part 40 regulates the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other by sandwiching the inflow-surface portions and the outflow-surface portions in the air flow direction of the heat exchanger units 10a and 10b vertically adjacent to each other at the middle of the long side portions 11 of the heat exchanger units 10a and 10b vertically adjacent to each other. The second regulating part 40 is made of metal.

[0049] Two ribs 41 and 42 are formed on the second regulating part 40. The two ribs 41 and 42 regulate the position of the heat exchanger unit 10a, which is the upper heat exchanger unit, by sandwiching the inflow-surface portion and the outflow-surface portion in the air flow direction of the heat exchanger unit 10a, which is the upper heat exchanger unit. The two ribs 41 and 42 protrude upward from a base portion 43 located between the heat exchanger units 10a and 10b vertically adjacent to each other. A bent portion 42a is formed on the rib 42 held in contact with the outflow-surface portion. The bent portion 42a has an angle increased at an upper distal end of the rib 42 so that the heat exchanger unit 10a, which is the upper heat exchanger unit, can be smoothly inserted.

[0050] A plurality of drain water passage holes 44 are opened in the base portion 43 of the second regulating part 40. The plurality of drain water passage holes 44 allow dew generated in the heat exchanger unit 10a, which is the upper heat exchanger unit, to flow downward as drain water.

[0051] Two ribs 45 and 46 are formed on the second regulating part 40. The two ribs 45 and 46 regulate the position of the heat exchanger unit 10b, which is the lower heat exchanger unit, by sandwiching the inflow-surface portion and the outflow-surface portion in the air flow direction of the heat exchanger unit 10b, which is the lower heat exchanger unit. The two ribs 45 and 46 protrude

downward from the base portion 43 located between the heat exchanger units 10a and 10b vertically adjacent to each other. A bent portion 46a is formed on the rib 46 held in contact with the outflow-surface portion. The bent portion 46a has an angle increased at a lower distal end of the rib 46 so that the heat exchanger unit 10b, which is the lower heat exchanger unit, can be smoothly inserted.

[0052] The two ribs 41 and 45 held in contact with the inflow-surface portions are cut from a part of one plate. From the base portion 43, the rib 41 is bent upward and the rib 45 is bent downward. A cut hole 41a, which is opened when the rib 45 is cut out, is opened in the rib 41. The two ribs 42 and 46 held in contact with the outflow-surface portions are cut from a part of the one plate. From the base portion 43, the rib 42 is bent upward and the rib 46 is bent downward. A cut hole 46b, which is opened when the rib 42 is cut out, is opened in the rib 46. In this manner, the four ribs 41, 42, 45, and 46 regulate the relative positions the heat exchanger units 10a and 10b vertically adjacent to each other with a small amount of material.

[0053] The second regulating part 40 includes projecting portions 47a and 47b. The projecting portions 47a and 47b are each inserted between corresponding ones of adjacent metal plates 15 of the heat exchanger unit 10a, which is the upper heat exchanger unit among the heat exchanger units 10a and 10b vertically adjacent to each other. The projecting portions 47a and 47b are each inserted between corresponding ones of the metal plates 15 at the long side portion 11 of the heat exchanger unit 10a, which is the upper heat exchanger unit. With this configuration, the projecting portions 47a and 47b prevent positional deviation of the second regulating part 40 in a lateral direction. Consequently, the second regulating part 40 is movable in the right-and-left direction, which is the longitudinal direction of the long side portion 11, together with the heat exchanger unit 10a, which is the upper heat exchanger unit.

[0054] When a projecting portion is formed also for the heat exchanger unit 10b, which is the lower heat exchanger unit, there is a problem in that the plurality of metal plates 15 of the heat exchanger 10 are deformed due to impact from an outside, and that the two heat exchanger units 10a and 10b vertically stacked are fixed with lateral deviation due to impact. As in Embodiment, the projecting portions 47a and 47b are provided only for the heat exchanger unit 10a, which is the upper heat exchanger unit. Thus, even when impact occurs, the second regulating part 40 is moved together with the heat exchanger unit 10a, which is the upper heat exchanger unit, but is not moved together with the heat exchanger unit 10b, which is the lower heat exchanger unit. Consequently, deformation of the metal plates 15 can be prevented, the second regulating part 40 and the heat exchanger unit 10a, which is the upper heat exchanger unit, can be returned to original positions after the impact, and positional deviation in the right-and-left direction, which

is the longitudinal direction of the long side portion 11, can be thus prevented.

[0055] In Embodiment, the projecting portions are each inserted between corresponding ones of the adjacent metal plates of the upper heat exchanger unit. However, the projecting portions may be inserted between the adjacent metal plates of the lower heat exchanger unit, in place of the upper heat exchanger unit.

[0056] Fig. 7 is a perspective view for illustrating the third regulating part 50 in Embodiment of the present invention. As illustrated in Fig. 7, the third regulating part 50 regulates, in the up-and-down direction, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other at the side edge portions 12a of the short side portions 12 of the heat exchanger units 10a and 10b vertically adjacent to each other, and provides play that allows the deviation in the air flow direction.

[0057] The third regulating part 50 is made of resin to be easily deformed. The third regulating part 50 may be made of metal as long as the third regulating part 50 can provide play that allows the deviation in the air flow direction.

[0058] Three insertion holes 51, 52, and 53 are opened at the upper portion of the third regulating part 50. The three insertion holes 51, 52, and 53 allow insertion of the U-turn portions 16 obtained by U-tuning the metal pipes 14 at the side edge portion 12a of the short side portion 12 of the heat exchanger unit 10a, which is the upper heat exchanger unit. Further, three insertion holes 54, 55, and 56 are opened at the lower portion of the third regulating part 50. The three insertion holes 54, 55, and 56 allow insertion of the U-turn portions 16 obtained by U-tuning the metal pipes 14 at the side edge portion 12a of the short side portion 12 of the heat exchanger unit 10b, which is the lower heat exchanger unit.

[0059] These insertion holes 51, 52, 53, 54, 55, and 56 are each opened to have a vertical dimension that allows fitting of the U-turn portion 16, and regulate, in the up-and-down direction, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other. Further, these insertion holes 51, 52, 53, 54, 55, and 56 are each opened to have a lateral dimension larger than that of the U-turn portion 16, and provide play that allows the deviation in the air flow direction.

