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(54) OUTDOOR UNIT OF REFRIGERATION DEVICE

(57) An outdoor unit includes a case, a fan, an electrical substrate (8), a partition plate (3), a flat plate (11), and a frame wall. The partition plate partitions an internal space of the case into a blast chamber (20) provided therein with the fan and a machine chamber (21) provided therein with the electrical substrate (8). The partition plate (3) has a hole (30) communicating with the blast chamber (20) and the machine chamber (21). The flat plate (11) is disposed in the machine chamber (21) to be spaced apart from the partition plate (3) and cover the hole (30). The frame wall is disposed between the flat plate (11) and the partition plate (3). The frame wall, the flat plate (11), and the partition plate (3) zone an opening (17). The flat plate (11) has a first end (11A) and a second end (11B) opposing the first end (11A). The first end (11A) zones at least part of the opening (17). The electrical substrate (8) is away from the opening (17) in a first direction from the first end (11A) to the second end (11B).

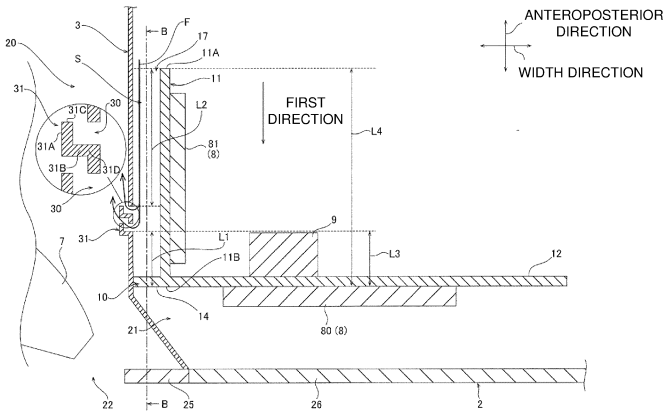

FIG. 5

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an outdoor unit of a refrigeration apparatus.

BACKGROUND ART

[0002] An outdoor unit of a refrigeration apparatus has been conventionally known as including a case, a fan, an electrical substrate, and a partition plate. The partition plate partitions an internal space of the case into a blast chamber provided therein with the fan and a machine chamber provided therein with the electrical substrate.

[0003] For example, Patent Literature 1 (Japanese Laid-Open Patent Publication No. 2012-145287) describes an outdoor unit including a partition plate that has a communication hole communicating with a blast chamber and a machine chamber, and a reactor attachment member supporting a reactor is provided to face the communication hole. The partition plate and the communication hole form a space opened toward a rear surface of the outdoor unit, and an electrical substrate is positioned adjacent to the rear surface with respect to the opening.

SUMMARY OF THE INVENTION

<Technical Problem>

[0004] When a fan stops rotating in the outdoor unit of an air conditioner described in Patent Literature 1, water such as rainwater may occasionally blow into the blast chamber via a blow-out port of the outdoor unit and enter the machine chamber from the blast chamber through the communication hole in the partition plate. In this case, water may wet the electrical substrate positioned adjacent to the rear surface with respect to the opening communicating with the communication hole.

[0005] The present disclosure proposes an outdoor unit of a refrigeration apparatus, configured to inhibit an electrical substrate from getting wet with water.

<Solutions to Problem>

[0006]

(1) An outdoor unit of a refrigeration apparatus includes a case, a fan, an electrical substrate, a partition plate, a first plate, and a wall. The fan is accommodated in the case. The electrical substrate is accommodated in the case. The partition plate partitions an internal space of the case into a blast chamber and a machine chamber. The blast chamber is provided therein with the fan. The machine chamber is provided therein with the electrical substrate. The partition plate has a hole communicating with the blast chamber and the machine chamber. The first plate is disposed in the machine chamber to be spaced apart from the partition plate and cover the hole. The wall is positioned between the first plate and the partition plate. The wall, the first plate, and the partition plate zone an opening. The first plate has a first end and a second end opposing the first end. The first end zones at least part of the opening. The electrical substrate is away from the opening in a first direction from the first end to the second end.
In the outdoor unit of the refrigeration apparatus, water entering the machine chamber via the hole in the partition plate is inhibited from wetting the electrical substrate.
(2) The case may have a blow-out port. The blow-out port faces the fan. The hole may be positioned between the blow-out port and the opening
When the fan rotates in the outdoor unit of the refrigeration apparatus, air flowing from the machine chamber passes through the opening and the hole in the mentioned order, flows into the blast chamber, and is blown out of the blow-out port. This configuration thus secures a smooth airflow in the case to stably cool the electrical substrate.
(3) A distance between the hole and the second end in the first direction may be shorter than a distance between the first end and the hole in the first direction.
The outdoor unit of the refrigeration apparatus can secure a longer distance from the hole to the opening in the first direction in comparison to a case where the distance between the first end and the hole in the first direction is shorter than the distance between the hole and the second end in the first direction. This configuration allows water entering the machine chamber via the hole to be discharged from the opening, so as to inhibit water passing through the opening from reaching the electrical substrate.
(4) A distance between the hole and the electrical substrate in the first direction may be shorter than a distance between the opening and the electrical substrate in the first direction.
The outdoor unit of the refrigeration apparatus can secure a longer distance from the opening to the electrical substrate in the first direction in comparison to a case where the distance between the opening and the electrical substrate in the first direction is shorter than the distance between the hole and the electrical substrate in the first direction. This configuration thus inhibits water passing through the opening from reaching the electrical substrate.
(5) The outdoor unit of the refrigeration apparatus may further include a second plate. The second plate is coupled to the first plate and supports the electrical substrate.
In the outdoor unit of the refrigeration apparatus, the second plate is coupled to the first plate to enhance strength of the first plate.
(6) The outdoor unit of the refrigeration apparatus

described in the above section (5) may further include an electrical component. The electrical component is supported by the second plate.

In the outdoor unit of the refrigeration apparatus, the second plate supports the electrical substrate and the electrical component. The single member can thus support both the electrical substrate and the electrical component. This configuration achieves reduction in the number of components in comparison to a case where the electrical substrate and the electrical component are supported by separate members.

(7) The outdoor unit of the refrigeration apparatus may further include a second electrical substrate. The second electrical substrate is supported by the first plate.

The outdoor unit of the refrigeration apparatus can inhibit the two electrical substrates from getting wet with water.

(8) The outdoor unit of the refrigeration apparatus may include a third plate. The third plate is provided in the blast chamber to have a portion spaced apart from and facing the hole.

The outdoor unit of the refrigeration apparatus can inhibit water from entering the hole from the blast chamber.

(9) In the outdoor unit of the refrigeration apparatus described in the above section (8), the third plate may have a third end and a fourth end opposing the third end. The third end is connected to the partition plate. The fourth end is away from the partition plate.

In the outdoor unit of the refrigeration apparatus, water entering the blast chamber comes into contact with the third end connected to the partition plate and the portion spaced apart from and facing the hole. Water thus comes into contact with the third plate and falls into the blast chamber. This configuration can thus inhibit water from entering the hole from the blast chamber.

Air flowing from the machine chamber toward the blast chamber passes through the hole and then passes between the fourth end and the partition plate to reach the blast chamber. This configuration thus allows air to flow from the machine chamber to the blast chamber so as to stably cool the electrical substrate.

(10) The case may have a blow-out port. The blow-out port faces the fan. The third end may be closer to the blow-out port than the fourth end.

[0007] In the outdoor unit of the refrigeration apparatus, water entering the blast chamber via a discharge port comes into contact with the third end closer to the blow-out port than the fourth end, to be stably inhibited from entering the hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a circuit diagram depicting a refrigerant circuit of an air conditioner as a refrigeration apparatus according to an embodiment.

FIG. 2 is a perspective view of an outdoor unit of the air conditioner, as an outdoor unit of a refrigeration apparatus according to a first embodiment.

FIG. 3 is a plan view of the outdoor unit depicted in FIG. 2, in a state where a top panel of a case is removed.

FIG. 4 is a side view of the outdoor unit depicted in FIG. 2, in a state where a machine chamber front panel and a machine chamber side plate of the case are removed.

FIG. 5 is a sectional view taken along line A-A of the outdoor unit depicted in FIG. 4.

FIG. 6 is a perspective view of a cover member depicted in FIG. 5.

FIG. 7 is a sectional view taken along line B-B of the outdoor unit depicted in FIG. 5.

FIG. 8 is a sectional view taken along line A-A of the outdoor unit depicted in FIG. 4, as an explanatory view of entry of water flowing from a blast chamber toward a machine chamber.

FIG. 9 is a sectional view taken along line A-A of an outdoor unit according to a second embodiment.

FIG. 10 is a sectional view taken along line A-A of an outdoor unit according to a third embodiment.

FIG. 11 is a sectional view taken along line A-A of an outdoor unit according to a fourth embodiment.

FIG. 12 is a sectional view taken along line A-A of an outdoor unit according to a fifth embodiment.

FIG. 13 is a sectional view taken along line A-A of an outdoor unit according to a sixth embodiment.

FIG. 14 is a sectional view taken along line A-A of an outdoor unit according to a seventh embodiment.

FIG. 15 is a plan view of an outdoor unit according to an eighth embodiment, in a state where a top panel of a case is removed.

FIG. 16 is a side view of an outdoor unit according to a ninth embodiment, in a state where a machine chamber front panel and a machine chamber side plate of a case are removed.

DESCRIPTION OF EMBODIMENTS

<First embodiment>

[0009] A refrigeration apparatus is configured to achieve a vapor compression refrigeration cycle to cool or heat gas like air or liquid like water. The refrigeration apparatus is applicable to an air conditioner, a cooling apparatus, a water heater, and the like. Description is made hereinafter to an air conditioner 100 exemplifying the refrigeration apparatus.

1. Entire configuration of air conditioner

[0010] FIG. 1 is a schematic configuration diagram of the air conditioner 100 including an outdoor unit 1 according to the first embodiment of the present disclosure.

[0011] The air conditioner 100 is configured to achieve the vapor compression refrigeration cycle to cool or heat an interior of a building or the like. The air conditioner 100 includes the outdoor unit 1 and an indoor unit 101. The outdoor unit 1 and the indoor unit 101 are connected via a liquid-refrigerant connection pipe 115 and a gas-refrigerant connection pipe 116.

[0012] The indoor unit 101 is installed indoors and includes an indoor heat exchanger 113.

[0013] The outdoor unit 1 is disposed outdoors, and includes a compressor 4, an accumulator 5, a four-way switching valve 111, an outdoor heat exchanger 6, an expansion valve 112, a liquid-refrigerant shutoff valve 117, a gas-refrigerant shutoff valve 118, and a fan 7. The outdoor heat exchanger 6 and the liquid-refrigerant shutoff valve 117 are connected via a liquid refrigerant pipe 119. The liquid refrigerant pipe 119 is provided with the expansion valve 112.

[0014] The indoor heat exchanger 113 of the indoor unit 101 is connected with the compressor 4, the accumulator 5, the four-way switching valve 111, the outdoor heat exchanger 6, the expansion valve 112 of the outdoor unit 1, and the like as depicted in FIG. 1, to constitute a refrigerant circuit 110.

[0015] The air conditioner 100 including the refrigerant circuit 110 thus configured causes, during cooling operation, a refrigerant to circulate in the compressor 4, the outdoor heat exchanger 6 functioning as a radiator, the expansion valve 112, the indoor heat exchanger 113 functioning as an evaporator, and the accumulator 5 in the mentioned order. The air conditioner 100 causes, during heating operation, the refrigerant to circulate in the compressor 4, the indoor heat exchanger 113 functioning as a radiator, the expansion valve 112, the outdoor heat exchanger 6 functioning as an evaporator, and the accumulator 5 in the mentioned order.

2. Entire configuration of outdoor unit

[0016] As depicted in FIG. 2 to FIG. 4, the outdoor unit 1 further includes a case 2, a partition plate 3, a plurality of electrical substrates 8, an electrical component 9, a cover member 10, and a support plate 12 exemplifying the second plate.

(1) Case

[0017] As depicted in FIG. 3, the case 2 constitutes an exterior of the outdoor unit 1 (see FIG. 2). The case 2 accommodates the partition plate 3, the outdoor heat exchanger 6, the fan 7, the compressor 4, the accumulator 5, the plurality of electrical substrates 8, the electrical component 9, the cover member 10, and the support plate 12. FIG. 3 and FIG. 4 exclude, for convenience, the expansion valve 112, the liquid-refrigerant shutoff valve 117, the gas-refrigerant shutoff valve 118, and the liquid refrigerant pipe 119.

[0018] The case 2 has an internal space partitioned into a blast chamber 20 and a machine chamber 21 by the partition plate 3. The blast chamber 20 accommodates the outdoor heat exchanger 6 and the fan 7. The machine chamber 21 accommodates the compressor 4, the accumulator 5, the plurality of electrical substrates 8, the electrical component 9, the cover member 10, and the support plate 12.

[0019] The case 2 has a blow-out port 22 and a first suction port 23.

[0020] The blow-out port 22 communicates with the blast chamber 20. The blow-out port 22 faces the fan 7. The first suction port 23 is positioned opposite to the blow-out port 22 with respect to the fan 7. The first suction port 23 communicates with the blast chamber 20.

[0021] Hereinafter, a direction in which the blow-out port 22 and the first suction port 23 are arranged is assumed as an anteroposterior direction, and a direction perpendicular to the anteroposterior direction is assumed as a width direction. The blow-out port 22 is positioned ahead of the fan 7. The first suction port 23 is positioned behind the fan 7. Specifically, such relative positions are in conformity to direction arrows in the drawings.

