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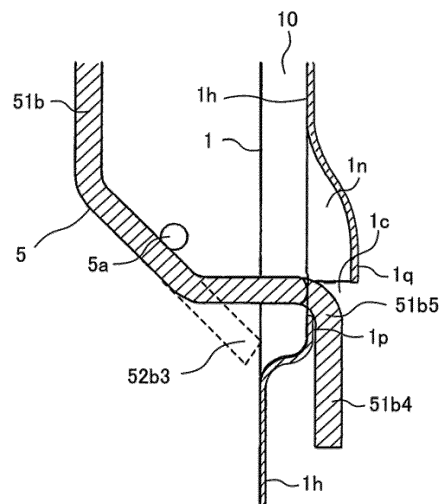
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(54) **OUTDOOR UNIT FOR AIR CONDITIONER**

(57) An outdoor unit for an air-conditioning apparatus, which requires no space above, which simplifies an attaching operation, which reduces noise, and which has high reliability, is provided. In an outdoor unit for an air-conditioning apparatus, an upper end of an upper anchoring portion of a fan guard is bent toward a casing and then formed upward, a lower end of a lower anchoring portion is bent toward the casing, a lower anchoring distal end portion that is a distal end-side portion of the lower anchoring portion is bent such that a distal end is

oriented downward, a front panel includes an upper temporary fixing groove in which the upper anchoring portion is inserted and that restricts movement of the upper anchoring portion in a right and left direction and a lower temporary fixing hole in which the lower anchoring portion is inserted and that restricts movement of the lower anchoring portion in a forward direction and in a downward direction, and the upper temporary fixing groove and the upper anchoring portion are covered with a top panel.

FIG. 8



Description

Technical Field

[0001] The present invention relates to an outdoor unit for an air-conditioning apparatus and, more specifically, to a structure of attaching a fan guard.

Background Art

[0002] Hitherto, an outdoor unit for an air-conditioning apparatus, which includes a fan guard, is known. The fan guard covers an air outlet opening of an air duct for sending air. The fan guard prevents a user from touching a rotating fan through the air outlet opening. For example, Patent Literature 1 describes a configuration that, in an outdoor unit, a fan guard is caused to slide along both sides of grooves on a casing from above and fitted to the grooves. With this configuration, when a top panel is attached, the fan guard is fixed, and thus fixing of the fan guard with a screw is not required.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2000-039186

Summary of Invention

Technical Problem

[0004] With the configuration of Patent Literature 1, the fan guard cannot be attached or detached without raising the fan guard by a distance corresponding to the height of the fan guard, and space having a height corresponding to the height of the fan guard is required above the outdoor unit. For example, when an outdoor unit is suspended in a veranda of an apartment, there is a problem that no work space for attaching or detaching the fan guard is ensured.

[0005] In order to cause the fan guard to smoothly slide along the grooves of the casing, clearance needs to be provided on the front, rear, right, and left sides of each slide portion. However, clearance between the fan guard and the casing causes repeated vibrations of the fan guard due to flow of outlet air through the fan guard during operation, so there is a problem of noise generation.

[0006] The present invention has been made to solve the above-described problems, and it is an object of the present invention to provide a highly reliable outdoor unit for an air-conditioning apparatus, which does not require work space above and which simplifies work in attaching a fan guard, and which reduces noise during operation.

Solution to Problem

[0007] An outdoor unit for an air-conditioning apparatus of an embodiment of the present invention includes

a casing and a fan guard. The casing includes a front panel and a top panel. The front panel has an opening. The fan guard is made up of a combination of a plurality of vertical bars and a plurality of horizontal bars, and covers the opening. The fan guard includes an upper anchoring portion and a lower anchoring portion. The upper anchoring portion is provided at an upper end of one of the vertical bars, located at a center, or each of upper ends of at least two of the vertical bars, located apart from each other in a right and left direction of the casing. The lower anchoring portion is provided at a lower end of a plurality of the vertical bars, located apart from each other in the right and left direction of the casing. The upper anchoring portion is provided such that the upper end is bent toward the casing and further bent upward. The lower anchoring portion is provided such that the lower end is bent toward the casing. A distal end of a lower anchoring distal end portion that is a distal end-side portion of the lower anchoring portion is bent so as to be oriented downward. The front panel includes an upper temporary fixing groove and a lower temporary fixing hole. The upper anchoring portion is inserted in the upper temporary fixing groove. The upper temporary fixing groove restricts movement of the upper anchoring portion in the right and left direction. The lower anchoring portion is inserted in the lower temporary fixing hole. The lower temporary fixing hole restricts movement of the lower anchoring portion in a forward direction and in a downward direction. The upper temporary fixing groove and the upper anchoring portion are covered with the top panel.

Advantageous Effects of Invention

[0008] According to the embodiment of the present invention, the fan guard is temporarily fixed when the lower anchoring portion of the fan guard is inserted in the lower temporary fixing hole of the front panel and the upper anchoring portion is inserted in the upper temporary fixing groove, and the fan guard is fixed to the casing when the top panel is placed on the fan guard. Therefore, it is not required to fix the fan guard with a screw or raise the fan guard, and thus working space is reduced, and workability for attaching or detaching the fan guard improves. In addition, since movement of the fan guard in the right and left direction is restricted by the lower temporary fixing hole and the upper temporary fixing groove and movement of the fan guard in the forward direction is restricted by the top panel, vibrations during operation are reduced, and also noise due to vibrations may be suppressed.

Brief Description of Drawings

[0009]

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

[Fig. 2] Fig. 2 is a schematic view illustrating a longitudinally sectional view along a plane containing a

central axis of a fan of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

[Fig. 3] Fig. 3 is an exploded perspective view of a state where a fan guard and top panel of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention are detached.

[Fig. 4] Fig. 4 is an enlarged view of portion A in Fig. 3 and is an enlarged view of a portion around an upper temporary fixing groove at a right upper side when the front panel is viewed from the front.

[Fig. 5] Fig. 5 is an enlarged view of portion B in Fig. 3 and is an enlarged view of a portion around a lower temporary fixing hole at a right lower side when the front panel is viewed from the front.

[Fig. 6] Fig. 6 is a perspective view illustrating the fan guard of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

[Fig. 7] Fig. 7 is an enlarged view of a portion around a lower anchoring portion of the fan guard of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention.

[Fig. 8] Fig. 8 is a schematic sectional view along the line C-C in Fig. 7.

[Fig. 9] Fig. 9 is an enlarged view of a portion around an upper anchoring portion in a state where the top panel of the outdoor unit for an air-conditioning apparatus according to Embodiment of the present invention is detached.

[Fig. 10] Fig. 10 is an enlarged view of the portion around the upper anchoring portion in a state where the top panel of the outdoor unit according to Embodiment of the present invention is attached.

[Fig. 11] Fig. 11 is a schematic sectional view along the line D-D in Fig. 9.

[Fig. 12] Fig. 12 is a schematic sectional view along the line E-E in Fig. 10.

[Fig. 13] Fig. 13 is a schematic view illustrating an outdoor unit for an air-conditioning apparatus according to a modification of Embodiment of the present invention.

Description of Embodiment

Embodiment

[0010] Hereinafter, an outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention will be described. The mode described in the drawings is an example, and is not restrictive. In the drawings, the same reference signs denote the same or corresponding components, and this applies to the entire text of the specification. In the drawings, the magnitude relations among components can be different from the actual ones.