[0060] Claw portions 51a, 53a, 54a, and 56a are formed in the insertion holes 51, 53, 54, and 56 opened at the inflow-surface portions and the outflow-surface portions in the air flow direction. The claw portions 51a, 53a, 54a, and 56a fix the U-turn portions 16 to some extent while allowing the deviation of the U-turn portions 16, and are elastically deformed to prevent disengagement of the third regulating part 50. The claw portions 51a, 53a, 54a, and 56a are each provided along a right-and-left direction of a corresponding one of the U-turn portions 16, and urge the U-turn portions 16 to such an extent that the third regulating part 50 is not disengaged from the U-turn portions 16. The claw portion 51a is pro-

vided on each of the right and left of the insertion hole 51, and the claw portion 54a is provided on each of the right and left of the insertion hole 54.

[0061] Fig. 8 is a perspective view for illustrating a state of the heat exchanger 10 to be mounted to the outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention as viewed from the back surface. As illustrated in Fig. 8, the two heat exchanger units 10a and 10b vertically stacked are combined with each other while the side edge portions 11a of the long side portions 11 are aligned so that the plurality of metal pipes 14 can be connected to the connection pipes 3 at the side edge portions 11a of the long side portions 11. Consequently, the first regulating part 30 and the second regulating part 40 align the relative positions of the two heat exchanger units 10a and 10b vertically stacked at the long side portions 11. With this configuration, surfaces of the long side portions 11 of the two heat exchanger units 10a and 10b vertically stacked are so flat that an uneven surface due to the deviation in the air flow direction is small.

[0062] Meanwhile, the two heat exchanger units 10a and 10b vertically stacked are not firmly fixed at the side edge portions 12a of the short side portions 12 that have the U-turn portions 16 of the metal pipes 14 with use of the third regulating part 50, but have play that allows the deviation in the air flow direction so that the heat exchanger unit 10a, which is the upper heat exchanger unit, and the heat exchanger unit 10b, which is the lower heat exchanger unit, are separately movable in the right-and-left direction. Further, the first regulating part 30 regulates the position of the heat exchanger 10 in a range between a part of the long side portion 11 and a part to the middle of the corner portion 13 continuous from the long side portion 11.

[0063] With this configuration, when the heat exchanger units 10a and 10b are vertically stacked, an uneven surface 17 due to the deviation in the air flow direction that is caused by manufacture variation is larger at the short side portion 12 than at the long side portion 11 of the heat exchanger 10. In the heat exchanger 10, the uneven surface 17 due to the deviation in the air flow direction is large at the short side portion 12.

[0064] The uneven surface is due to the deviation in the air flow direction between the heat exchanger units that are vertically stacked. Thus, there is no problem even when an uneven surface directed downward is caused as in the case of the uneven surface 17 directed upward, which is illustrated in Fig. 8.

[0065] The side surface of the outdoor unit 100 at which the short side portion 12 of the heat exchanger 10 having the uneven surface 17 is present is covered by the outdoor-unit-side-surface portion 7a of the casing 7.

[0066] Fig. 9 is a perspective view for illustrating a state of a heat exchanger 210 to be mounted to an outdoor unit for an air-conditioning apparatus in the related art as viewed from a back surface. As illustrated in Fig. 9, the heat exchanger 210 is formed in such a manner that side

edge portions 211a of long side portions 211 having connecting end portions of metal pipes to be connected to connection pipes accommodated in the outdoor unit are aligned and that side edge portions 212a of short side portions 212 having U-turn portions of the metal pipes are aligned. Consequently, in the heat exchanger 210, an uneven surface 217 due to the deviation in the air flow direction is caused in the combined parts between a heat exchanger unit 210a, which is the upper heat exchanger unit, and a heat exchanger unit 210b, which is the lower

[0067] In this case, when the long side portion 211 of the heat exchanger 210 is exposed to allow air to smoothly flow, an installation worker or a user can easily touch the uneven surface 217. Consequently, there is a fear of occurrence of such a disadvantage that an installation worker or a user is injured due to the uneven surface 217, or that clothes are caught to be damaged. When, for example, a net is provided on the back surface of the outdoor unit 100 as a measure against the disadvantage, an installation worker or a user cannot easily touch the heat exchanger 210. However, the number of components is increased, which is uneconomical.

[0068] Further, a bending process for the heat exchanger unit 210a, which is the upper heat exchanger unit, and a bending process for the heat exchanger unit 210b, which is the lower heat exchanger unit, are simultaneously performed on the same facility. Consequently, variation that occurs at the time of the bending process is equalized between the two heat exchanger units 210a and 210b vertically stacked, and the uneven surface 217 when the two heat exchanger units 210a and 210b are stacked can be thus prevented. However, in this case, the facility is increased in size, or a production site is limited. Thus, there is a problem in that production does not catch up with increase in production.

[0069] According to Embodiment, the outdoor unit 100 for an air-conditioning apparatus includes the heat exchanger 10 including the two heat exchanger units 10a and 10b. The two heat exchanger units 10a and 10b are vertically stacked and each include the long side portion 11, the short side portion 12, and the corner portion 13 bent and connecting the long side portion 11 and the short side portion 12 to each other. In the heat exchanger 10, the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is larger at the short side portion 12 than at the long side portion 11.

[0070] With this configuration, bending angles of the heat exchanger units 10a and 10b are not adjusted at the time of assembly, and the heat exchanger units 10a and 10b can be assembled so that the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is large at the short side portion 12. Consequently, assembly efficiency can be improved through elimination of need for adjustment of the bending angles of the heat

exchanger units 10a and 10b at the time of assembly. Further, it is possible to prevent the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the part at which the long side portion 11 is placed, such as the back surface of the outdoor unit 100, at which an installation worker or a user can touch the heat exchanger units 10a and 10b vertically stacked.

[0071] Consequently, an installation worker or a user cannot easily touch the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the part at which the long side portion 11 is placed, such as the back surface of the outdoor unit 100, and safety can be thus improved. Further, it is possible to prevent the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the part at which an installation worker or a user can touch the heat exchanger units 10a and 10b vertically stacked and the long side portion 11 that is conspicuous on the outer appearance of the outdoor unit 100 is placed. Consequently, the outdoor unit 100 for an air-conditioning apparatus does not give a user a feeling of anxiety that a product defect occurs due to the conspicuous uneven surface.

[0072] According to Embodiment, in the heat exchanger 10, the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is larger at the short side portion 12 than at the long side portion 11 through alignment of the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other in a range between a part of the long side portion 11 and a part of the corner portion 13 continuous from the long side portion 11.

[0073] With this configuration, in the heat exchanger 10, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other are aligned in the range between a part of the long side portion 11 and a part of the corner portion 13 continuous from the long side portion 11, and the most deviation in the air flow direction at the long side portion 11 can be shifted to the deviation at the short side portion 12. Consequently, the heat exchanger units 10a and 10b can be assembled so that the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is large at the short side portion 12 without adjustment of the bending angles of the heat exchanger units 10a and 10b at the time of assembly.