[0022] The case 2 includes a first front panel 25, a first side plate 28, a second front panel 26, a second side plate 27, a top panel 29 (see FIG. 2), and a bottom frame 24.

[0023] The first front panel 25 constitutes part of a front surface of the case 2. The first front panel 25, the first side plate 28, and the partition plate 3 zone the blast chamber 20. The first front panel 25 extends in the width direction. The first front panel 25 has the blow-out port 22. The blow-out port 22 depicted in FIG. 2 is covered with a blow-out grill 25A having a plurality of holes. FIG. 3 excludes, for convenience, the blow-out grill 25A.

[0024] The first side plate 28 constitutes a side surface of the case 2. The first side plate 28 is positioned opposite to the partition plate 3 with respect to the fan 7. The first side plate 28 extends in the anteroposterior direction. The first side plate 28 has a front end part connected to the first front panel 25. The first side plate 28 has a plurality of second suction ports 28A. Each of the second suction ports 28A communicates with the blast chamber 20.

[0025] The second front panel 26 and the first front panel 25 constitute the front surface of the case 2, and the second front panel 26 constitutes part of a side surface adjacent to the machine chamber, of the case 2. The second front panel 26, the second side plate 27, and the partition plate 3 zone the machine chamber 21. The second front panel 26 has an L shape in a cross sectional view along a horizontal plane. The second front panel 26 has a third suction port 26A. The third suction port 26A is positioned in the side surface of the case 2, and is

positioned in a lower portion of the second front panel 26 (see FIG. 4). The third suction port 26A communicates with the machine chamber 21.

[0026] The second side plate 27 and the second front panel 26 constitute the side surface of the case 2, and the second side plate 27 constitutes part of a rear surface of the case 2. The second side plate 27 is positioned opposite to the first side plate 28 with respect to the partition plate 3. The second side plate 27 has an L shape in a cross sectional view along the horizontal plane. The second side plate 27 has a rear surface portion spaced in the width direction apart from a rear end part of the first side plate 28. The rear surface portion of the second side plate 27, the rear end part of the first side plate 28, a rear end part of the top panel 29, and a rear end part of the bottom frame 24 zone the first suction port 23.

[0027] The top panel 29 constitutes an upper surface of the case 2. The bottom frame 24 constitutes a bottom surface of the case 2.

(2) Partition plate

[0028] The partition plate 3 partitions the internal space of the case 2 into the blast chamber 20 and the machine chamber 21. The partition plate 3 is disposed between the plurality of electrical substrates 8 and the fan 7 in the internal space of the case 2. As depicted in FIG. 4, the partition plate 3 extends in a vertical direction and the anteroposterior direction. The partition plate 3 has a plurality of holes 30. The partition plate 3 is provided with the plurality of holes 30. There is provided, in the anteroposterior direction, a plurality of rows 30A including a plurality of holes aligned in the vertical direction. Each of the holes 30 causes the blast chamber 20 and the machine chamber 21 to communicate with each other (see FIG. 5).

(3) Heat exchanger

[0029] As depicted in FIG. 3, the outdoor heat exchanger 6 is disposed in the blast chamber 20. The outdoor heat exchanger 6 has an L shape. The outdoor heat exchanger 6 is disposed along the first side plate 28 and faces the first suction port 23 in the anteroposterior direction.

(4) Fan

[0030] The fan 7 is disposed in the blast chamber 20. The fan 7 is positioned opposite to the first suction port 23 with respect to the outdoor heat exchanger 6. The fan 7 generates an airflow passing through the outdoor heat exchanger 6. The fan 7 is driven by a motor 70. The fan 7 is driven to cause external air to be sucked into the blast chamber 20 via the first suction port 23 and the plurality of second suction ports 28A, pass through the outdoor heat exchanger 6, and then be discharged from the blow-out port 22.

(5) Compressor and accumulator

[0031] The compressor 4 and the accumulator 5 are disposed in the machine chamber 21. The compressor 4 is positioned opposite to the second front panel 26 with respect to the support plate 12. As depicted in FIG. 4, the compressor 4 is positioned below the cover member 10. As depicted in FIG. 3, the accumulator 5 is positioned between the second side plate 27 and the compressor 4. The accumulator 5 is positioned behind the cover member 10.

(6) Plurality of electrical substrates and electrical component

[0032] The plurality of electrical substrates 8 and the electrical component 9 are disposed in the machine chamber 21. Each of the electrical substrates 8 is provided with an electronic component configured to control operation of the air conditioner. The electrical component 9 is an electronic component different from the electronic component mounted on each of the electrical substrates 8, and examples thereof include a reactor. The electrical substrates 8 and the electrical component 9 are supported by the cover member 10 and the support plate 12, as to be described in detail later.

(7) Cover member and support plate

[0033] As depicted in FIG. 4, the cover member 10 and the support plate 12 are disposed in the machine chamber 21. The cover member 10 covers all the holes 30. The cover member 10 is disposed above the third suction port 26A to be spaced apart therefrom. The cover member 10 supports the electrical substrates 8, as to be described in detail later. The support plate 12 is coupled to the cover member 10. The support plate 12 supports the electrical substrates 8 and the electrical component 9, as to be described in detail later.

3. Details of cover member

[0034] As depicted in FIG. 6, the cover member 10 includes a flat plate 11 exemplifying the first plate, and a frame wall 13 exemplifying the wall.

(1) Flat plate

[0035] The flat plate 11 is disposed in the machine chamber 21 to be spaced apart from the partition plate 3 and cover the holes 30. The flat plate 11 faces the partition plate 3 to be spaced apart therefrom in the width direction and cover all the holes 30. The plurality of holes 30 allows a space S between the flat plate 11 and the partition plate 3 to communicate with the blast chamber 20 (see FIG. 5).

[0036] The flat plate 11 extends in the vertical direction and the anteroposterior direction. The flat plate 11 is dis-

posed in parallel with the partition plate 3. The flat plate 11 thus has a thickness direction in parallel with a thickness direction of the partition plate 3. The thickness direction of the flat plate 11 is in parallel with the width direction.

[0037] As depicted in FIG. 5, the flat plate 11 has a first end 11A and a second end 11B opposing the first end 11A in the anteroposterior direction (a direction perpendicular to both the vertical direction and the thickness direction of the flat plate 11). The first end 11A is positioned opposite to the second front panel 26 with respect to the second end 11B. According to the present embodiment, the first end 11A corresponds to a rear end of the flat plate 11 and the second end 11B corresponds to a front end of the flat plate 11. The first end 11A and the second end 11B interpose the plurality of holes 30 in the anteroposterior direction.

[0038] Hereinafter, an anteroposterior direction from the first end 11A to the second end 11B will be called a first direction. The first direction according to the present embodiment is a direction from a rear side to a front side.

[0039] A distance L1 between the holes 30 and an end surface of the second end 11B in the first direction is shorter than a distance L2 between an end surface of the first end 11A and the holes 30 in the first direction. This configuration secures a long distance from the holes 30 to an opening 17 in the first direction, and discharges, from the opening 17, water entering the machine chamber 21 via the holes 30, to inhibit water passing through the opening 17 from reaching the electrical substrates 8.

(2) Frame wall

[0040] As depicted in FIG. 6, the frame wall 13 is positioned between the flat plate 11 and the partition plate 3. The frame wall 13 surrounds peripheral ends of the flat plate 11 with a rear side being opened. The frame wall 13 is coupled to the flat plate 11. The frame wall 13 may be provided integrally with or separately from the flat plate 11. The frame wall 13 extends from the flat plate 11 toward the partition plate 3 and comes into contact with the partition plate 3.

[0041] As depicted in FIG. 6 and FIG. 7, the frame wall 13 has a U shape in a sectional view in parallel with the partition plate 3. The frame wall 13 includes a first wall 14, a second wall 15, and a third wall 16.

[0042] The first wall 14 in the frame wall 13 corresponds to a portion positioned between the second end 11B and the partition plate 3. The first wall 14 is coupled to the second end 11B and is in contact with the partition plate 3. The first wall 14 extends in the vertical direction and the width direction. The first wall 14 is equal in size in the vertical direction to the flat plate 11.

[0043] The second wall 15 in the frame wall 13 corresponds to a portion positioned between an upper end of the flat plate 11 and the partition plate 3. The second wall 15 is coupled to the upper end of the flat plate 11 and is in contact with the partition plate 3. The second wall 15 extends in the first direction and the width direction. The second wall 15 is equal in size in the first direction to the flat plate 11. The second wall 15 has a first end 15A and a second end 15B positioned away from the first end 15A in the first direction. The second end 15B is provided continuously to an upper end of the first wall 14.

[0044] The third wall 16 in the frame wall 13 corresponds to a portion positioned between a lower end of the flat plate 11 and the partition plate 3. The third wall 16 is coupled to the lower end of the flat plate 11 and is in contact with the partition plate 3. The third wall 16 is disposed to be spaced apart from the second wall 15 in the vertical direction. The third wall 16 extends in the first direction and the width direction. The third wall 16 is equal in size in the first direction to the flat plate 11. The third wall 16 has a first end 16A and a second end 16B positioned away from the first end 16A in the first direction. The first end 16A is disposed to be spaced apart from the first end 15A in the vertical direction. The second end 16B is provided continuously to a lower end of the first wall 14.

[0045] The frame wall 13, the flat plate 11, and the partition plate 3 zone the opening 17. More specifically, the opening 17 is zoned by the first end 11A of the flat plate 11, the first end 15A of the second wall 15, the first end 16A of the third wall 16, and the partition plate 3. In other words, the first end 11A of the flat plate 11 zones at least part of the opening 17.

[0046] The opening 17 viewed in the first direction has a rectangular shape extending in the vertical direction. The opening 17 is provided between the flat plate 11 and the partition plate 3. The opening 17 allows the space S positioned inside the frame wall 13 to communicate with a space outside the space S. The plurality of holes 30 is positioned between the first wall 14 and the opening 17. A distance between the holes 30 and the first wall 14 in the first direction is shorter than the distance between the opening 17 and the holes 30 in the first direction.

[0047] The plurality of holes 30 is positioned between the blow-out port 22 and the opening 17 in the first direction. When the fan 7 is driven to rotate, air flowing from the machine chamber 21 passes through the opening 17 and the holes 30 in the mentioned order, flows into the blast chamber 20, and is blown out of the blow-out port 22. This configuration thus secures a smooth airflow in the case 2 to stably cool the electrical substrates 8.

4. Details of support plate

[0048] As depicted in FIG. 4, the support plate 12 is disposed above the third suction port 26A to be spaced apart therefrom. As depicted in FIG. 5, the support plate 12 is disposed behind the second front panel 26 to be spaced apart therefrom. The support plate 12 is coupled to the flat plate 11. The flat plate 11 can thus be enhanced in strength.

[0049] The support plate 12 may be provided integrally with or separately from the flat plate 11. The support plate

12 is positioned opposite to the partition plate 3 with respect to the flat plate 11. The support plate 12 according to the present embodiment is provided continuously to the second end 11B of the flat plate 11. The support plate 12 extends in the width direction and the vertical direction to be perpendicular to the first direction.

5. Details of electrical substrates and electrical component

[0050] The plurality of electrical substrates 8 includes a first electrical substrate 80 and a second electrical substrate 81.

[0051] The first electrical substrate 80 is away from the opening 17 in the first direction. Even when water enters the machine chamber 21 via the holes 30 in the partition plate 3, the water is discharged from the opening 17 so as to be away from the first electrical substrate 80. The first electrical substrate 80 can thus be inhibited from getting wet with water.

[0052] The first electrical substrate 80 is away from the plurality of holes 30 in the first direction. A distance L3 between the holes 30 and the first electrical substrate 80 in the first direction is shorter than a distance L4 between the opening 17 and the first electrical substrate 80 in the first direction. This configuration secures a long distance from the opening 17 to the first electrical substrate 80 in the first direction, to inhibit water passing through the opening 17 from reaching the first electrical substrate 80.

[0053] The first electrical substrate 80 is positioned opposite to the opening 17 with respect to the support plate 12. The first electrical substrate 80 extends in the width direction and the vertical direction to be perpendicular to the first direction.

[0054] The support plate 12 supports the first electrical substrate 80. The support plate 12 is disposed between the third suction port 26A (see FIG. 3) and the flat plate 11 in the width direction, and extends along a plane perpendicular to the first direction. The support plate 12 can thus support the first electrical substrate 80 at a position between the third suction port 26A (see FIG. 3) and the opening 17 in the width direction. This configuration allows an airflow from the third suction port 26A (see FIG. 3) toward the opening 17 to pass near the first electrical substrate 80, so as to stably cool the first electrical substrate 80.

[0055] The first electrical substrate 80 is supported by a front surface of the support plate 12. When the second front panel 26 is detached from the case 2, the first electrical substrate 80 is exposed forward. This configuration allows an installation worker or a service person to easily check wiring and voltage at the first electrical substrate 80, replace the first electrical substrate 80, and the like.

[0056] The second electrical substrate 81 is away from the opening 17 in the first direction. The first electrical substrate 80 and the second electrical substrate 81 can thus be inhibited from getting wet with water. The second electrical substrate 81 is positioned between the first electrical substrate 80 and the opening 17. More specifically, the second electrical substrate 81 is positioned between the support plate 12 and the opening 17. The second electrical substrate 81 is positioned opposite to the partition plate 3 with respect to the flat plate 11. The second electrical substrate 81 extends in the first direction and the vertical direction.