<Overall Configuration of Outdoor Unit 100>

[0011] Fig. 1 is a perspective view of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment of the present invention. As illustrated in Fig. 1, the outdoor unit 100 includes, for example, a box-shaped casing 10. The casing 10 includes a front panel 1 at a front side, a side panel 2 at a side, a top panel 3 at a top side, and a back panel 6. The back panel 6 makes up a backside and a side facing the side panel 2. The front panel 1 of the outdoor unit 100 has an opening 1a that serves as an air duct. The opening 1a is covered with a fan guard 5 at the front side from the outer side of the casing 10. The top panel 3 has a lid shape and has side peripheral portions 3a at its four sides. The side peripheral portions 3a extend downward. The top panel 3 covers the top side of the casing 10. The configuration of the casing 10 of the outdoor unit 100 is not limited to the above-described configuration, and may be changed as needed. The panels that make up the casing 10 of the outdoor unit 100, such as the front panel 1, may be combined and integrated. Each panel may be made up of a plurality of separate panels. In the following description, the side where the front panel 1 of the casing 10 is disposed is defined as "front side", the back panel 6 side facing the front panel 1 in the casing 10 is defined as "rear side", and the right and left sides when the front panel 1 of the casing 10 is viewed from the front are defined as "right side" and "left side". In addition, the top panel 3 side of the casing 10 is defined as "upper side", and the side where a surface facing the top panel 3 of the casing 10 is located is defined as "lower side".

[0012] Fig. 2 is a schematic longitudinally sectional view along a plane including a central axis of a fan 4 of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment. As illustrated in Fig. 2, the fan 4 is disposed inside the casing 10. A motor 8 is mounted at the center portion of the fan 4. The motor 8 is mounted on a fixing element 7 provided inside the casing 10. A heat exchanger 15 is disposed on the back panel 6 side of the fan 4 and motor 8. The back panel 6 has an air inlet 6a that opens along the heat exchanger 15. When the fan 4 is driven by the motor 8 for rotation, outside air flows in through the air inlet 6a, and is introduced into the casing 10 from the backside. Then, air having exchanged heat with refrigerant in the heat exchanger 15 is discharged through the opening 1a of the front panel 1.

<Configuration of Front Panel 1>

[0013] Fig. 3 is an exploded perspective view of a state where the fan guard 5 and the top panel 3 of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment are detached. As illustrated in Fig. 3, the front panel 1 has upper temporary fixing grooves 1b above the opening 1a. The upper temporary fixing grooves 1b are used to temporarily fix the fan guard 5. Similarly, the front panel 1 has lower temporary fixing

holes 1c below the opening 1a. The upper temporary fixing grooves 1b are disposed at bilaterally symmetric locations relative to the center at two portions to the right and left of the opening 1a when the front panel 1 is viewed from the front. The lower temporary fixing holes 1c are disposed likewise.

[0014] Fig. 4 is an enlarged view of portion A in Fig. 3 and is an enlarged view of a portion around the upper temporary fixing groove 1b at the right upper side when the front panel 1 is viewed from the front. A portion around the upper temporary fixing groove 1b at the left upper side when the front panel 1 is viewed from the front has a similar structure to a structure bilaterally symmetric to the structure of the portion around the upper temporary fixing groove 1b of Fig. 4. As illustrated in Fig. 4, the upper temporary fixing groove 1b smoothly connects with a surface 1h of the front panel 1 at right and left edge portions 1d, 1e, and opens on the front of the casing. The right and left edge portions 1d, 1e are connected in a cylindrical shape and recessed from the surface 1h toward the backside. The right and left edge portions 1d, 1e form the upper temporary fixing groove 1b in a curved surface shape. The upper temporary fixing groove 1b is, for example, formed by plastically deforming an element such as a sheet metal that makes up the front panel 1.

[0015] Fig. 5 is an enlarged view of portion B in Fig. 3 and is an enlarged view of a portion around the lower temporary fixing hole 1c at the right lower side when the front panel 1 is viewed from the front. A portion around the lower temporary fixing hole 1c at the left lower side when the front panel 1 is viewed from the front has a similar structure to a structure bilaterally symmetric to the structure of the portion around the lower temporary fixing hole 1c of Fig. 5. As illustrated in Fig. 5, the lower temporary fixing hole 1c is formed such that a groove 1n that is long in an up and down direction and formed at the surface 1h of the front panel 1 opens at its lower end. The lower temporary fixing hole 1c is made up of a lower edge 1p projecting forward and an upper edge 1q recessed rearward. The lower temporary fixing hole 1c is oriented upward of the casing 10 at its end.

<Configuration of Fan Guard 5>

[0016] Fig. 6 is a perspective view illustrating the fan guard 5 of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment. As illustrated in Fig. 6, the fan guard 5 is made up of a combination of a plurality of horizontal bars 5a and a plurality of vertical bars 5b. The horizontal bars 5a and the vertical bars 5b are made up of, for example, wire elements. A plurality of the horizontal bars 5a is disposed in the up and down direction at predetermined intervals, and each of the horizontal bars 5a is provided in the right and left direction. A plurality of the vertical bars 5b is disposed in the right and left direction at predetermined intervals, and each of the vertical bars 5b is provided in the up and down direction. The horizontal bars 5a and the vertical bars 5b are pro-

vided so as to intersect at right angles with each other.

[0017] The vertical bars 5b include first vertical bars 51b and second vertical bars 52b. The first vertical bars 51b are disposed at two portions located apart in the right and left direction of the casing 10. The second vertical bars 52b are disposed at two portions located apart in the right and left direction of the casing 10 and located closer to the center than the first vertical bars 51b.

[0018] Each of the first vertical bars 51b has an upper anchoring portion 51b2. The upper anchoring portion 51b2 is bent toward the casing 10 at its upper end, and then the distal end portion of the upper anchoring portion 51b2 is bent upward. In addition, each of the first vertical bars 51b has a lower anchoring portion 51b5 at its lower end. The lower anchoring portion 51b5 is bent toward the casing 10, and then a lower anchoring distal end portion 51b4 that is the distal end portion of the lower anchoring portion 51b5 is bent downward.

[0019] Each of the second vertical bars 52b has a contact portion 52b3 at its upper end and a contact portion 52b3 at its lower end. The contact portion 52b3 is bent toward the casing 10, and the distal end of the contact portion 52b3 is oriented at an angle close to a direction perpendicular to the surface 1h of the front panel 1.

[0020] Numbers of the horizontal bars 5a and vertical bars 5b are not limited to the specific numbers illustrated in the drawings. The locations of the first vertical bars 51b and the second vertical bars 52b are also not limited to the illustrated locations. The number of locations of the first vertical bars 51b is not limited to two, and may be one at the center or three or more in the right and left direction of the casing 10. The number of locations of the second vertical bars 52b is also not limited to two, and may be one at the center or may be three or more. However, it is desirable that the first vertical bars 51b and the second vertical bars 52b both be disposed equally in the right and left direction relative to the center of the fan guard 5. The fan guard 5 may be made up of resin, not metal wires.

[0021] Fig. 7 is an enlarged view of a portion around the lower anchoring portion 51b5 of the fan guard 5 of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment. Fig. 8 is a schematic sectional view along the line C-C in Fig. 7 and illustrates a section in the front and rear direction of the casing 10 so as to pass through the center of the lower temporary fixing hole 1c. In Fig. 8, the portion indicated by the dashed line represents the contact portion 52b3 located on the far side of the first vertical bar 51b.