[0074] According to Embodiment, the outdoor unit 100 for an air-conditioning apparatus further includes the first regulating part 30 regulating the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other. The first regulating part 30 regulates the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other by sandwiching inflow-surface portions and outflow-surface portions in the air flow direction of the heat exchanger units 10a and 10b vertically adjacent to each other in the range between a

part of the long side portion 11 and a part of the corner portion 13 continuous from the long side portion 11.

[0075] With this configuration, in the heat exchanger 10, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other are aligned in the range between a part of the long side portion 11 and a part of the corner portion 13 continuous from the long side portion 11 with use of the first regulating part 30, and the most deviation in the air flow direction at the long side portion 11 can be shifted to the deviation at the short side portion 12.

[0076] According to Embodiment, the first regulating part 30 allows the heat exchanger units 10a and 10b vertically adjacent to each other to relatively move in a longitudinal direction of the long side portion 11.

[0077] With this configuration, the first regulating part 30 allows the heat exchanger units 10a and 10b vertically adjacent to each other to relatively move in the longitudinal direction of the long side portions 11. Consequently, damage of the heat exchanger 10, such as deformation, can be prevented.

[0078] According to Embodiment, the first regulating part 30 includes the projecting portion 37 inserted between the adjacent metal plates 15 of the heat exchanger unit 10a, which is the upper heat exchanger unit among the heat exchanger units 10a and 10b vertically adjacent to each other.

[0079] With this configuration, the first regulating part 30 can be moved together with the heat exchanger unit 10a, which is the upper heat exchanger unit among the heat exchanger units 10a and 10b, with the projecting portion 37 inserted between the adjacent metal plates 15 of the heat exchanger unit 10a. The first regulating part 30 can allow the heat exchanger units 10a and 10b vertically adjacent to each other to relatively move.

[0080] According to Embodiment, the outdoor unit 100 for an air-conditioning apparatus further includes the second regulating part 40 regulating the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other. The second regulating part 40 regulates the relative positions the heat exchanger units 10a and 10b vertically adjacent to each other by sandwiching the inflow-surface portions and the outflow-surface portions in the air flow direction of the heat exchanger units 10a and 10b vertically adjacent to each other at the middle of the long side portions 11 of the heat exchanger units 10a and 10b vertically adjacent to each other.

[0081] With this configuration, in the heat exchanger 10, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other are aligned at the middle of the long side portions 11 with use of the second regulating part 40, and the most deviation in the air flow direction at the long side portion 11 can be shifted.

[0082] The second regulating part 40 shifts the deviation in the air flow direction at the long side portion 11 to the deviation at the short side portion 12 together with the first regulating part 30, that is, at the two parts, and the uneven surface due to the deviation in the air flow

direction at the long side portion 11 can be thus prevented.

[0083] According to Embodiment, the outdoor unit 100 for an air-conditioning apparatus further includes the third regulating part 50 regulating the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other. The third regulating part 50 regulates, in the up-and-down direction, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other at the side edge portions 12a of the short side portions 12 of the heat exchanger units 10a and 10b vertically adjacent to each other, and provides play that allows the deviation in the air flow direction.

[0084] With this configuration, in the heat exchanger 10, the relative positions of the heat exchanger units 10a and 10b vertically adjacent to each other can be regulated in the up-and-down direction at the side edge portions 12a of the short side portions 12 with use of the third regulating part 50. Consequently, in the heat exchanger 10, the heat exchanger units 10a and 10b vertically adjacent to each other are not spaced vertically at the side edge portions 12a of the short side portions 12. Further, the third regulating part 50 can provide play that allows the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically adjacent to each other. Consequently, in the heat exchanger 10, positions of the side edge portions 12a of the short side portions 12 can be regulated in the up-and-down direction while the most deviation in the air flow direction that is shifted to the deviation at the short side portion 12 is maintained.

[0085] According to Embodiment, in the heat exchanger 10, the long side portion 11 is exposed as the back surface of the outdoor unit 100. The outdoor unit 100 for an air-conditioning apparatus further includes the casing 7, which covers the short side portion 12 of the heat exchanger 10, and has the plurality of openings 7a1 that allow passage of air.

[0086] With this configuration, in the heat exchanger 10, the long side portion 11 is exposed as the back surface of the outdoor unit 100. It is possible to prevent the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the long side portion 11 that is exposed as the back surface of the outdoor unit 100 at which an installation worker or a user can touch the heat exchanger units 10a and 10b vertically stacked.

[0087] Consequently, an installation worker or a user cannot easily touch the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the long side portion 11 that is exposed as the back surface of the outdoor unit 100, and safety can be thus improved. Further, it is possible to prevent the uneven surface due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked at the long side portion 11 at which an installation worker or a user can touch the heat exchanger units 10a and 10b vertically stacked and that is exposed as the back surface of the outdoor unit

100, which is conspicuous on the outer appearance of the outdoor unit 100. Consequently, the outdoor unit 100 for an air-conditioning apparatus does not give a user a feeling of anxiety that a product defect occurs due to the conspicuous uneven surface on the back surface of the outdoor unit 100.

[0088] Further, the casing 7 covers the short side portion 12 of the heat exchanger 10, and has the plurality of openings 7a1 that allow passage of air. Consequently, the deviation in the air flow direction or the uneven surface 17 due to the deviation that is large at the short side portion 12 of the heat exchanger 10 is covered by the casing 7 to be hidden. Further, the plurality of openings 7a1 that allow passage of air are opened in the casing 7, and decrease in efficiency of the heat exchanger 10 at the short side portion 12 can be thus prevented.

[0089] Consequently, the short side portion 12 at which the deviation in the air flow direction is large is covered by the casing 7, and hence an installation worker or a user cannot easily touch the uneven surface 17 due to the deviation in the air flow direction of the heat exchanger units 10a and 10b vertically stacked, and safety can be thus improved. Further, the short side portion 12 at which the deviation in the air flow direction is large is covered by the casing 7, and hence the outdoor unit 100 for an air-conditioning apparatus does not give a user a feeling of anxiety that a product defect occurs due to the conspicuous uneven surface 17 due to the deviation in the air flow direction.

[0090] According to Embodiment, the outdoor unit 100 for an air-conditioning apparatus includes the top plate 9, which is placed over the casing 7, and fixes the heat exchanger 10 by pressing the heat exchanger 10 downward.