[0057] The second electrical substrate 81 is supported by the flat plate 11. The second electrical substrate 81 is supported by a surface, opposite to a surface facing the opening 17, of the flat plate 11. The first electrical substrate 80 and the second electrical substrate 81 can thus be disposed separately from each other for effective utilization of the space in the case 2, which achieves reduction in size of the outdoor unit 1.

[0058] The electrical component 9 is away from the opening 17 in the first direction. The electrical component 9 is positioned opposite to the first electrical substrate 80 with respect to the support plate 12.

[0059] The electrical component 9 is supported by a rear surface of the support plate 12. The support plate 12 thus supports the first electrical substrate 80 and the electrical component 9. The single support plate 12 can thus support both the first electrical substrate 80 and the electrical component 9. This configuration achieves reduction in the number of components and reduction in length of wiring connecting the first electrical substrate 80 and the electrical component 9, in comparison to a case where the first electrical substrate 80 and the electrical component 9 are supported by separate members.

[0060] The first electrical substrate 80 and the electrical component 9 can be maintained by detaching the support plate 12 supporting both the first electrical substrate 80 and the electrical component 9 from the outdoor unit 1. This configuration enables smooth maintenance of the first electrical substrate 80 and the electrical component 9.

6. Details of partition plate

[0061] The partition plate 3 is provided with a cover plate 31 exemplifying the third plate.

[0062] The cover plate 31 is provided in the blast chamber 20. The cover plate 31 is positioned opposite to the flat plate 11 with respect to the partition plate 3. The present embodiment provides a plurality of cover plates 31 correspondingly to the plurality of holes 30.

[0063] The cover plates 31 each include a body portion 31A and a coupling portion 31B. The body portion 31A faces a corresponding one of the holes 30 to be spaced apart therefrom. Water entering the blast chamber 20 thus comes into contact with the body portion 31A before passing through the hole 30. Water eventually falls into the blast chamber 20. This configuration can inhibit water from entering the hole 30 from the blast chamber 20.

[0064] The body portion 31A extends in the anteroposterior direction. The body portion 31A has a front end connected to the coupling portion 31B. The body portion

31A has a rear end 31C exemplifying the fourth end and positioned away from the partition plate 3.

[0065] The coupling portion 31B couples the front end of the body portion 31A and a circumferential edge of the hole 30 in the partition plate 3. The coupling portion 31B extends in the width direction. The coupling portion 31B has a first end connected to the front end of the body portion 31A. The coupling portion 31B has a second end 31D exemplifying the third end and connected to the partition plate 3. In other words, the cover plate 31 has the third end (second end 31D) connected to the partition plate 3, and the fourth end (rear end 31C) opposing the third end. Though not depicted, the cover plate 31 has an upper end and a lower end connected to the partition plate 3.

[0066] The second end 31D of the coupling portion 31B is closer to the blow-out port 22 than the rear end 31C of the body portion 31A. In other words, the cover plate 31 is opened toward the outdoor heat exchanger 6 and has a closed end part adj acent to the blow-out port 22. Water entering the blast chamber 20 via the blow-out port 22 thus comes into contact with the second end 31D of the coupling portion 31B as a closed portion of the cover plate 31, before coming into contact with the rear end 31C of the body portion 31A as an opened portion of the cover plate 31. This configuration can thus stably inhibit water entering the blast chamber 20 via the blow-out port 22 from entering the hole 30.

[0067] When the fan 7 rotates in a normal rotation direction, air flowing from the machine chamber 21 toward the blast chamber 20 passes through the hole 30 and then passes between the rear end 31C of the body portion 31A and the partition plate 3 to reach the blast chamber 20. This configuration thus allows air to flow from the machine chamber 21 to the blast chamber 20 so as to stably cool the electrical substrates 8.

[0068] Each of the cover plates 31 according to the present embodiment is provided integrally with the partition plate 3, and is formed into a louver shape by cutting and raising work. The cover plate 31 may alternatively be provided separately from the partition plate 3. In this case, the cover plate 31 is connected to the partition plate 3 by spot welding or the like.

7. Airflow in outdoor unit

[0069] Described next with reference to FIG. 3 to FIG. 7 is an airflow in the outdoor unit 1.

[0070] As depicted in FIG. 3, the fan 7 receives driving force from the motor 70 to rotate in the normal rotation direction. When the fan 7 rotates in the normal rotation direction, external air is sucked into the blast chamber 20 via the first suction port 23 and the second suction ports 28A and passes through the outdoor heat exchanger 6. The air having passed through the outdoor heat exchanger 6 is discharged from the blow-out port 22.

[0071] As depicted in FIG. 4, external air flows into the machine chamber 21 via the third suction port 26A. The air having flowed into the machine chamber 21 rises in the machine chamber 21. Such an airflow F branches, below the support plate 12, into a first airflow F1 passing near the first electrical substrate 80 and a second airflow F2 passing near the second electrical substrate 81.

[0072] The first airflow F1 then rises near the first electrical substrate 80 to cool the first electrical substrate 80. The first airflow F1 thereafter flows over an upper end of the support plate 12 and passes between the upper end of the support plate 12 and the top panel 29. The first airflow F1 subsequently passes near the electrical component 9 and the second electrical substrate 81 to cool the electrical component 9 and the second electrical substrate 81, and then flows into the opening 17.

[0073] The second airflow F2 rises near the second electrical substrate 81 and the electrical component 9 to cool the second electrical substrate 81 and the electrical component 9. The second airflow F2 thereafter flows into the opening 17.

[0074] As depicted in FIG. 5, the airflow F having flowed into the opening 17 flows in the space S between the flat plate 11 and the partition plate 3 toward the plurality of holes 30. This airflow has an airflow direction in parallel with the first direction. The airflow F then passes through the plurality of holes 30, is changed in terms of its airflow direction by the cover plates 31, and reaches the blast chamber 20. Air having flowed into the blast chamber 20 is discharged from the blow-out port 22 by the fan 7 being rotating.

8. Water entry in outdoor unit

[0075] As depicted in FIG. 8, rain and wind may occasionally blow into the blast chamber 20 via the blow-out port 22 when the fan 7 is stopped. In this case, rainwater comes into contact with the fan 7 to be hit toward the partition plate 3.

[0076] In this case, the water hit by the fan 7 initially comes into contact with the cover plates 31. Part of the water thus comes into contact with the cover plates 31 to fall into the blast chamber 20. This configuration inhibits water from entering the holes 30.

[0077] When water flows between the rear end 31C of the body portion 31A and the partition plate 3 and enters the space S between the partition plate 3 and the flat plate 11 via the hole 30, part of the water comes into contact with the flat plate 11 to fall into the cover member 10. The water having entered the space S may be occasionally changed in terms of its flow direction by the flat plate 11 to flow toward the opening 17. The water is, however, discharged from the opening 17 so as to be away from the plurality of electrical substrates 8. Even when water is discharged from the opening 17, the water is inhibited from wetting the electrical substrates 8.

<Second embodiment>

[0078] The second embodiment will be described next.

In the second embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0079] As depicted in FIG. 9, the opening 17 according to the second embodiment is positioned between the blow-out port 22 and the plurality of holes 30 in the anteroposterior direction. In this case, the first end 11A corresponds to the front end of the flat plate 11 and the second end 11B corresponds to the rear end of the flat plate 11. The first direction is accordingly a direction from the front side to the rear side.

[0080] The second embodiment can exert functional effects similar to those according to the first embodiment.

<Third embodiment>

[0081] The third embodiment will be described next. In the third embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0082] As depicted in FIG. 10, according to the third embodiment, the distance L1 between the holes 30 and the end surface of the second end 11B in the first direction is longer than the distance L2 between the first end 11A and the holes 30 in the first direction.

[0083] The third embodiment can exert functional effects similar to those according to the first embodiment.

<Fourth embodiment>

[0084] The fourth embodiment will be described next. In the fourth embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0085] As depicted in FIG. 11, according to the fourth embodiment, the distance L3 between the holes 30 and the first electrical substrate 80 in the first direction is longer than the distance L4 between the opening 17 and the first electrical substrate 80 in the first direction.

[0086] In this case, the support plate 12 is disposed between the holes 30 and the first end 11A in the anteroposterior direction, and is connected to a portion between the first end 11A and the second end 11B of the flat plate 11. A distance between the end surface of the first end 11A and the support plate 12 in the first direction is shorter than a distance between the support plate 12 and the holes 30 in the first direction.

[0087] The fourth embodiment can exert functional effects similar to those according to the first embodiment.

<Fifth embodiment>

[0088] The fifth embodiment will be described next. In the fifth embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0089] The support plate 12 according to the first embodiment extends perpendicularly to the first direction and is coupled to the flat plate 11, though the support plate 12 is not limited thereto in terms of its configuration. Alternatively, the support plate 12 may extend to cross the first direction and may not be coupled to the flat plate 11.

[0090] As depicted in FIG. 12, the support plate 12 according to the fifth embodiment is not coupled to the flat plate 11 but is coupled to the partition plate 3. In this case, the support plate 12 is provided separately from the flat plate 11 and is positioned away from the flat plate 11 in the first direction.

[0091] The fifth embodiment can exert functional effects similar to those according to the first embodiment.

<Sixth embodiment>

[0092] The sixth embodiment will be described next. In the sixth embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0093] As depicted in FIG. 13, according to the sixth embodiment, the body portion 31A has a front end 31E exemplifying the fourth end and positioned away from the partition plate 3, and has a rear end connected to the coupling portion 31B.

[0094] In this case, the first end of the coupling portion 31B is connected to the rear end of the body portion 31A. The second end 31D of the coupling portion 31B is connected to the partition plate 3. The second end 31D of the coupling portion 31B is thus farther from the blow-out port 22 than the front end 31E of the body portion 31A.

[0095] The sixth embodiment can exert functional effects similar to those according to the first embodiment.

<Seventh embodiment>

[0096] The seventh embodiment will be described next. In the seventh embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0097] As depicted in FIG. 14, the cover plate 31 according to the seventh embodiment collectively covers the plurality of holes 30. In this case, the body portion 31A faces the plurality of holes 30 to be spaced apart therefrom.

[0098] The seventh embodiment can exert functional effects similar to those according to the first embodiment.

<Eighth embodiment>

[0099] The eighth embodiment will be described next. In the eighth embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0100] As depicted in FIG. 15, the second wall 15 according to the eighth embodiment is shorter in size in the first direction than the flat plate 11. The first end 15A of

the second wall 15 is away from the first end 11A of the flat plate 11 in the first direction.

[0101] In this case, the opening 17 is zoned by the first end 11A of the flat plate 11, the first end 15A of the second wall 15, the upper end of the flat plate 11 positioned between the first end 11A and the first end 15A, the first end 16A of the third wall 16, and the partition plate 3.

[0102] The eighth embodiment can exert functional effects similar to those according to the first embodiment. Similarly to the second wall 15, the third wall 16 may be shorter in size in the first direction than the flat plate 11.

<Ninth embodiment>

[0103] The ninth embodiment will be described next. In the ninth embodiment, members same as those according to the first embodiment will be denoted by same reference signs and will not be described repeatedly.

[0104] As depicted in FIG. 16, the opening 17 according to the ninth embodiment is opened upward.

[0105] In this case, the first end 11A corresponds to the upper end of the flat plate 11 and the second end 11B corresponds to the lower end of the flat plate 11. The first direction is accordingly a direction from an upper side to a lower side. The first end 11A is slanted downward as being gradually away from the first electrical substrate 80. The first electrical substrate 80 is disposed below the opening 17.

[0106] The ninth embodiment can exert functional effects similar to those according to the first embodiment.

<Modification examples>

[0107] The outdoor unit 1 according to the above first embodiment includes the electrical component 9 supported by the support plate 12. The outdoor unit 1 may alternatively not include the electrical component 9.

[0108] The outdoor unit 1 according to the above first embodiment includes the second electrical substrate 81 supported by the flat plate 11. The outdoor unit 1 may alternatively not include the second electrical substrate 81.

[0109] The outdoor unit 1 according to the above first embodiment includes the cover plates 31 provided at the partition plate 3. The outdoor unit 1 may alternatively not include the cover plate 31.

[0110] Each of the cover plates 31 according to the above first embodiment includes the body portion 31A extending in the anteroposterior direction and the coupling portion 31B extending in the width direction. However, the cover plates 31 are not limited in terms of their shape. The coupling portion 31B may alternatively have a curved shape or the like.

[0111] Any of matters described in the first to ninth embodiments and the modification examples can be combined with each other.

[0112] The embodiments and the modification examples have been described above. Various modifications to modes and details will be apparently available without departing from the object and the scope of the patent claims.