[0022] As illustrated in Fig. 7 and Fig. 8, the lower anchoring portion 51b5 is inserted in the lower temporary fixing hole 1c of the front panel 1, the distal end-side lower anchoring distal end portion 51b4 is located inside the casing 10 and is parallel to the surface 1h of the front panel 1. The lower anchoring distal end portion 51b4 is located rearward of the lower edge 1p of the lower temporary fixing hole 1c and forward of the upper edge 1q. Movement of the fan guard 5 in the forward direction of

the casing 10 is restricted by contact between the lower anchoring distal end portion 51b4 and the lower edge 1p. At this time, a force directed from the casing 10 toward the fan guard 5 acts on the lower anchoring distal end portion 51b4.

[0023] As indicated by the dashed line in Fig. 8, the contact portion 52b3 is provided at the lower end of the second vertical bar 52b. The contact portion 52b3 contacts with the surface 1h of the front panel 1, and restricts movement of the fan guard 5 in the rearward direction. With the contact portion 52b3, a force directed from the fan guard 5 toward the casing 10 acts. The force that is applied to the fan guard 5 by contact of the contact portion 52b3 with the casing 10 is opposite to the force that is applied to the fan guard 5 by contact of the lower anchoring distal end portion 51b4 with the casing 10.

[0024] Fig. 9 is an enlarged view of a portion around the upper anchoring portion 5b2 in a state where the top panel 3 of the outdoor unit 100 for an air-conditioning apparatus according to Embodiment is detached. Fig. 10 is an enlarged view of a portion around the upper anchoring portion 51b2 in a state where the top panel 3 of the outdoor unit 100 according to Embodiment is attached. As illustrated in Fig. 9 and Fig. 10, the upper anchoring portion 51b2 of the fan guard 5 is plugged in the upper temporary fixing groove 1b formed in the front panel 1. The upper anchoring portion 51b2 is covered with the side peripheral portion 3a of the top panel 3 placed above.

[0025] Fig. 11 is a schematic sectional view along the line D-D in Fig. 9. The D-D section is a section of the casing 10, in the right and left direction, and is a section passing through the center of the upper temporary fixing groove 1b. Fig. 12 is a schematic sectional view along the line E-E in Fig. 10. The E-E section is a section of the casing 10, in the front and rear direction, and is a section passing through the center of the upper temporary fixing groove 1b.

[0026] As illustrated in Fig. 11 and Fig. 12, the upper anchoring portion 51b2 is press-fitted in the upper temporary fixing groove 1b, and is sandwiched by the side peripheral portion 3a of the top panel 3 and the surface 1h of the front panel 1. The upper temporary fixing groove 1b is formed so as to have a width equal to the diameter of the wire of the upper anchoring portion 51b2, and restricts movement of the upper anchoring portion 51b2 in the right and left direction. The width of the upper temporary fixing groove 1b only needs to be selected as appropriate so that the upper anchoring portion 51b2 can be held. With the width less than the diameter of the wire, the upper anchoring portion 51b2 is further securely held.

[0027] The upper temporary fixing groove 1b is formed so as to have a depth equal to the diameter of the wire of the upper anchoring portion 51b2, and restricts movement, in the front and rear direction, of the upper anchoring portion 51b2 sandwiched by the side peripheral portion 3a of the top panel 3 and the surface 1h of the front panel 1. A portion of the upper anchoring portion 51b2, being exposed from the opening of the upper temporary

fixing groove 1b, is pressed by the side peripheral portion 3a of the top panel 3, and movement of the upper anchoring portion 51b2 in the forward direction is restricted. Movement of the upper anchoring portion 51b2 in the rearward direction is restricted by the upper temporary fixing groove 1b having a shape recessed toward the backside. The depth of the upper temporary fixing groove 1b only needs to be a depth that allows the upper anchoring portion 51b2 to be sandwiched by the side peripheral portion 3a of the top panel 3 and the surface 1h of the front panel 1, and may be less than the diameter of the wire.

[0028] Since the upper anchoring portion 51b2 is press-fitted in the upper temporary fixing groove 1b, movement of the fan guard 5 in the right and left direction is restricted. Since the upper anchoring portion 51b2 is sandwiched by the front panel 1 and the top panel 3, movement of the fan guard 5 in the front and rear direction is restricted. Therefore, movement of the fan guard 5 due to vibrations during operation of the air-conditioning apparatus is prevented, and thus generation of noise is suppressed.

<Procedure to Attach Fan Guard 5>

[0029] The fan guard 5 is attached before the top panel 3 is attached to the casing 10.

[0030] First, in a position in which the upper anchoring portions 51b2 of the fan guard 5 are placed above and the lower anchoring portions 51b5 are placed below, the fan guard 5 is located in front of the front panel 1. At this time, the fan guard 5 is inclined by tilting the upper ends of the upper anchoring portions 51b2 forward of the casing 10. After that, the lower anchoring distal end portions 51b4 of the lower anchoring portions 51b5 are brought close to the lower portion of the front panel 1 and inserted into the lower temporary fixing holes 1c formed in the front panel 1, and the lower anchoring portions 51b5 are engaged with the lower temporary fixing holes 1c.

[0031] Subsequently, about the lower anchoring portions 51b5, the fan guard 5 is pivoted in a direction in which the upper ends of the upper anchoring portions 51b2 are brought closer to the upper portion of the front panel 1. Then, the upper anchoring portions 51b2 are moved to the locations of the upper temporary fixing grooves 1b formed in the front panel 1. At this time, the lower anchoring portions 51b5 contact with the lower edges 1p of the lower temporary fixing holes 1c, and movement of the lower anchoring portions 51b5 in the front and rear direction and in the downward direction is restricted. Therefore, the upper anchoring portions 51b2 move along predetermined trajectories and reliably reach the locations of the upper temporary fixing grooves 1b.

[0032] Subsequently, the upper anchoring portions 51b2 are pushed in toward the front panel 1 while being caused to contact with the lower edges 1p of the upper temporary fixing grooves 1b, and fitted into the upper temporary fixing grooves 1b. Thus, the upper anchoring

portions 51b2 are engaged with the upper temporary fixing grooves 1b. It is desirable that the lower edges 1p of the upper temporary fixing grooves 1b have a curved surface 1f. This is because, when the lower edges 1p have the curved surfaces 1f, the upper anchoring portions 51b2 move along the curved surfaces 1f and easily engage with the upper temporary fixing grooves 1b.

[0033] The upper anchoring portions 51b2 and the lower anchoring portions 51b5 of the fan guard 5 are respectively engaged with the upper temporary fixing grooves 1b and the lower temporary fixing holes 1c, and the fan guard 5 is preliminarily fixed at a predetermined location of the casing 10. Thus, the fan guard 5 is temporarily fixed.

[0034] In a state where the fan guard 5 is temporarily fixed, the upper anchoring portions 51b2 are inserted in the upper temporary fixing grooves 1b, and movement of the fan guard 5 in the front and rear direction and in the right and left direction is restricted. In addition, the upper anchoring portions 51b2 of the fan guard 5 are press-fitted in the upper temporary fixing grooves 1b. Therefore, the fan guard 5 does not fall forward of the casing 10, and the fan guard 5 is kept attached to the casing 10. Hence, a worker does not need to hold the fan guard 5.

[0035] Finally, the top panel 3 is disposed on the casing 10 to which the fan guard 5 is temporarily fixed, and the four side peripheral portions 3a of the top panel 3 are fitted to the upper portion of the casing 10. Thus, the top panel 3 is placed to cover the casing 10. In this manner, the upper anchoring portions 51b2 of the fan guard 5 are sandwiched by the side peripheral portion 3a of the top panel 3 and the surface 1h of the front panel 1. Thus, the fan guard 5 is fixed to the casing 10. Attachment of the fan guard 5 completes.