[0091] With this configuration, the top plate 9 is placed over the casing 7, and fixes the heat exchanger 10 by pressing the heat exchanger 10 downward. In this case, the top plate 9 can press downward the motor mounting base 5 of the heat exchanger 10 to which a flexible part such as insulation is bonded, sandwich the heat exchanger 10 together with the bottom plate 1, and fix the heat exchanger 10. Consequently, even when the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is large at the short side portion 12, the short side portion 12 of the heat exchanger 10 is only pressed and fixed by the top plate 9. Thus, the heat exchanger 10 can be firmly fixed under the state in which the deviation in the air flow direction is allowed. With this configuration, even when the position of the short side portion 12 is changed due to the deviation amount, the short side portion 12 of the heat exchanger 10 is not required to be fixed to a set part with, for example, screws or a hooking part. Consequently, the number of components can be reduced, and assembly efficiency can be thus prevented.

[0092] According to Embodiment, the heat exchanger units 10a and 10b are each formed into such an L-shape that the short side portion 12 is continuous from the long

side portion 11 through the corner portion 13. The casing 7 includes the outdoor-unit-side-surface portion 7a that covers the short side portion 12 of the heat exchanger 10, and the outdoor-unit-front-surface portion 7b that is opposite to the long side portion 11 of the heat exchanger 10 exposed as the back surface of the outdoor unit 100. The outdoor unit 100 for an air-conditioning apparatus further includes the pillar portion 8 that forms an outdoor-unit-opposite-side-surface portion at a portion of the outdoor unit 100 opposite to the outdoor-unit-side-surface portion 7a of the casing 7. The side edge portion 11a of the long side portion 11 of the heat exchanger 10 is fixed to the pillar portion 8. The top plate 9 is placed over the casing 7 and the pillar portion 8, and fixes the heat exchanger 10 by pressing the heat exchanger 10 downward.

[0093] With this configuration, in the heat exchanger 10 including the heat exchanger units 10a and 10b each formed into an L-shape, the side edge portions 11a of the long side portions 11, at which the deviation in the air flow direction is adjusted to align positions of the end portions of the side edge portions 11a, are fixed to the pillar portion 8. Further, the top plate 9 is placed over the casing 7 and the pillar portion 8, and fixes the heat exchanger 10 by pressing the heat exchanger 10 downward. In this case, the top plate 9 can press downward the motor mounting base 5 of the heat exchanger 10 to which a flexible part such as insulation is bonded, sandwich the heat exchanger 10 together with the bottom plate 1, and fix the heat exchanger 10. Consequently, even when the deviation in the air flow direction that lies between the heat exchanger units 10a and 10b vertically adjacent to each other is large at the short side portion 12, the short side portion 12 of the heat exchanger 10 is only pressed and fixed by the top plate 9. Thus, the heat exchanger 10 can be firmly fixed under the state in which the deviation in the air flow direction is allowed. With this configuration, even when the position of the short side portion 12 is changed due to the deviation amount, the short side portion 12 of the heat exchanger 10 is not required to be fixed to a set part with, for example, screws or a hooking part. Consequently, the number of components can be reduced, and assembly efficiency can be thus improved.

[0094] Further, a flexible part made of a flexible material such as insulation is bonded to the top surface of the motor mounting base 5, and the motor mounting base 5 is held in contact with the top plate 9. With this configuration, the outdoor unit 100 for an air-conditioning apparatus can prevent the contact noise between the motor mounting base 5 and the top plate 9 that is generated due to vibration during an operation.

[0095] The heat exchanger units 10a and 10b are each formed into such an L-shape that the short side portion 12 is continuous from the long side portion 11 through the corner portion 13. However, the present invention is applicable also when the heat exchanger units are each formed into such a U-shape that short side portions are

each provided on a corresponding one of both sides of the long side portion.

Reference Signs List

[0096] 1 bottom plate 2 compressor 3 connection pipe 4 fan 5 motor mounting base 6 controller 7 casing 7a outdoor-unit-side-surface portion 7a1 opening 7b outdoor-unit-front-surface portion 7b1 air outlet 8 pillar portion 9 top plate 10 heat exchanger 10a heat exchanger unit 10b heat exchanger unit 11 long side portion 11a side edge portion 12 short side portion 12a side edge portion 13 corner portion 14 metal pipe 15 metal plate 16 U-turn portion 17 uneven surface 20a screw 20b screw 30 first regulating part 30a start point 30b end point 31 rib 31a cut hole 32 rib 32a bent portion 33 base portion 34 drain water passage hole 35 rib 36 rib 36a bent portion 37 projecting portion 40 second regulating part 41 rib 41a cut hole 42 rib 42a bent portion 43 base portion 44 drain water passage hole 45 rib 46 rib 46a bent portion 46b cut hole 47a projecting portion 47b projecting portion 50 third regulating part 51 insertion hole 51a claw portion 52 insertion hole 53 insertion hole 53a claw portion 54 insertion hole 54a claw portion 55 insertion hole 56 insertion hole 56a claw portion 100 outdoor unit 210 heat exchanger 210a heat exchanger unit 210b heat exchanger unit 211 long side portion 211a side edge portion 212 short side portion 212a side edge portion 213 corner portion 217 uneven surface

Claims

1. An outdoor unit for an air-conditioning apparatus, comprising a heat exchanger including a plurality of heat exchanger units, the plurality of heat exchanger units being vertically stacked and each including a long side portion, a short side portion, and a corner portion bent and connecting the long side portion and the short side portion to each other, in the heat exchanger, deviation in an air flow direction that lies between ones of the plurality of heat exchanger units that are vertically adjacent to each other being larger at the short side portions than at the long side portions.
2. The outdoor unit for an air-conditioning apparatus of claim 1, wherein, in the heat exchanger, the deviation in the air flow direction that lies between the ones of the plurality of heat exchanger units that are vertically adjacent to each other is larger at the short side portions than at the long side portions through alignment of relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other in a range between a part of a corresponding one of the long side portions and a part of a corresponding one of the corner portions continuous from the corresponding one of the long side portions.