REFERENCE SIGNS LIST

[0113]

1:	Outdoor unit
2:	Case
3:	Partition plate
7:	Fan
8:	Electrical substrate
9:	Electrical component
11:	Flat plate
11A:	First end
11B:	Second end
12:	Support plate
13:	Frame wall
17:	Opening
20:	Blast chamber
21:	Machine chamber
22:	Blow-out port
30:	Hole
31:	Cover plate
31A:	Body portion
31C:	Rear end of body portion
31D:	Second end of coupling portion
80:	First electrical substrate
81:	Second electrical substrate

CITATION LIST

PATENT LITERATURE

[0114] Patent Literature 1: JP 2012-145287 A

Claims

1. An outdoor unit (1) of a refrigeration apparatus, the outdoor unit comprising:

a case (2);
a fan (7) accommodated in the case (2);
an electrical substrate (8) accommodated in the case (2);
a partition plate (3) partitioning an internal space of the case (2) into a blast chamber (20) provided therein with the fan (7) and a machine chamber (21) provided therein with the electrical substrate (8), and having a hole (30) communicating with the blast chamber (20) and the machine chamber (21);
a first plate (11) disposed in the machine chamber (21) to be spaced apart from the partition plate (3) and cover the hole (30); and
a wall (13) positioned between the first plate (11)

and the partition plate (3), the wall, the first plate (11), and the partition plate (3) zoning an opening (17); wherein
the first plate (11) has a first end (11A) zoning at least part of the opening (17), and a second end (11B) opposing the first end (11A), and
the electrical substrate (8) is away from the opening (17) in a first direction from the first end (11A) to the second end (11B).

2. The outdoor unit (1) of the refrigeration apparatus according to claim 1, wherein

the case (2) has a blow-out port (22) facing the fan (7), and
the hole (30) is positioned between the blow-out port (22) and the opening (17).

3. The outdoor unit (1) of the refrigeration apparatus according to claim 1 or 2, wherein
a distance (L1) between the hole (30) and the second end (11B) in the first direction is shorter than a distance (L2) between the first end (11A) and the hole (30) in the first direction.

4. The outdoor unit (1) of the refrigeration apparatus according to any one of claims 1 to 3, wherein
a distance (L3) between the hole (30) and the electrical substrate (80) in the first direction is shorter than a distance (L4) between the opening (17) and the electrical substrate (80) in the first direction.

5. The outdoor unit (1) of the refrigeration apparatus according to any one of claims 1 to 4, the outdoor unit further comprising
a second plate (12) coupled to the first plate (11) and supporting the electrical substrate (80).

6. The outdoor unit (1) of the refrigeration apparatus according to claim 5, the outdoor unit further comprising
an electrical component (9) supported by the second plate (12).

7. The outdoor unit (1) of the refrigeration apparatus according to any one of claims 1 to 6, the outdoor unit further comprising
a second electrical substrate (81) supported by the first plate (11).

8. The outdoor unit (1) of the refrigeration apparatus according to any one of claims 1 to 7, the outdoor unit further comprising
a third plate (31) provided in the blast chamber (20) to have a portion (31A) spaced apart from and facing the hole (30).

9. The outdoor unit (1) of the refrigeration apparatus according to claim 8, wherein

the third plate (31) has a third end (31D) connected to the partition plate (3), and a fourth end (31C) opposing the third end (31D), and
the fourth end (31C) is away from the partition plate (3).

10. The outdoor unit (1) of the refrigeration apparatus according to claim 9, wherein

the case (2) has a blow-out port (22) facing the fan (7), and
the third end (31D) is closer to the blow-out port (22) than the fourth end (31C).

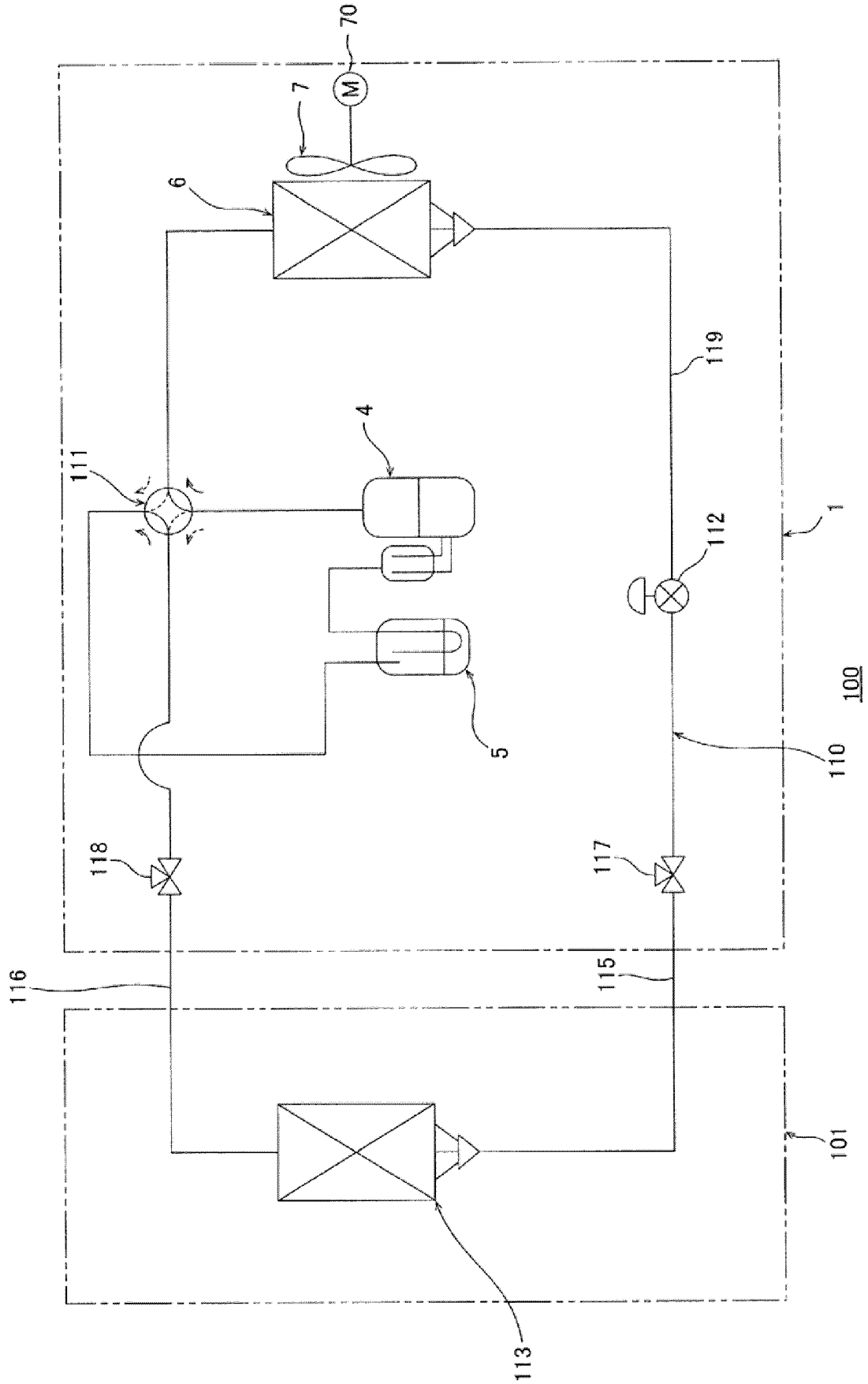


FIG. 1

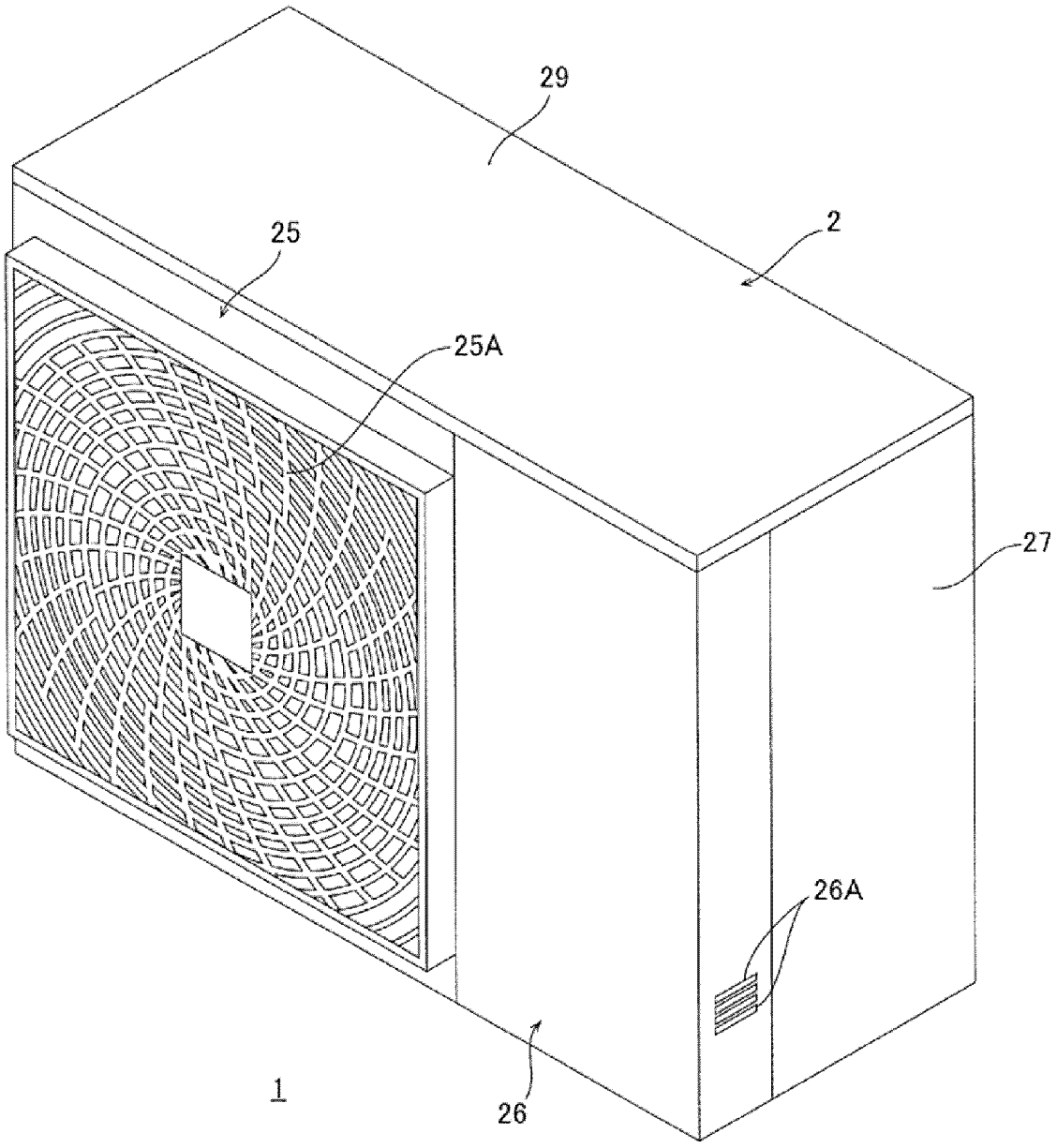
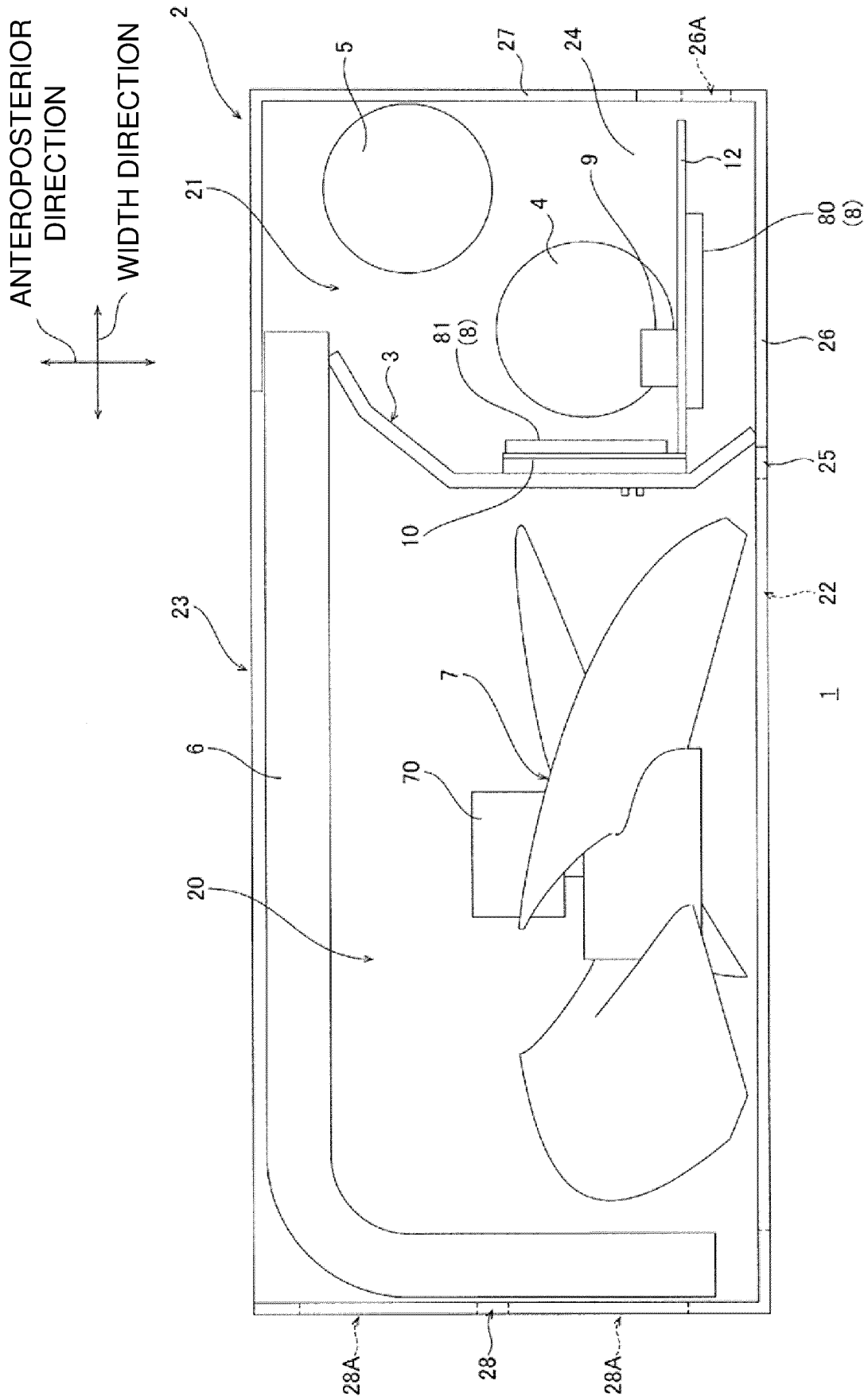