[0036] Since the fan guard 5 is firmly fixed by the top panel 3, a forward drop-off of the fan guard 5 at the time when a large impact acts on the casing 10 is reduced. In addition, movement of the upper anchoring portions 51b2 and the lower anchoring portions 51b5 of the fan guard 5 in the front and rear direction and in the right and left direction is restricted, thus vibrations during operation are reduced, and noise due to vibrations is reduced. Furthermore, since the fan guard 5 is fixed by disposing the top panel 3 through clearance above the casing 10 and placing the top panel 3 to cover the casing 10, space required for attachment is reduced. In addition, fastening with a screw is not required, and therefore attachment is facilitated.

[0037] At the time of detaching the fan guard 5, the top panel 3 is detached, and the fan guard 5 is placed in a temporary fixed state. Then, the upper anchoring portions 51b2 are pulled out from the upper temporary fixing grooves 1b, the upper end of the fan guard 5 is pivoted in a direction to move forward, and then the fan guard 5 is raised upward to pull the lower anchoring portions 51b5 out from the lower temporary fixing holes 1c. Thus, detaching of the fan guard 5 completes.

[0038] In this case as well, no tool or other devices to release a screw are required. Even after the fan guard 5 is fixed, the fan guard 5 is kept in a temporarily fixed state unless the fan guard 5 is pulled out from the upper temporary fixing grooves 1b, and therefore a worker does not need to hold the fan guard 5. Therefore, in detaching of the fan guard 5 as well, improvement in workability is expected.

[0039] In the above description, the upper anchoring portion 51b2 and the lower anchoring portion 51b5 both are provided in the first vertical bar 51b. Instead, the upper anchoring portion 51b2 and the lower anchoring portion 51b5 may be respectively provided in different vertical bars. It is desirable that each of the set of upper anchoring portions 51b2 and the set of lower anchoring portions 51b5 be provided at bilaterally symmetric locations. This is because, with this configuration, forces that act on the fan guard 5 reach equilibrium. Furthermore, the upper anchoring portion 51b2 may be provided at least in one vertical bar located at the center.

<Modification>

[0040] Fig. 13 is a schematic view illustrating the outdoor unit 100 for an air-conditioning apparatus according to a modification of Embodiment, and corresponds to a schematic sectional view along the line D-D in Fig. 9 in Embodiment. The outdoor unit 100 for an air-conditioning apparatus according to the modification includes protrusions 11b2 formed in the upper temporary fixing groove 11b of the front panel 1. In Fig. 13, the D-D section is a section of the casing 10, in the right and left direction, and is a section passing through the center of the upper temporary fixing groove 11b.

[0041] As illustrated in Fig. 13, in the modification, the upper temporary fixing groove 11b has the protrusions 11b2 formed at the front side. Each of the protrusions 11b2 is formed at the edge of the recessed shape of the upper temporary fixing groove 11b along, for example, part of the upper temporary fixing groove 11b in a longitudinal direction or a ridge 11b1 of the edge. The diameter of a circle drawn by an inner wall surface 1b3 of the upper temporary fixing groove 11b and tangents of the protrusions 11b2 is equal to the diameter of the upper anchoring portion 51b2.

[0042] When the upper anchoring portion 51b2 is press-fitted into the upper temporary fixing groove 11b, the upper anchoring portion 51b2 is held by the protrusions 11b2, and movement in the right and left direction and in the forward direction is restricted. With the thus configured protrusions 11b2, the upper anchoring portion 51b2 is prevented from coming off from the upper temporary fixing groove 11b. In addition, for example, even when the outdoor unit 100 is manufactured without dimensional control for press-fitting, the upper anchoring portion 51b2 is held, and movement in the right and left direction and in the front and rear direction due to vibrations is restricted.

[0043] With the above-described outdoor unit 100 for an air-conditioning apparatus according to Embodiment, the upper anchoring portions 51b2 and lower anchoring portions 51b5 of the fan guard 5 are inserted into the upper temporary fixing grooves 1b and lower temporary fixing holes 1c of the front panel 1, and the fan guard 5 is temporarily fixed to the casing 10. Then, when the top panel 3 is placed on the casing 10 to which the fan guard 5 is temporarily fixed, the fan guard 5 is fixed. In a temporarily fixed state, movement of the upper anchoring portions 51b2 in the up and down direction is restricted by the upper temporary fixing grooves 1b, and movement of the lower anchoring portions 51b5 in the up and down direction and in the front and rear direction is restricted by the lower temporary fixing holes 1c. Therefore, a worker is not required to hold the fan guard 5. In addition, in a fixed state, movement of the upper anchoring portions 51b2 in the front and rear direction is restricted by the top panel 3 and the front panel 1. Therefore, vibrations during operation are reduced, so noise is reduced. In a temporarily fixed state or in a fixed state, since no fastening with a screw is required, attachment is facilitated, and workability of attaching and detaching of the fan guard 5 improves. Since the casing 10 is fixed when the top panel 3 is placed to cover the casing 10, work space to be ensured above the casing 10 may be small. Since the fan guard 5 is fixed in a temporarily fixed state, the fan guard 5 also does not need to be held at the time of detaching the fan guard 5.

[0044] The upper temporary fixing groove 1b is an opening that opens on the front of the casing, and allows the upper anchoring portion 51b2 to be inserted therein when the upper anchoring portion 51b2 is pushed in. Therefore, attachment is facilitated, and a member, such as a screw, that needs to be fixed is not required.

[0045] Since the upper temporary fixing groove 1b has a cylindrical shape, the upper anchoring portion 51b2 that has moved along the curved surface 1f can reach the upper temporary fixing groove 1b and engage with the upper temporary fixing groove 1b.

[0046] By allowing the width of the upper temporary fixing groove 1b to be equal to or less than the diameter of the upper anchoring portion 51b2, movement of the upper anchoring portion 51b2 press-fitted in the upper temporary fixing groove 1b, in the right and left direction can be restricted, and the upper anchoring portion 51b2 can be held.

[0047] With the protrusions 11b2 of the upper temporary fixing groove 11b, the upper anchoring portion 51b2 is prevented from coming off from the upper temporary fixing groove 11b. In addition, even when the outdoor unit 100 is manufactured without dimensional control for press-fitting, the upper anchoring portion 51b2 is held, and movement of the upper anchoring portion 51b2 in the right and left direction and in the front and rear direction due to vibrations is restricted.

[0048] Since the lower temporary fixing holes 1c open upward and the lower anchoring portions 51b5 are in-

serted in the lower temporary fixing holes 1c, the lower anchoring portions 51b5 contact with the lower temporary fixing holes 1c when the lower anchoring portions 51b5 move, and movement of the fan guard 5 in the front and rear direction and in the right and left direction is restricted.

[0049] With the lower edge 1p located at a further front side than the upper edge 1q of the lower temporary fixing hole 1c, the lower anchoring portion 51b5 contacts with the lower edge 1p when the lower anchoring portion 51b5 moves forward, and movement of the lower anchoring portion 51b5 in the forward direction is restricted.

[0050] The contact portions 52b3 and lower anchoring distal end portions 51b4 of the fan guard 5 contact with the casing 10, and apply opposite forces to the fan guard 5. Therefore, movement of the fan guard 5 in the forward direction is restricted by the contact portions 52b3, movement of the fan guard 5 in the rearward direction is restricted by the lower anchoring portions 51b5, and movement of the fan guard 5 due to vibrations is reduced.