3. The outdoor unit for an air-conditioning apparatus of claim 2, further comprising a first regulating part regulating the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other, wherein the first regulating part regulates the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other by sandwiching inflow-surface portions and outflow-surface portions in the air flow direction of the ones of the plurality of heat exchanger units that are vertically adjacent to each other in the range between the part of the corresponding one of the long side portions and the part of the corresponding one of the corner portions continuous from the corresponding one of the long side portions.
4. The outdoor unit for an air-conditioning apparatus of claim 3, wherein the first regulating part allows the ones of the plurality of heat exchanger units that are vertically adjacent to each other to relatively move in a longitudinal direction of the corresponding ones of the long side portions.
5. The outdoor unit for an air-conditioning apparatus of claim 3 or 4, wherein the first regulating part includes a projecting portion inserted between adjacent metal plates of any one of the ones of the plurality of heat exchanger units that are vertically adjacent to each other.
6. The outdoor unit for an air-conditioning apparatus of any one of claims 3 to 5, further comprising a second regulating part regulating the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other, wherein the second regulating part regulates the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other by sandwiching the inflow-surface portions and the outflow-surface portions in the air flow direction of the ones of the plurality of heat exchanger units that are vertically adjacent to each other at a middle of the long side portions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other.
7. The outdoor unit for an air-conditioning apparatus of any one of claims 3 to 6, further comprising a third regulating part regulating the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other, wherein the third regulating part regulates, in an up-and-down direction, the relative positions of the ones of the plurality of heat exchanger units that are vertically adjacent to each other at side edge portions of the short side portions of the ones of the plurality of heat exchanger units that are vertically adjacent

to each other, and provides play that allows the deviation in the air flow direction.

8. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 7, 5
 wherein, in the heat exchanger, the long side portions are exposed as a back surface of the outdoor unit, and
 wherein the outdoor unit further comprises a casing covering the short side portions of the heat exchanger and having a plurality of openings that allow passage of air. 10

9. The outdoor unit for an air-conditioning apparatus of claim 8, further comprising a top plate placed over the casing and fixing the heat exchanger by pressing the heat exchanger downward. 15

10. The outdoor unit for an air-conditioning apparatus of claim 9, 20
 wherein the plurality of heat exchanger units are each formed into such an L-shape that the short side portion is continuous from the long side portion through the corner portion,
 wherein the casing includes an outdoor-unit-side-surface portion that covers the short side portions of the heat exchanger, and an outdoor-unit-front-surface portion that is opposite to the long side portions of the heat exchanger exposed as the back surface of the outdoor unit, 25
 wherein the outdoor unit further comprises a pillar portion that forms an outdoor-unit-opposite-side-surface portion at a portion of the outdoor unit opposite to the outdoor-unit-side-surface portion of the casing, side edge portions of the long side portions of the heat exchanger being fixed to the pillar portion, and 30
 wherein the top plate is placed over the casing and the pillar portion, and fixes the heat exchanger by pressing the heat exchanger downward. 35
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FIG. 1