FIG. 2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27
24
26A
21
4
9
12
80
(8)
81
(8)
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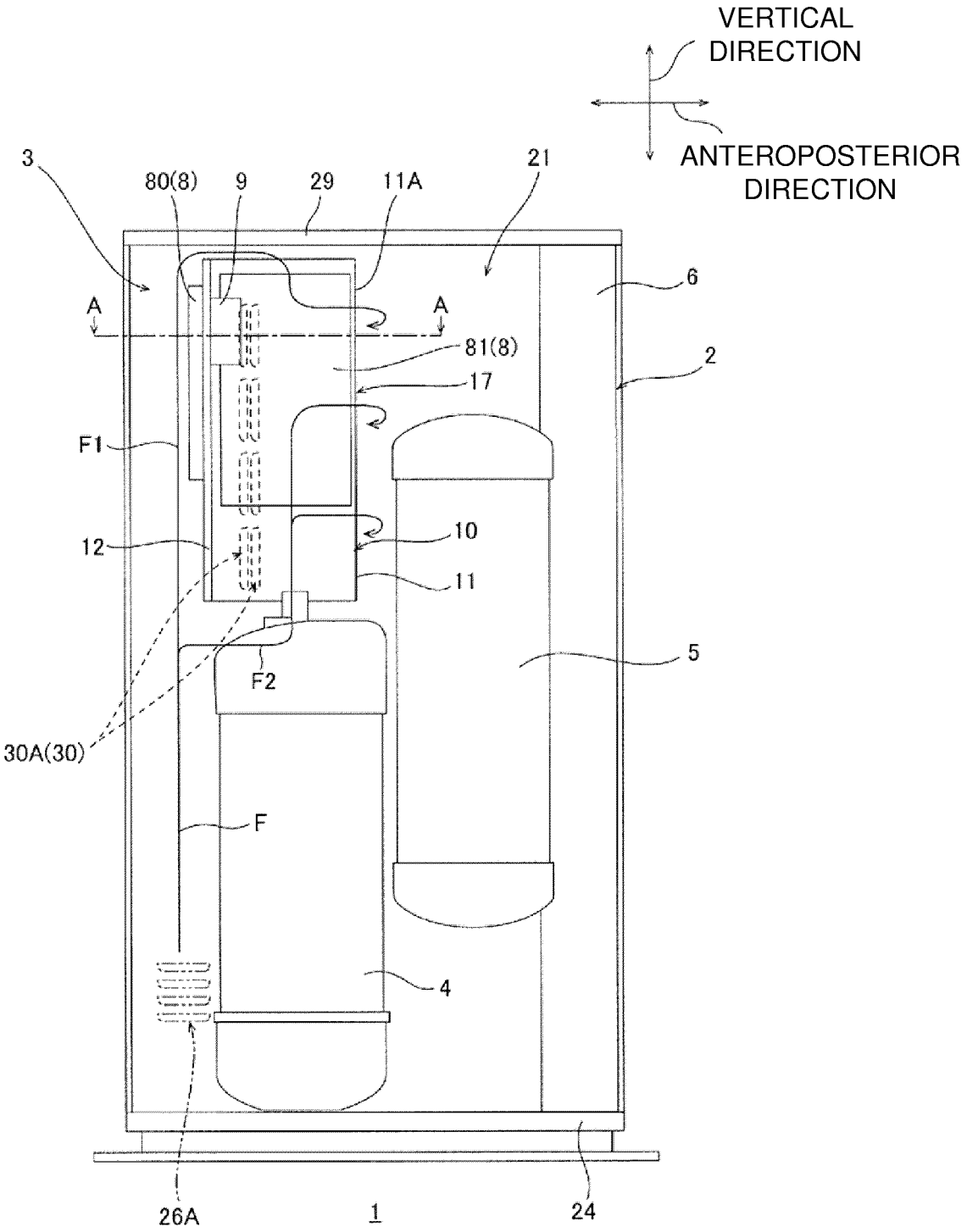
26
10
25
23
22
7
1
6
70
20
28A
28
28A

FIG. 3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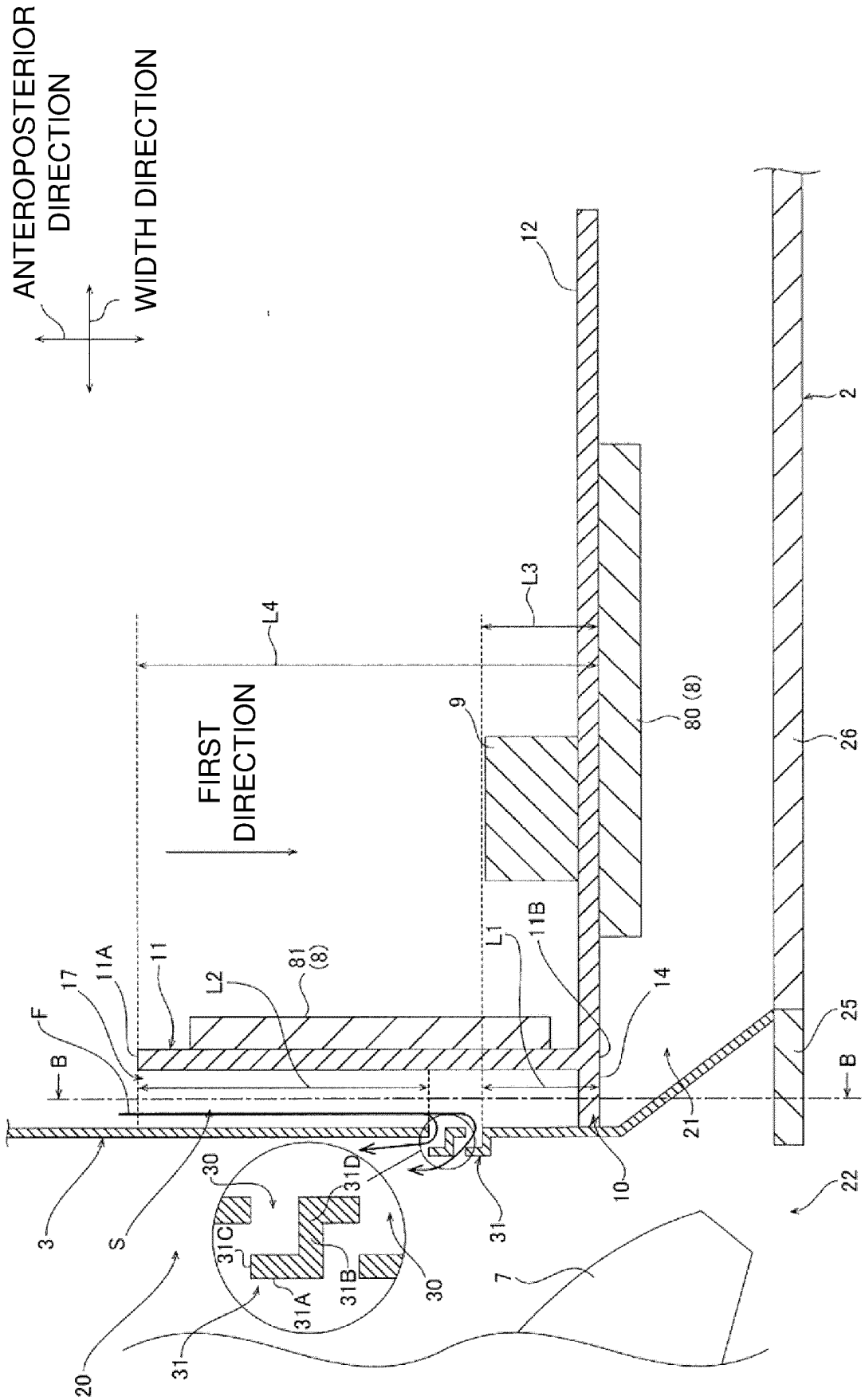
9
29
11A
21
6
A
A
81(8)
2
17
F1
10
12
11
5
F2
30A(30)
F
4
26A
1
24

FIG. 4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FIRST DIRECTION
L1
L2
L3
L4
B
B
F
S
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3
7
9
10
11
11A
11B
12
14
17
20
21
22
25
26
30
31
31A
31B
31C
31D
80 (8)
81 (8)