Reference Signs List

[0051] 1 front panel 1a opening 1b upper temporary fixing groove 1b3 inner wall surface 1c lower temporary fixing hole 1d, 1e edge portion 1f curved surface 1h surface 1n groove 1p lower edge 1q upper edge 2 side panel 3 top panel 3a side peripheral portion 4 fan 5 fan guard 5a horizontal bar 5b vertical bar 6 back panel 6a air inlet 7 fixing member 8 motor 10 casing 11b upper temporary fixing groove 11b1 ridge 11b2 protrusion 15 heat exchanger 51b first vertical bar 51b2 upper anchoring portion 51b4 lower anchoring distal end portion 51b5 lower anchoring portion 52b second vertical bar 52b3 contact portion 100 outdoor unit

Claims

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

a casing including a front panel and a top panel, the front panel having an opening; and
a fan guard made up of a combination of a plurality of vertical bars and a plurality of horizontal bars, the fan guard covering the opening, wherein
the fan guard includes

an upper anchoring portion formed at an upper end of one of the vertical bars, located at a center, or each of upper ends of at least two of the vertical bars, located apart from each other in a right and left direction of the casing, and

a lower anchoring portion formed at a lower end of a plurality of the vertical bars, located

apart from each other in the right and left direction of the casing,

the upper anchoring portion is formed such that the upper end is bent toward the casing and further bent upward,
the lower anchoring portion is formed such that the lower end is bent toward the casing,
a distal end of a lower anchoring distal end portion that is a distal end-side portion of the lower anchoring portion is bent so as to be oriented downward,
the front panel includes

an upper temporary fixing groove in which the upper anchoring portion is inserted and that restricts movement of the upper anchoring portion in the right and left direction, and

a lower temporary fixing hole in which the lower anchoring portion is inserted and that restricts movement of the lower anchoring portion in a forward direction and in a downward direction, and

the upper temporary fixing groove and the upper anchoring portion are covered with the top panel.

2. The outdoor unit for an air-conditioning apparatus of claim 1, wherein the upper temporary fixing groove opens on the front of the casing. 30
3. The outdoor unit for an air-conditioning apparatus of claim 1 or 2, wherein the upper temporary fixing groove has a curved surface recessed in a cylindrical shape. 35
4. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 3, wherein a width of the upper temporary fixing groove is equal to or less than a width of the upper anchoring portion. 40
5. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 3, wherein the upper temporary fixing groove has a protrusion at a front of the upper temporary fixing groove. 45
6. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 5, wherein the lower temporary fixing hole opens upward. 50
7. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 6, wherein the lower temporary fixing hole is defined by a lower edge located at a lower side of the front panel and an upper edge located at an upper side of the front 55

panel, and
the lower edge is located at a further front side of the casing than the upper edge.

8. The outdoor unit for an air-conditioning apparatus of any one of claims 1 to 7, further comprising:

a contact portion provided at the lower end of the vertical bar in which the lower anchoring portion is not formed, the contact portion contacting with a surface of the front panel, wherein a force that acts on the fan guard by contact between the contact portion and the surface of the front panel is opposite to a force that acts on the fan guard by contact between the lower anchoring distal end portion and a portion of the casing forward of the lower temporary fixing hole.