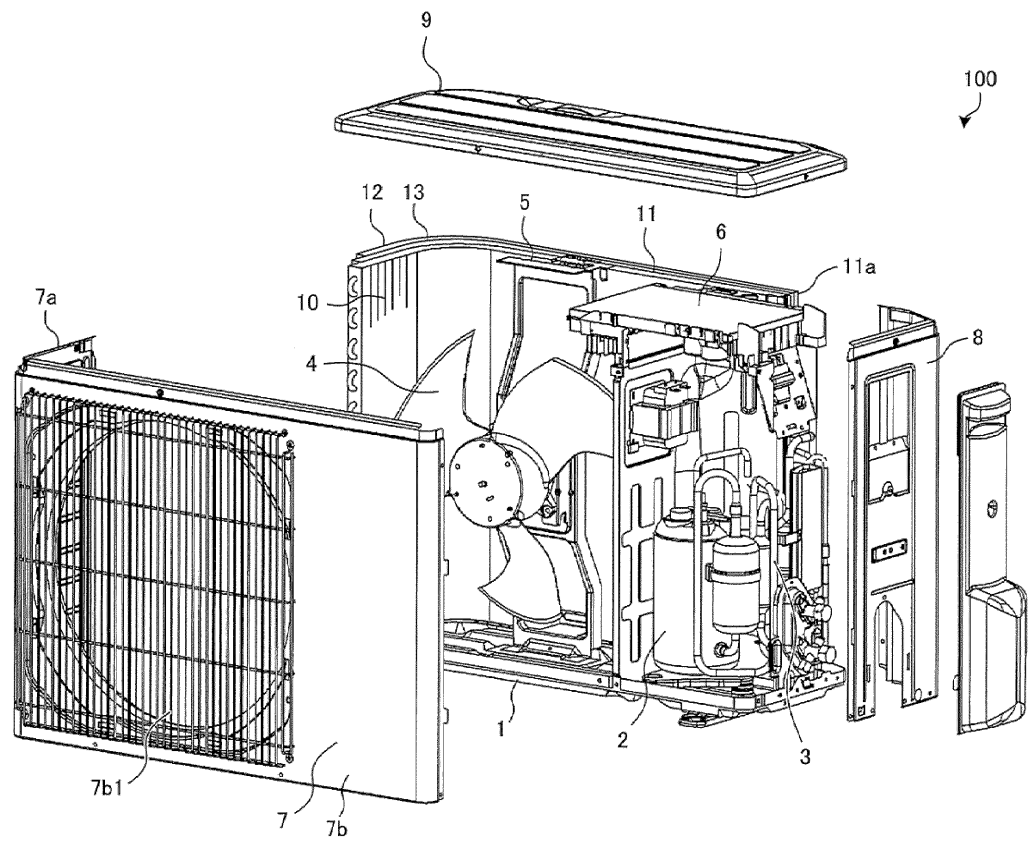


FIG. 2

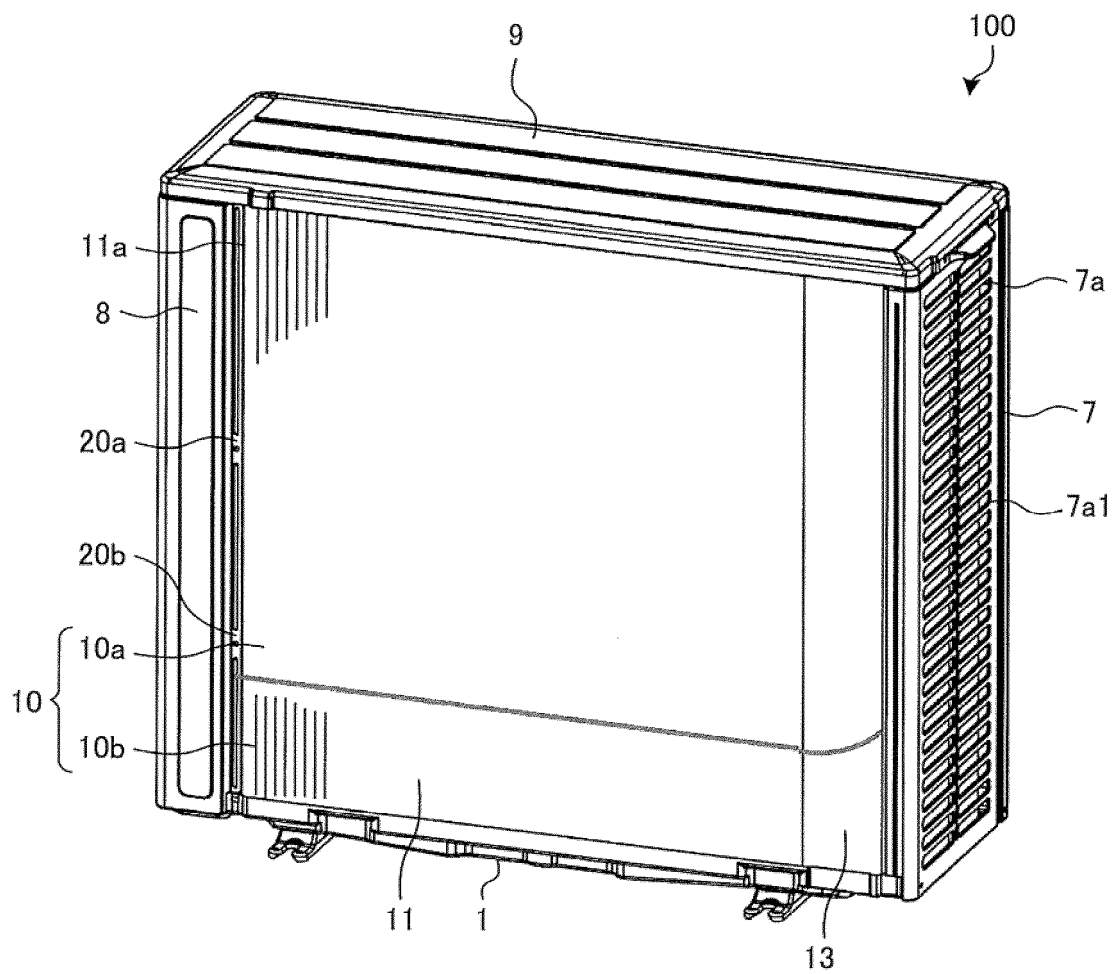


FIG. 3

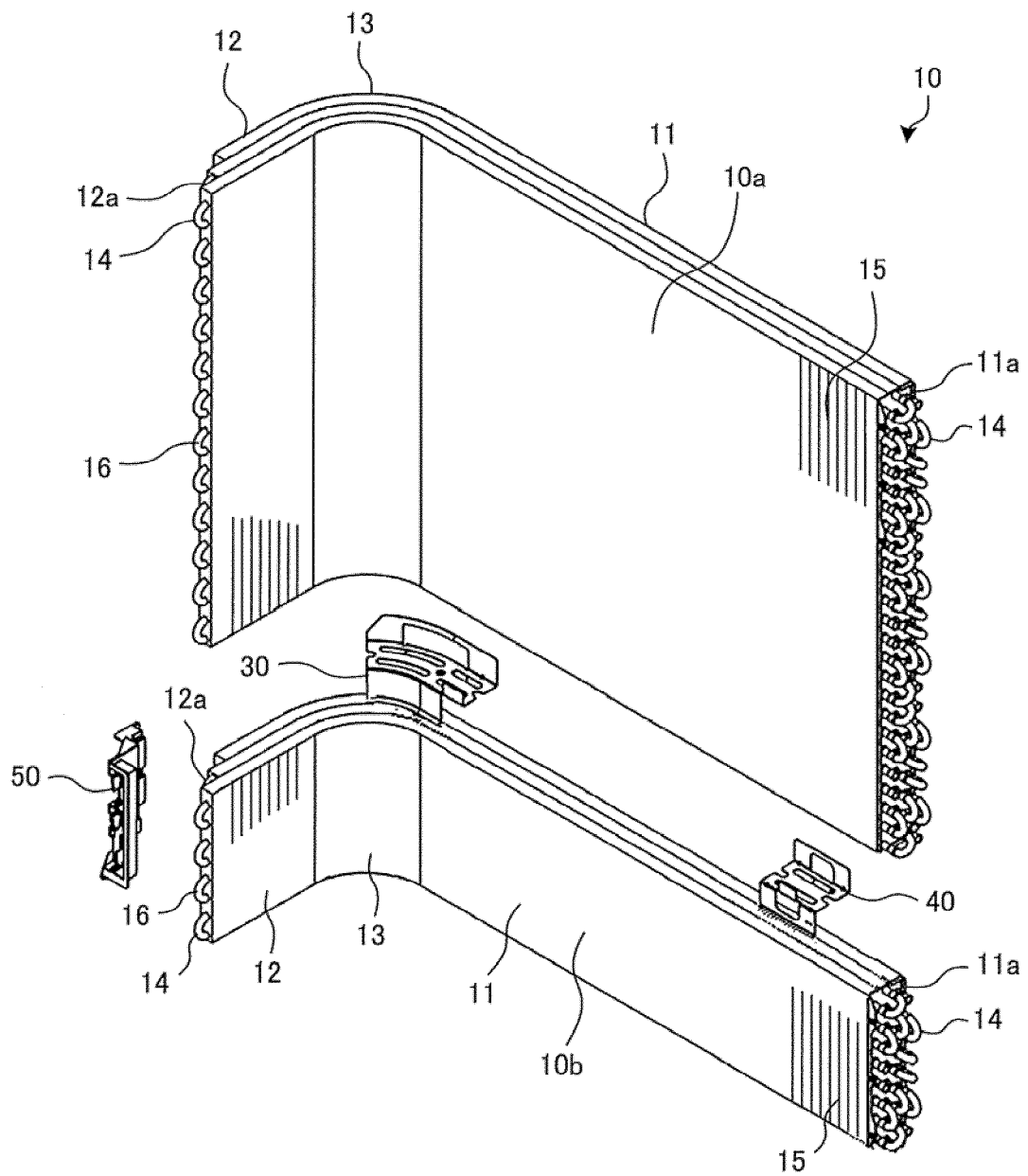


FIG. 4

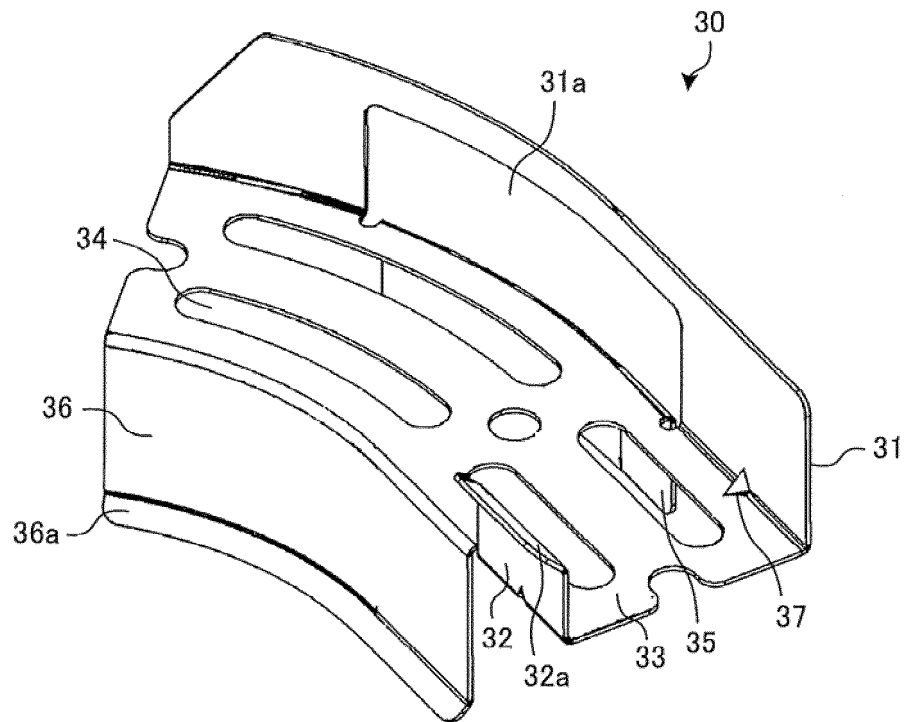


FIG. 5

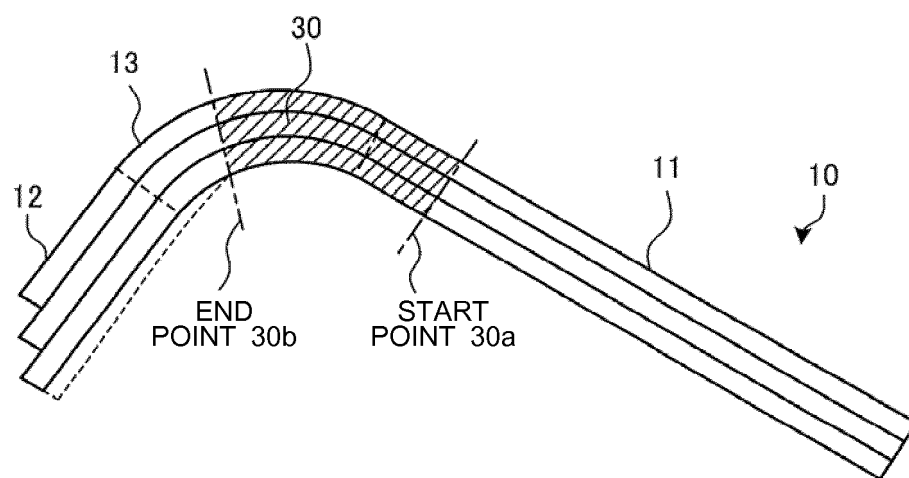


FIG. 6

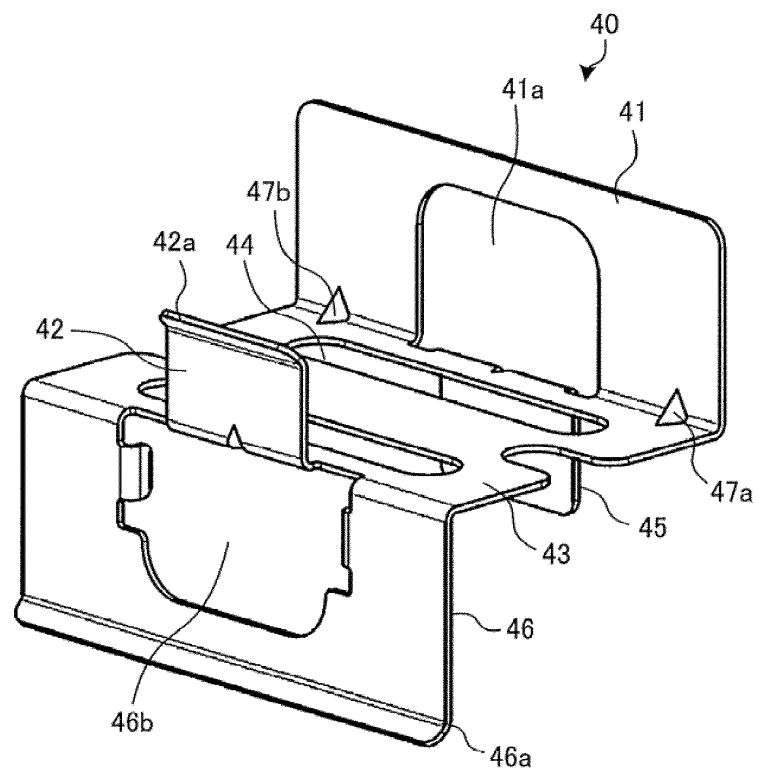


FIG. 7

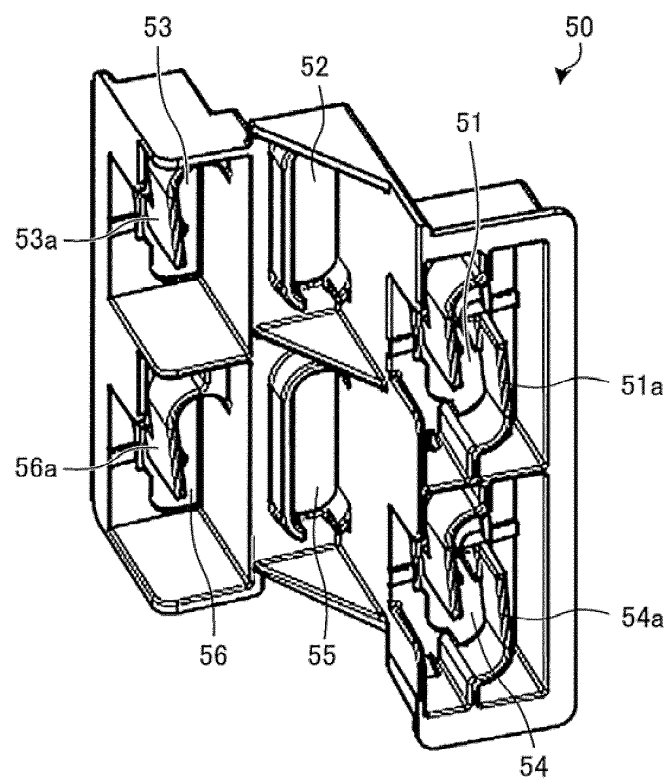


FIG. 8

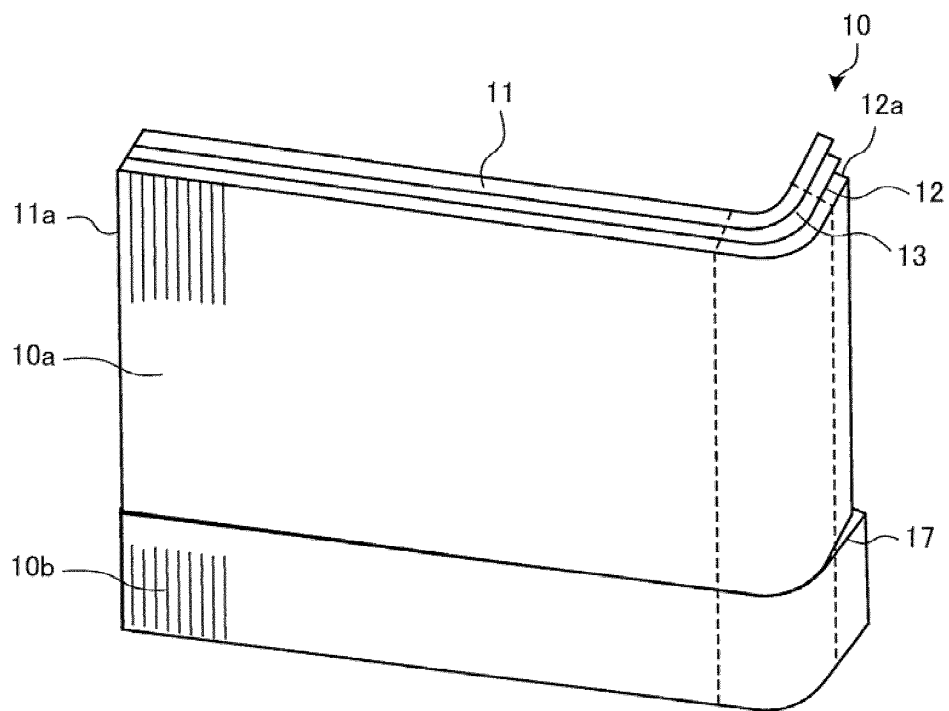
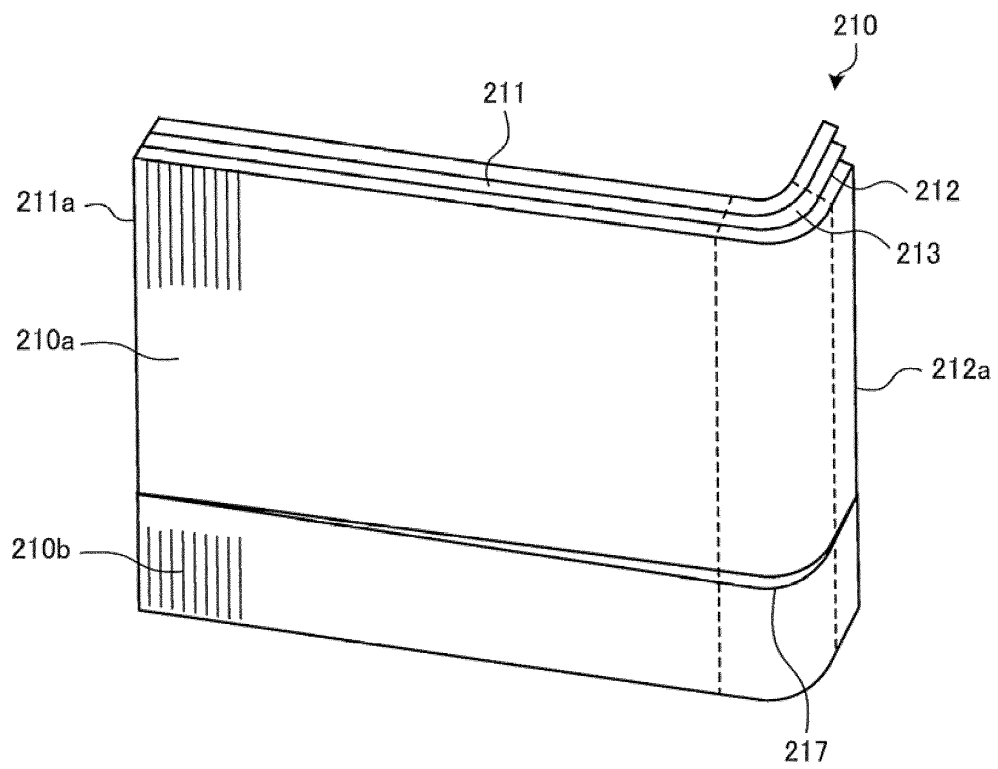


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/073536

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 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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 A	WO 2014/199490 A1 (Mitsubishi Electric Corp.), 18 December 2014 (18.12.2014), paragraph [0038]; fig. 13 (Family: none)	1-2 3-6, 8-10 7