FIG. 5

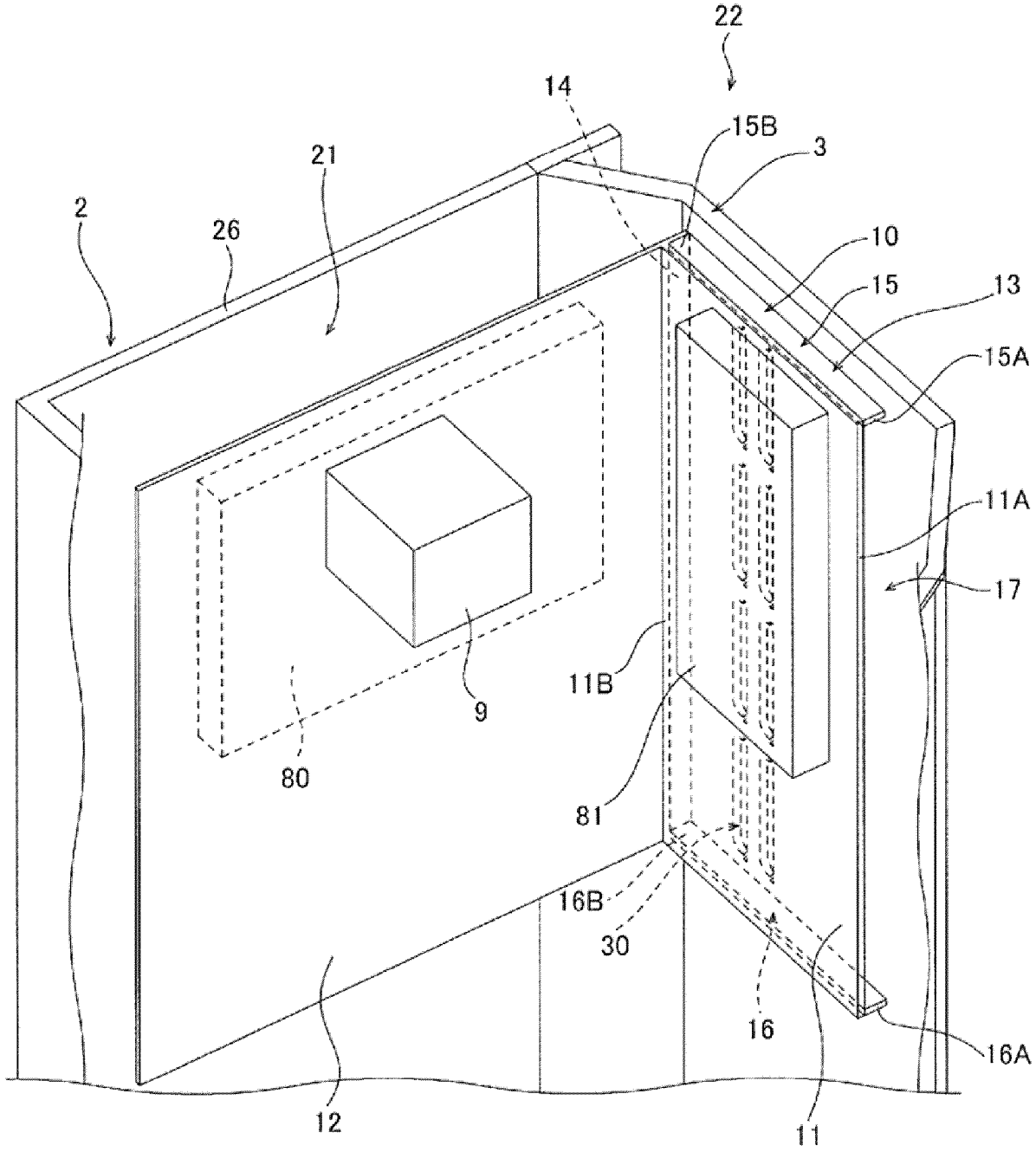


FIG. 6

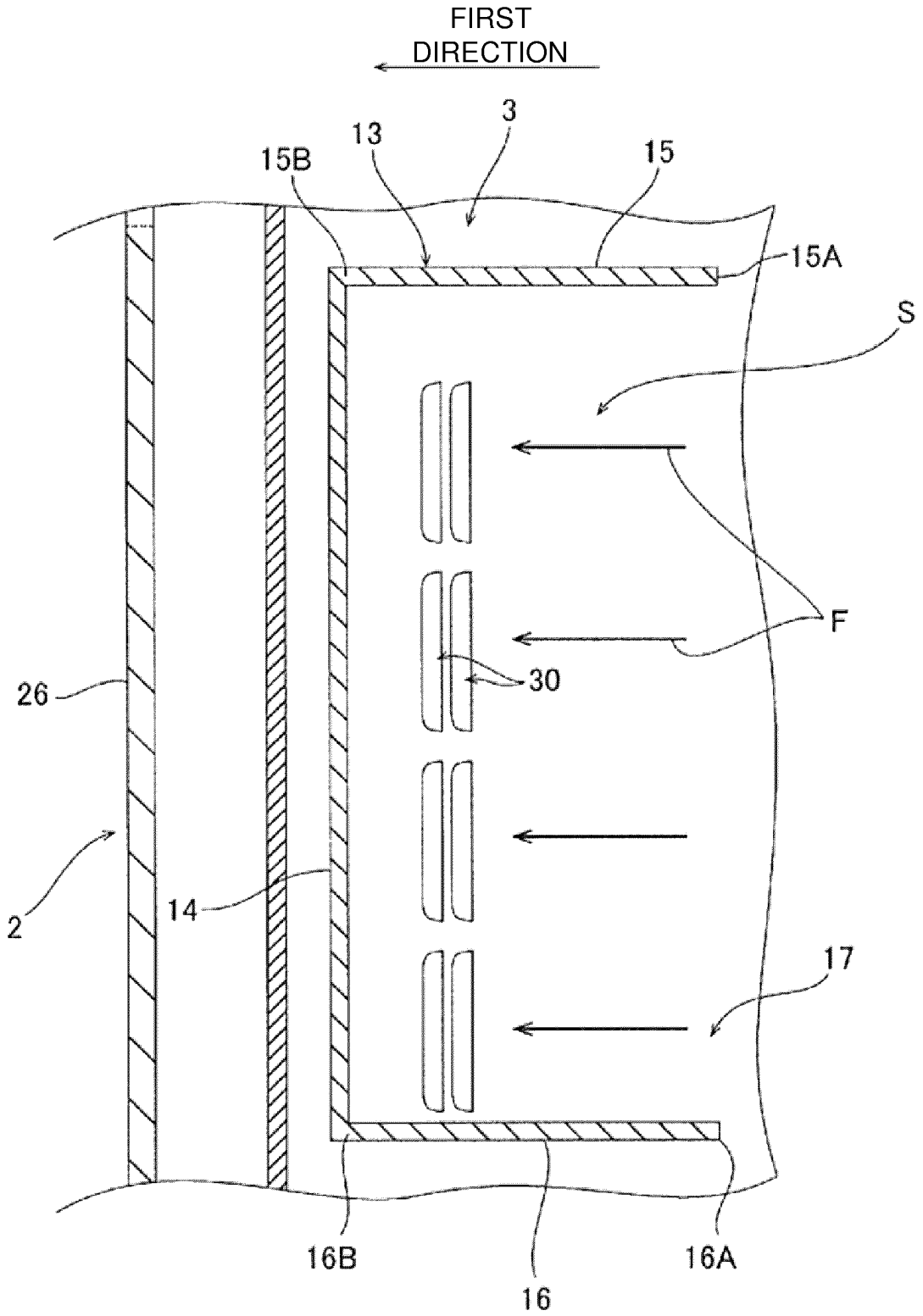
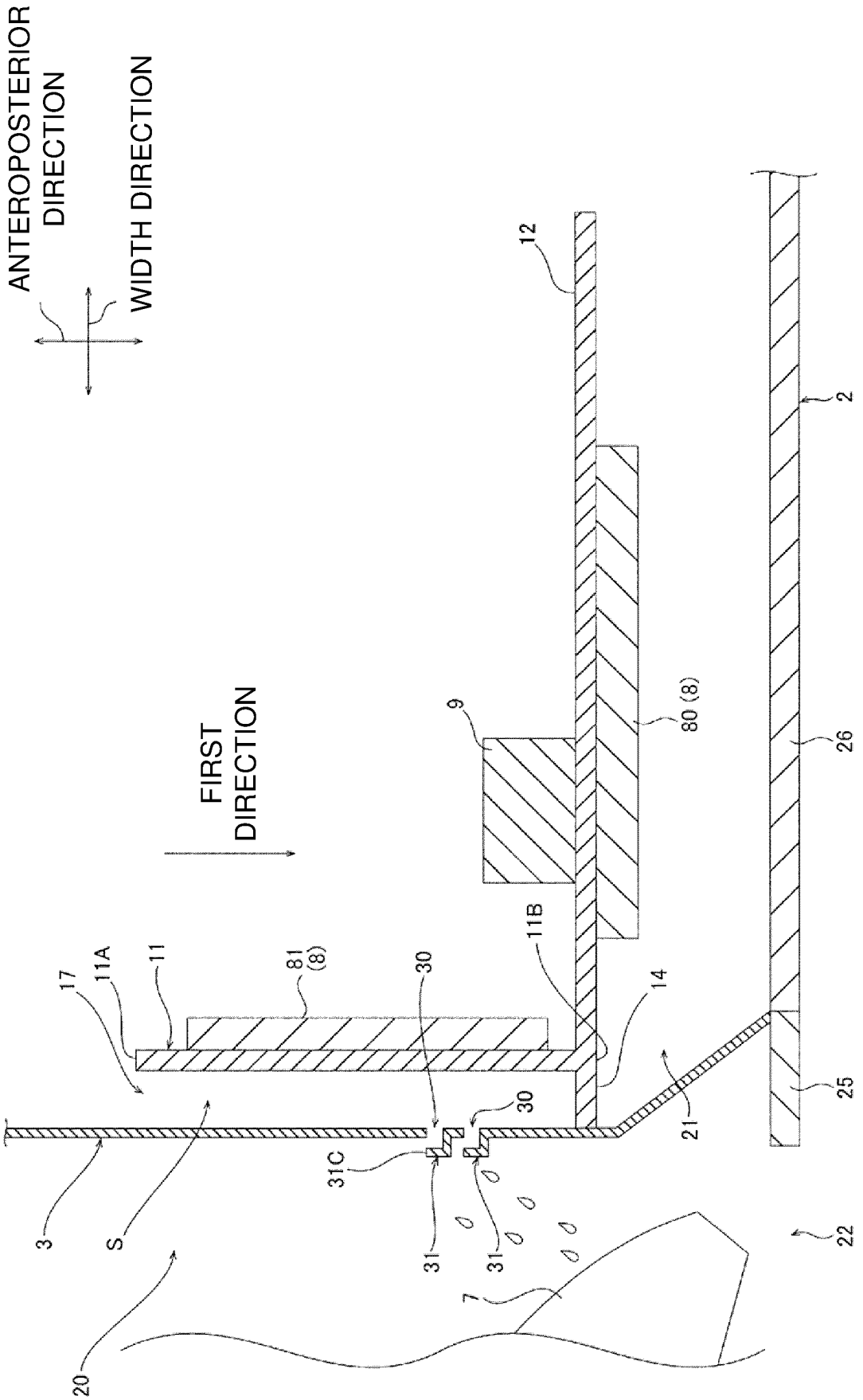


FIG. 7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11
81 (8)
30
30
21
25
31C
3
S
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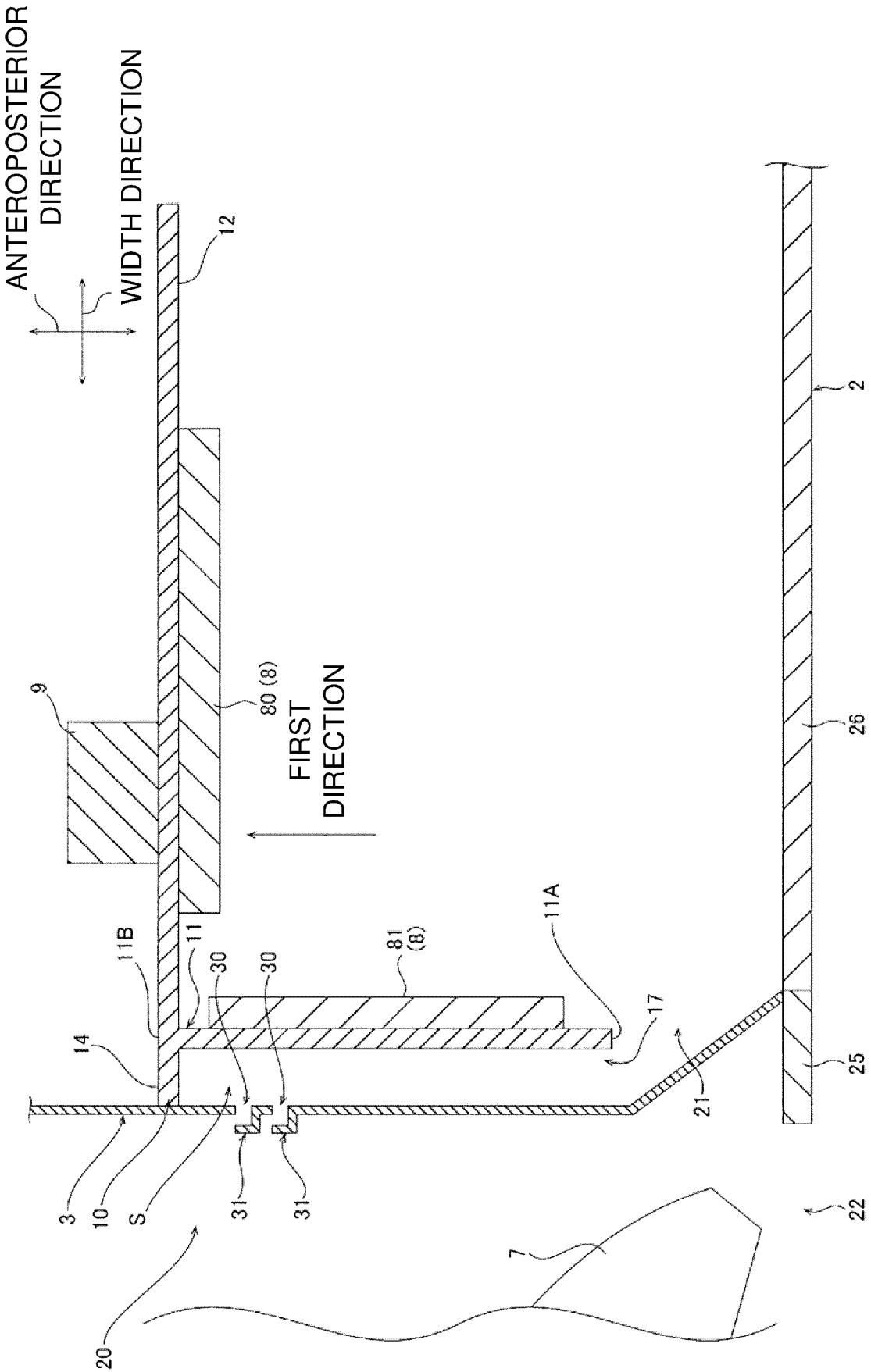
31
7
22
20