FIG. 1

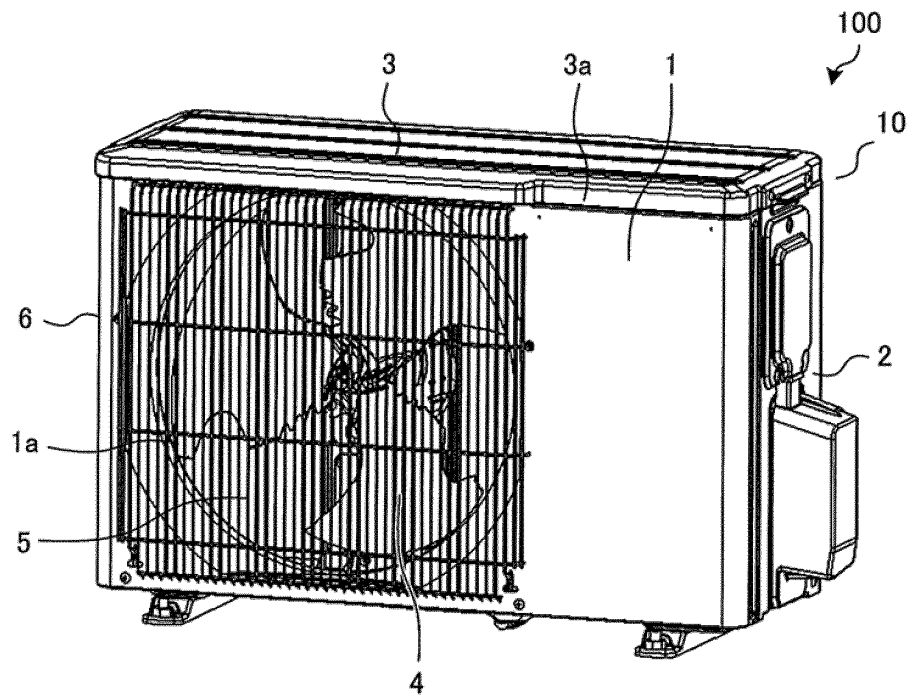


FIG. 2

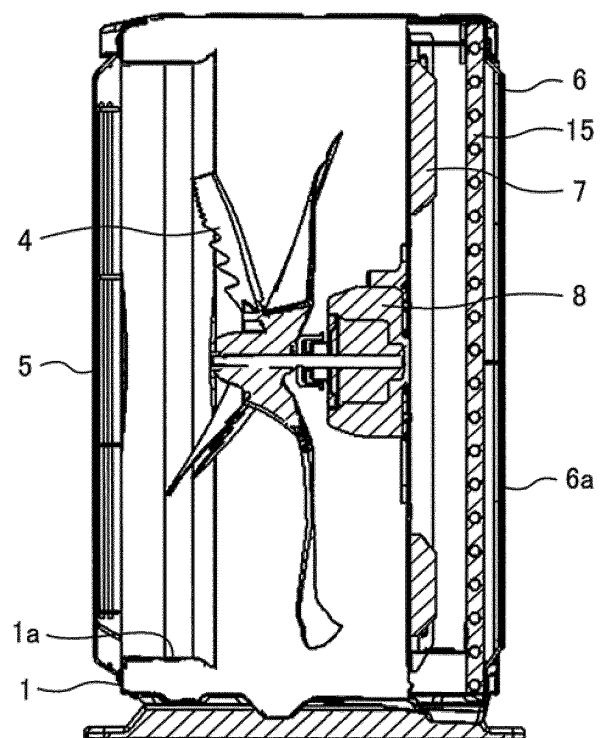


FIG. 3

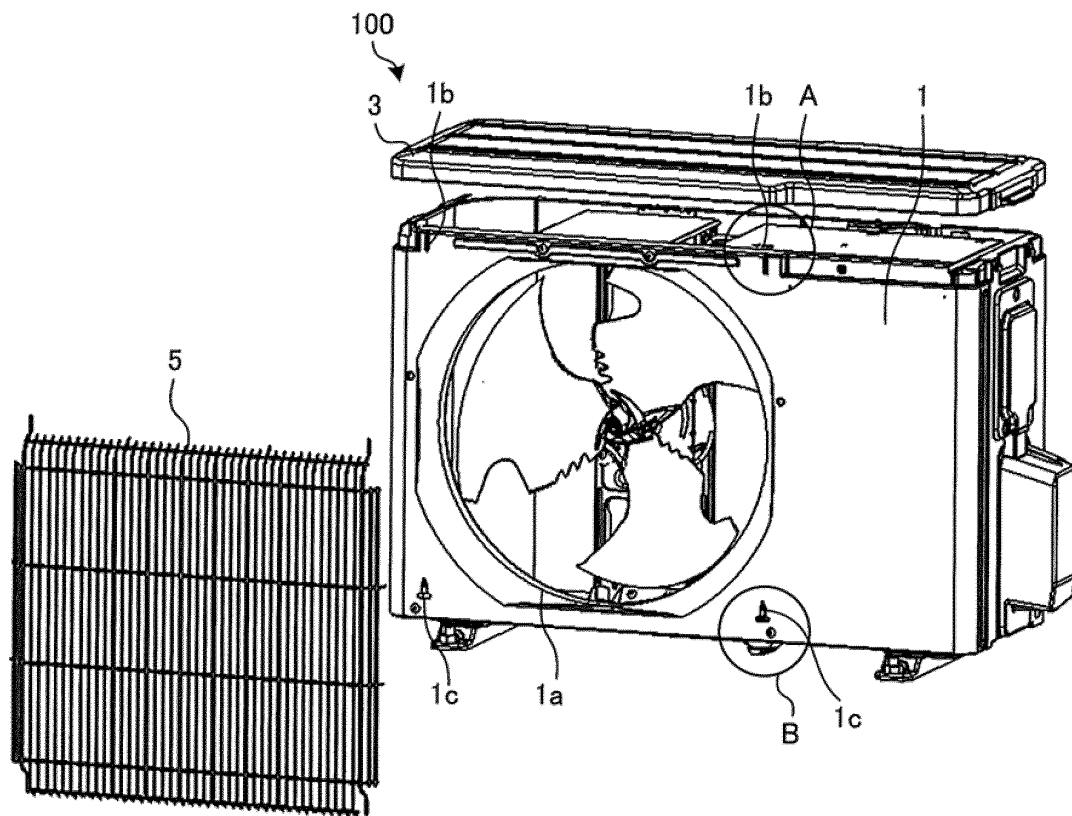


FIG. 4

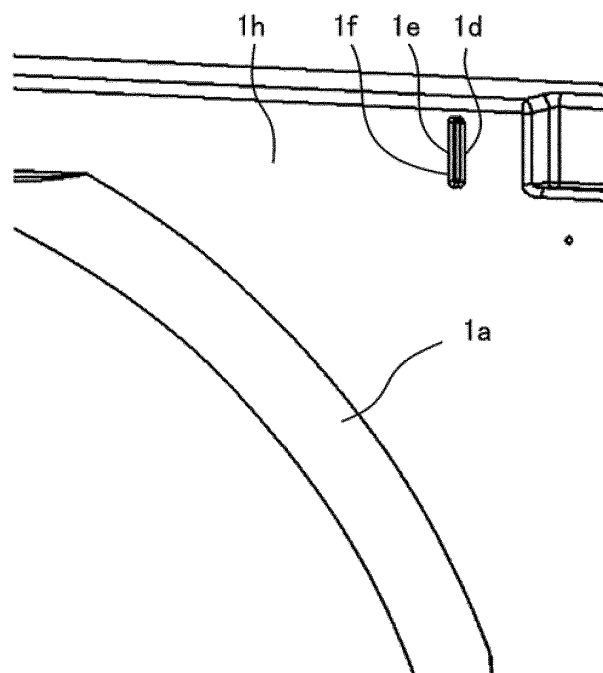


FIG. 5

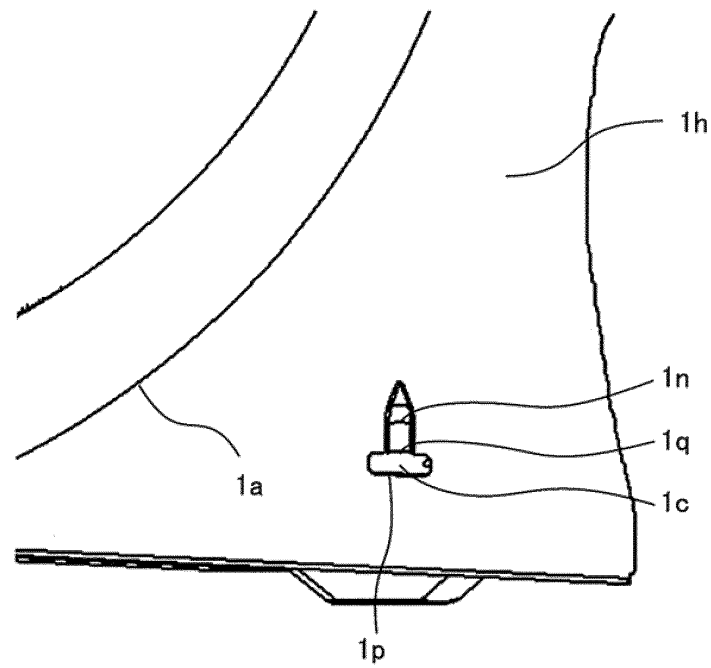


FIG. 6

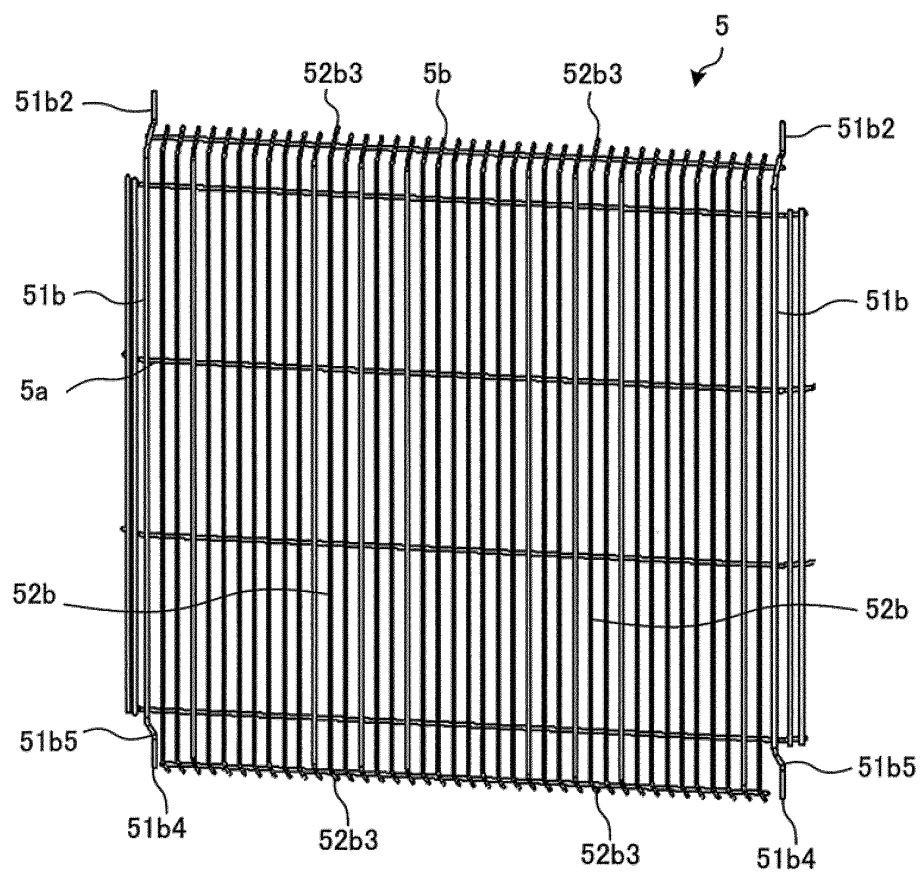


FIG. 7

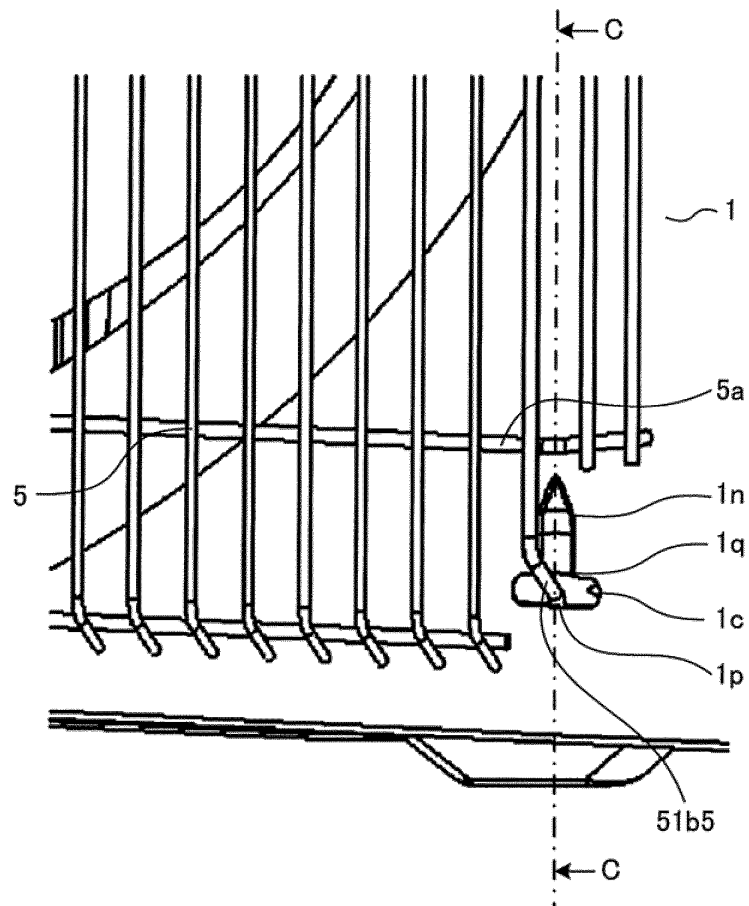


FIG. 8

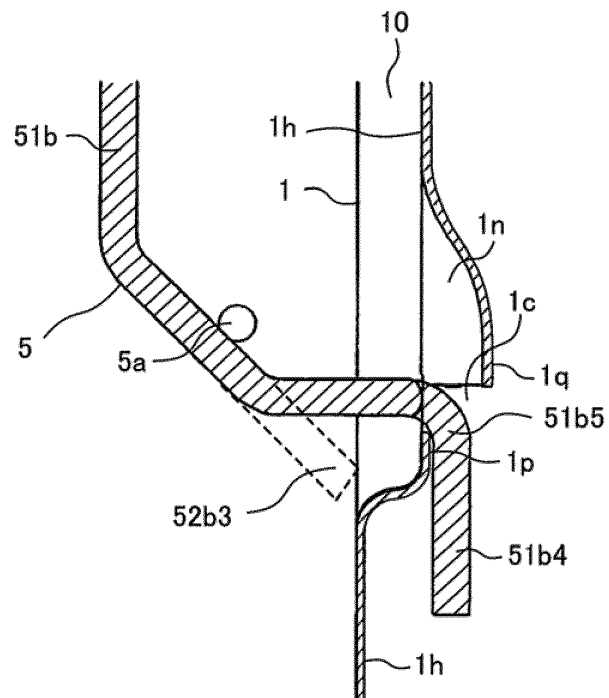


FIG. 9

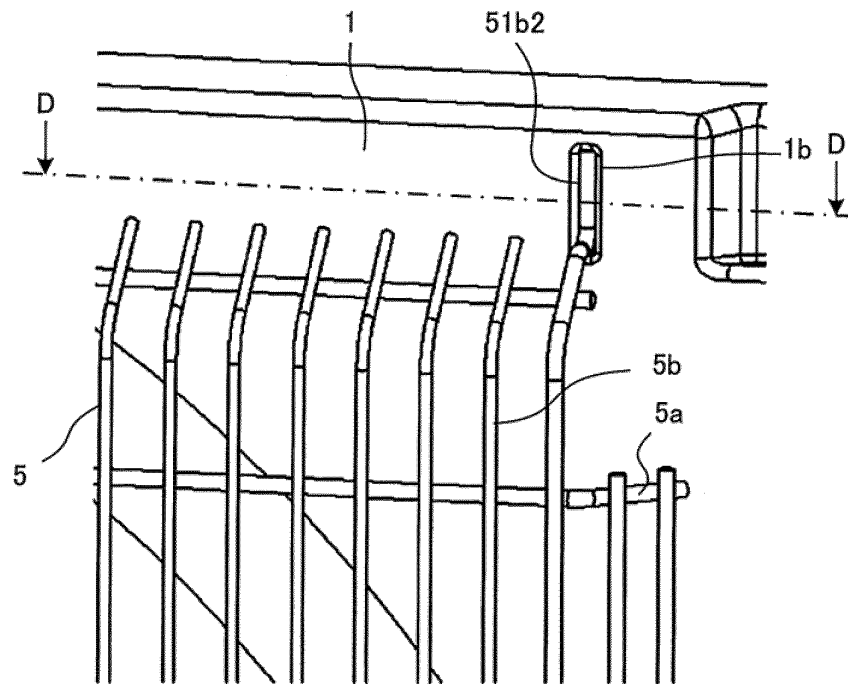


FIG. 10

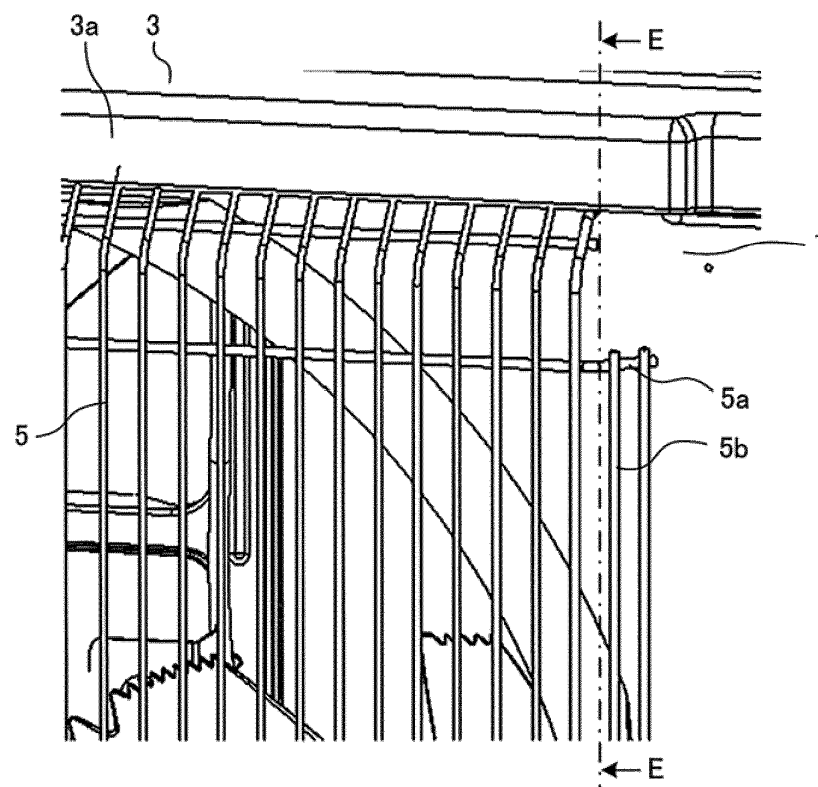


FIG. 11

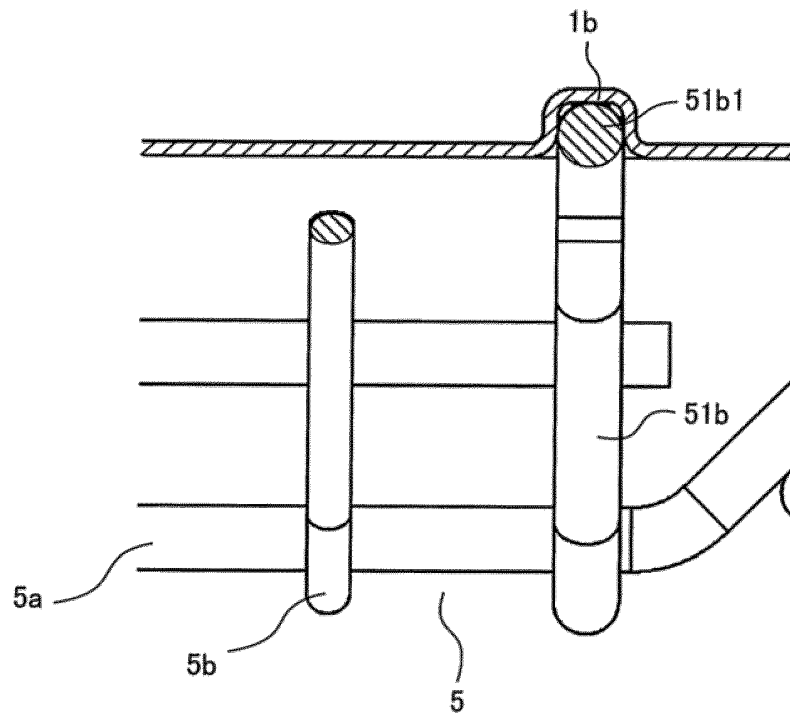


FIG. 12

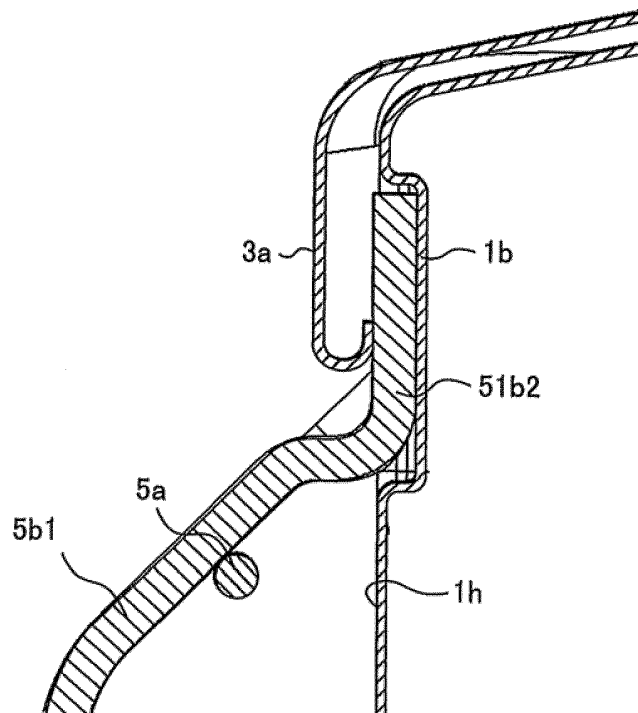
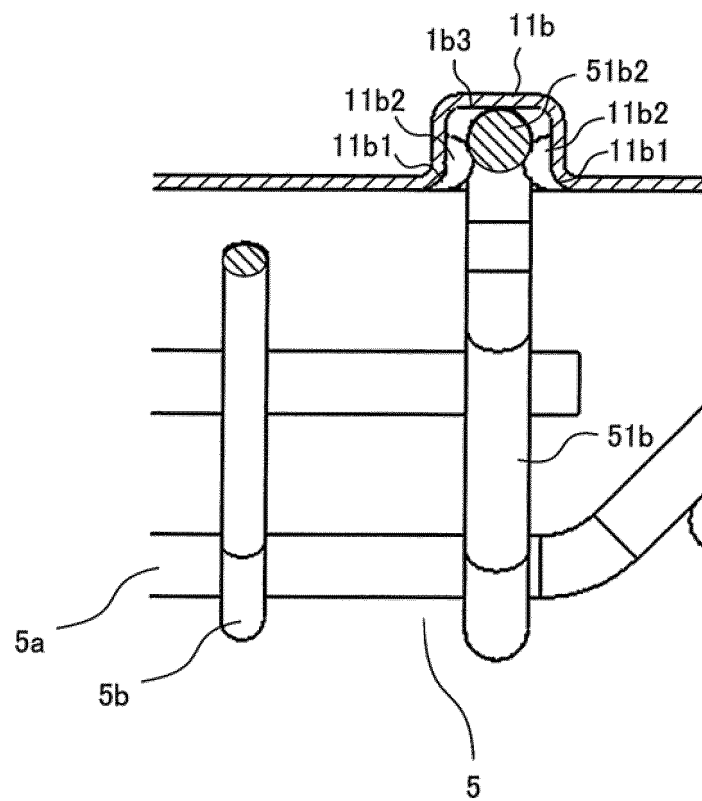


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/006908

A. CLASSIFICATION OF SUBJECT MATTER

F24F1/56(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)

F24F1/56

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 1996-2017

Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 8-136003 A (Funai Electric Co., Ltd.), 31 May 1996 (31.05.1996), paragraphs [0007] to [0008], [0014] to [0028]; fig. 1 to 5 (Family: none)	1-4, 6-7 5, 8
Y A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 64918/1991 (Laid-open No. 10918/1993) (Fujitsu General Ltd.), 12 February 1993 (12.02.1993), specification, paragraphs [0003] to [0007]; fig. 1 to 3 (Family: none)	1-4, 6-7 5, 8

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

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Date of the actual completion of the international search

27 April 2017 (27.04.17)

Date of mailing of the international search report

16 May 2017 (16.05.17)

Name and mailing address of the ISA/

Japan Patent Office

3-4-3, Kasumigaseki, Chiyoda-ku,

Tokyo 100-8915, Japan

Authorized officer

Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/006908

5	C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
10	A	JP 1-189438 A (Matsushita Seiko Co., Ltd.), 28 July 1989 (28.07.1989), page 2, lower left column, line 9 to page 3, upper left column, line 10; fig. 3 to 4 (Family: none)	1-8
15	A	JP 2015-34659 A (Mitsubishi Electric Corp.), 19 February 2015 (19.02.2015), entire text; all drawings (Family: none)	1-8
20	A	JP 2011-2167 A (Mitsubishi Electric Corp.), 06 January 2011 (06.01.2011), paragraphs [0011] to [0015]; fig. 1 to 5 & US 2010/0319380 A1 paragraphs [0038] to [0046]; fig. 1 to 5 & EP 2278230 A2	1-8
25	A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 19830/1989(Laid-open No. 114826/1990) (Mitsubishi Electric Corp.), 13 September 1990 (13.09.1990), entire text; all drawings (Family: none)	1-8
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2000039186 A [0003]