X Y A	JP 2006-145128 A (Matsushita Electric Industrial Co., Ltd.), 08 June 2006 (08.06.2006), paragraphs [0019] to [0025]; fig. 1 to 3 (Family: none)	1-2 3-6, 8-10 7
X Y A	JP 2016-109382 A (Denso Corp.), 20 June 2016 (20.06.2016), paragraphs [0057] to [0058]; fig. 9 (Family: none)	1-2 3-6, 8-10 7

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

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"&" document member of the same patent family

Date of the actual completion of the international search
17 October 2016 (17.10.16)Date of mailing of the international search report
25 October 2016 (25.10.16)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/JP2016/073536

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 2008-151392 A (Daikin Industries, Ltd.), 03 July 2008 (03.07.2008), paragraphs [0042] to [0051], [0063] to [0072]; fig. 7 to 11 (Family: none)	3-6
Y	JP 2013-130376 A (Mitsubishi Electric Corp.), 04 July 2013 (04.07.2013), paragraphs [0011], [0023] (Family: none)	8-10
Y	JP 9-303824 A (Daikin Industries, Ltd.), 28 November 1997 (28.11.1997), paragraph [0007] (Family: none)	9-10
A	JP 2001-124491 A (Showa Aluminum Corp.), 11 May 2001 (11.05.2001), paragraph [0012] (Family: none)	1-10
A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 106795/1991 (Laid-open No. 40737/1993) (Daikin Industries, Ltd.), 01 June 1993 (01.06.1993), paragraph [0010]; fig. 1 (Family: none)	1-10

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

REFERENCES CITED IN THE DESCRIPTION

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