FIG. 8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80 (8)
FIRST DIRECTION
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30
81 (8)
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31
31
22
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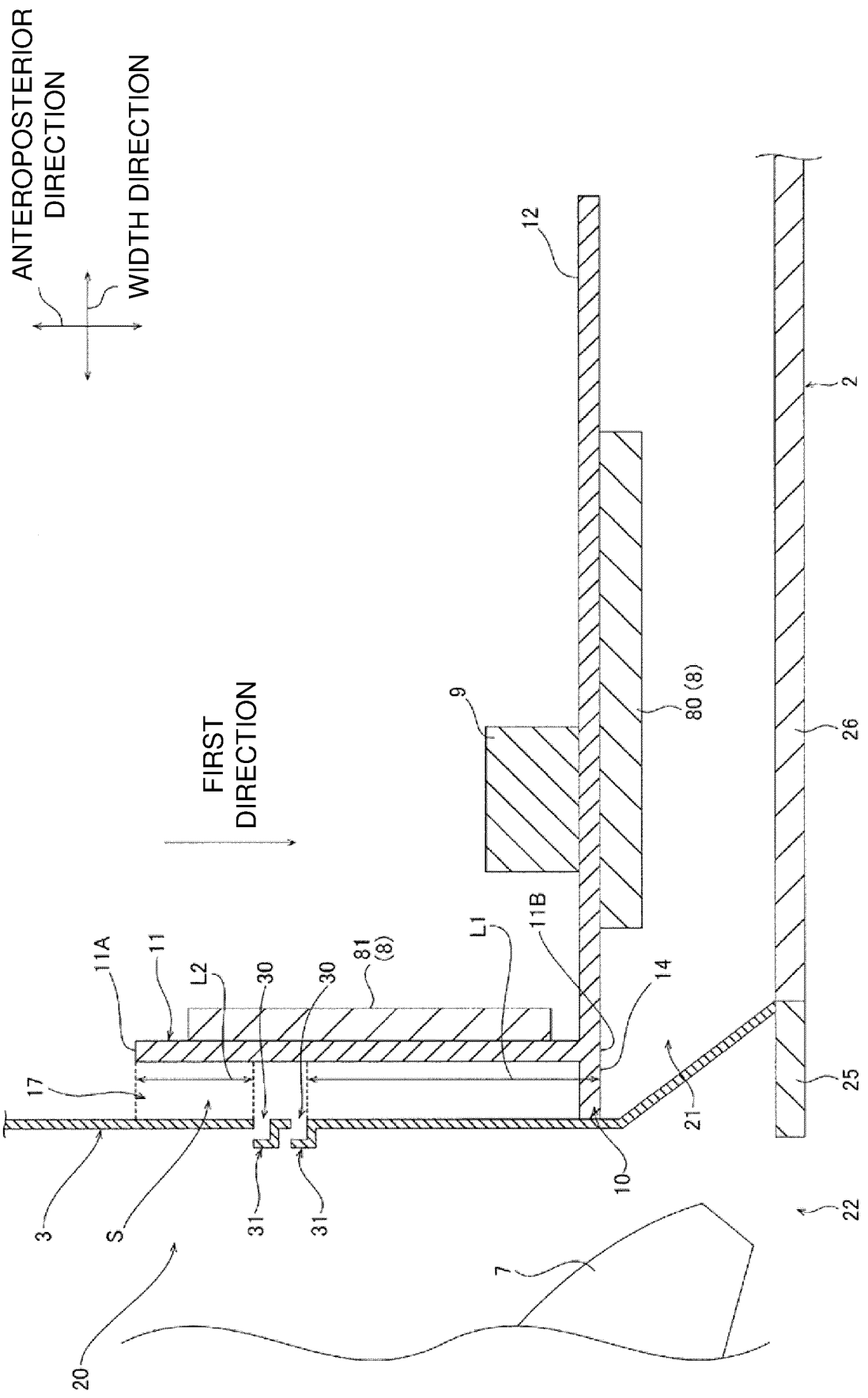
FIG. 9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L1
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3
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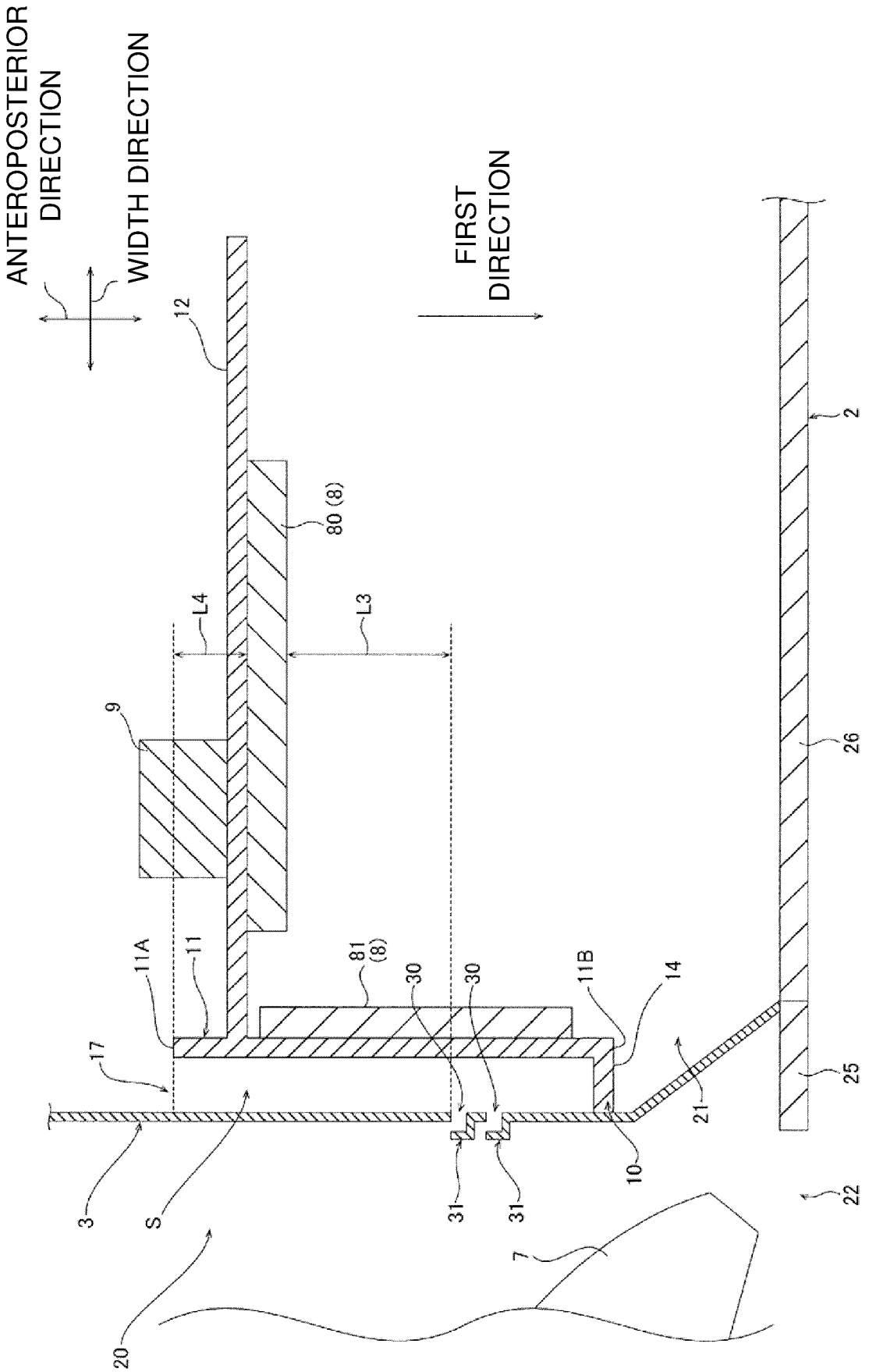
22
7
20

FIG. 10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L4
L3
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11B
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3
S
31
31
7
20
22

FIG. 11

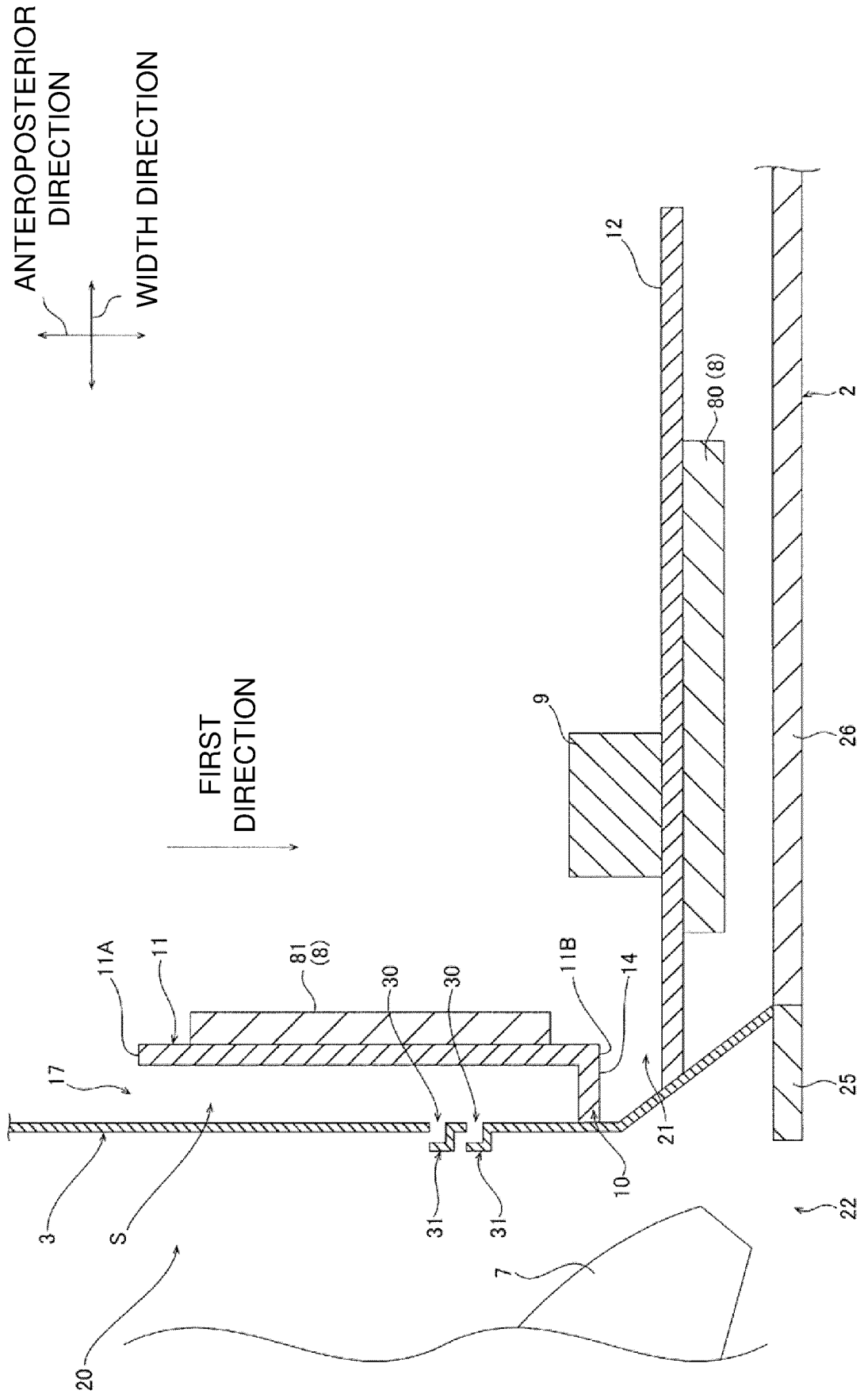
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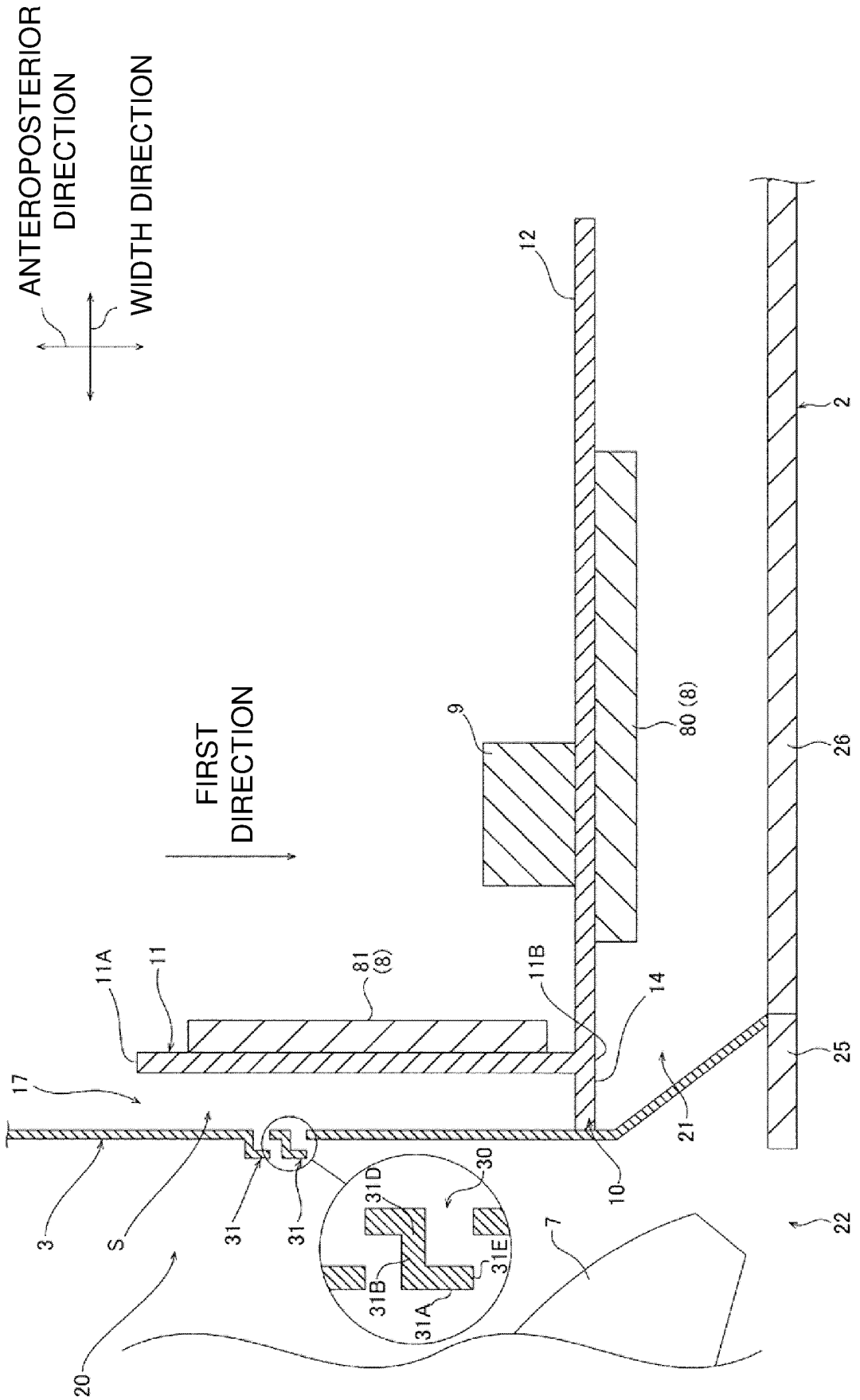
FIG. 12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11A
11
81 (8)
11B
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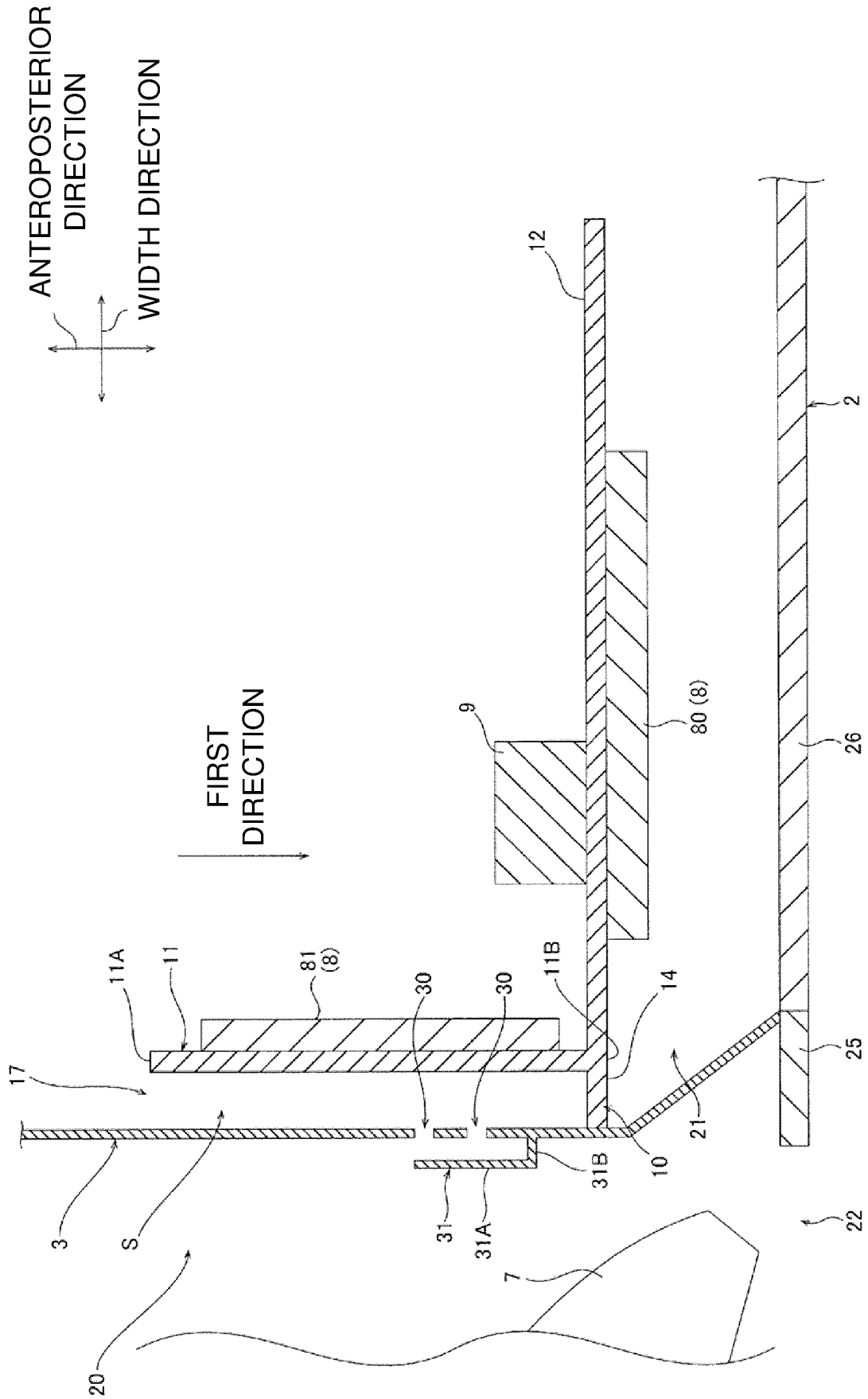
21
3
S
31
31
31D
30
10
22
7
31E
31B
31A
20

FIG. 13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S
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31A
22
7
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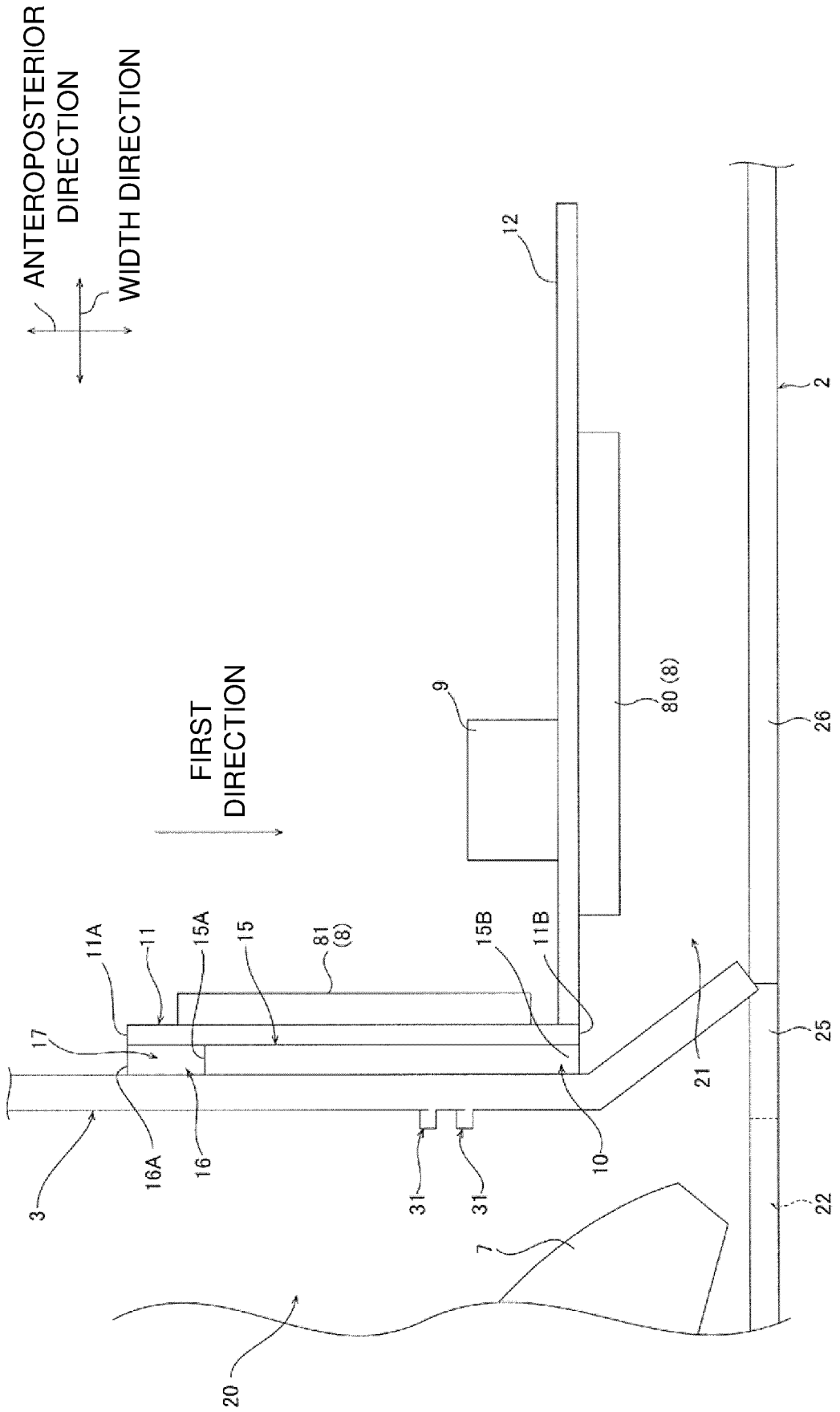
FIG. 14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15A
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15B
11B
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16A
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22
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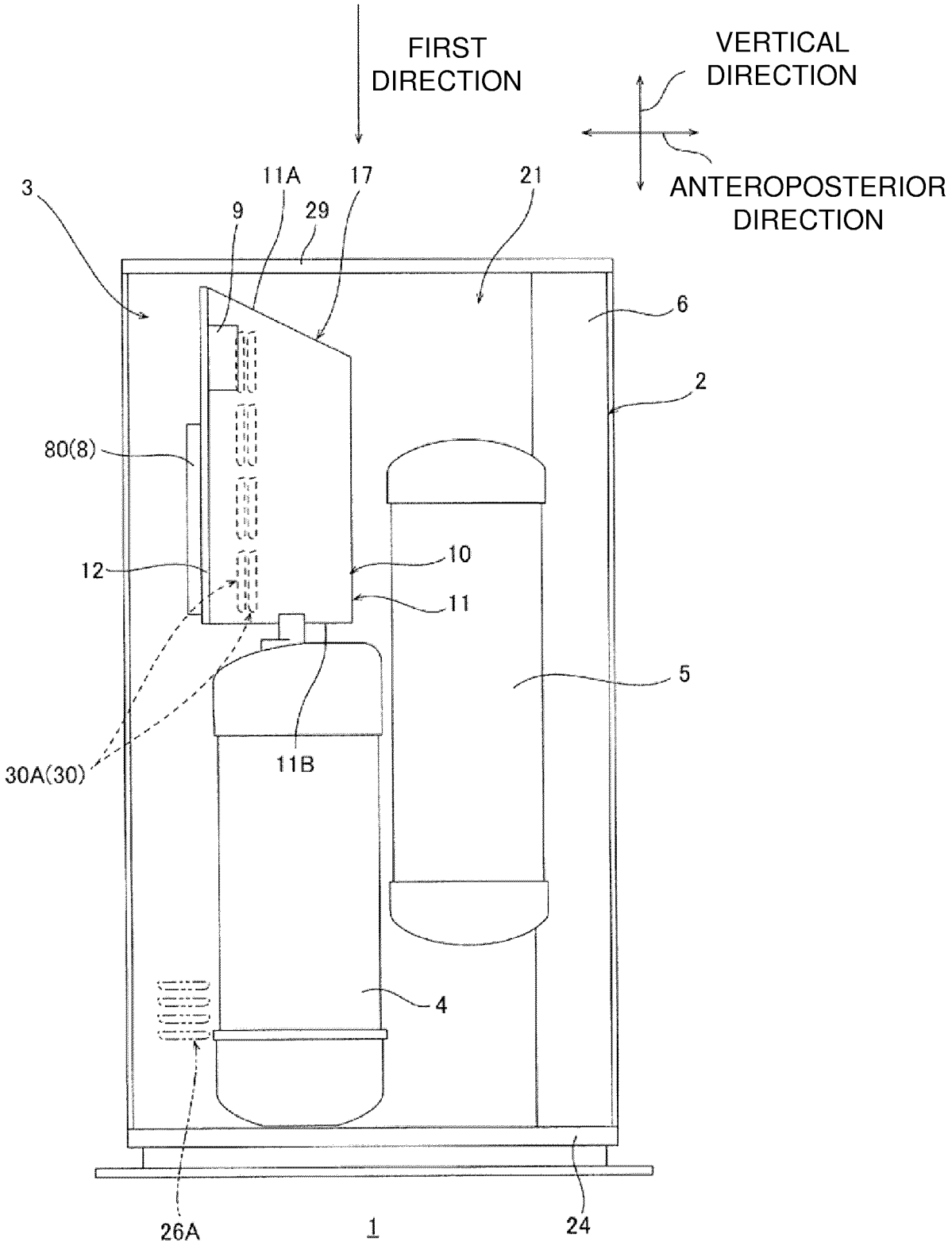
FIG. 15


FIRST
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DIRECTION
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DIRECTION
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21
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10
11
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30A(30)
11B
4
26A
1
24

FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/035578

A. CLASSIFICATION OF SUBJECT MATTER
F24F 1/24(2011.01)i; F24F 1/56(2011.01)i
FI: F24F1/24; F24F1/56
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)
F24F1/24; F24F1/56

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

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

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	JP 2015-55466 A (FUJITSU GENERAL LTD.) 23 March 2015 (2015-03-23) paragraphs [0001]-[0061], fig. 1-11	1, 4, 8-9 7 2-3, 5-6, 10
Y	JP 2012-145287 A (MITSUBISHI ELECTRIC CORP.) 02 August 2012 (2012-08-02) paragraphs [0012]-[0134], fig. 1-22	7
A	JP 9-292142 A (MITSUBISHI HEAVY INDUSTRIES, LTD.) 11 November 1997 (1997-11-11) entire text, all drawings	1-10
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 44517/1987 (Laid-open No. 153034/1988) (MITSUBISHI ELECTRIC CORP.) 07 October 1988 (1988-10-07) entire text, all drawings	1-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search	Date of mailing of the international search report
04 November 2020 (04.11.2020)	17 November 2020 (17.11.2020)

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2009-97743 A (PANASONIC CORP.) 07 May 2009 (2009-05-07) entire text, all drawings	1-10
A	JP 3-152324 A (MITSUBISHI ELECTRIC CORP.) 28 June 1991 (1991-06-28) entire text, all drawings	1-10

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/035578

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2015-55466 A	23 Mar. 2015	(Family: none)	
JP 2012-145287 A	02 Aug. 2012	(Family: none)	
JP 9-292142 A	11 Nov. 1997	(Family: none)	
JP 63-153034 U1	07 Oct. 1988	(Family: none)	
JP 2009-97743 A	07 May 2009	(Family: none)	
JP 3-152324 A	28 Jun. 1991	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2012145287 A **[0003] [0114]**