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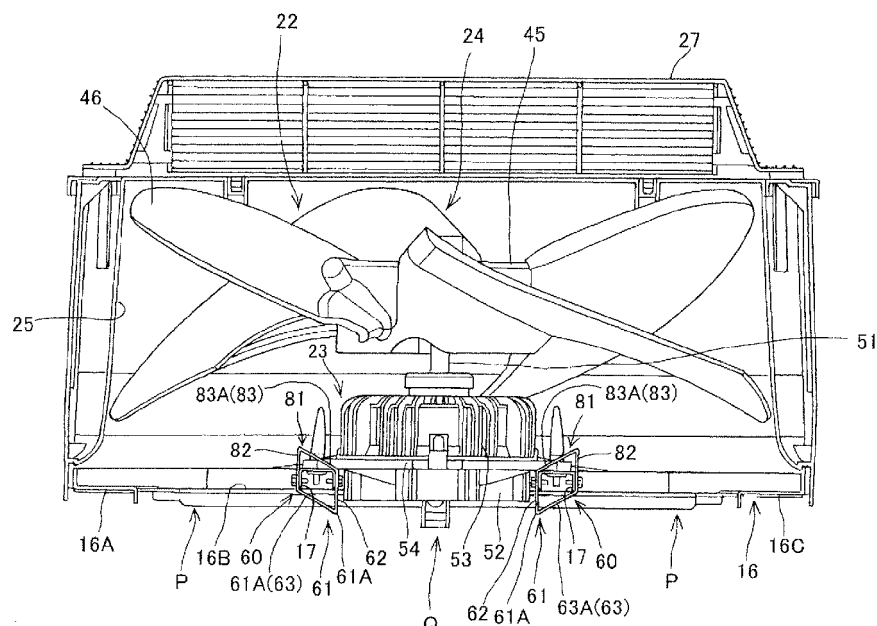
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(54) Outdoor unit for air conditioner

(57) An outdoor unit for an air conditioner in which a pair of motor support tables are disposed at an upper portion of a housing, and an outdoor fan having a fan motor is supported on the pair of motor support tables, and air sucked from a side of the housing through a heat exchanger in the housing by the outdoor fan is upwardly blown out, characterized in that a rectifying unit for guid-

ing airflow passing through the heat exchanger and reaching a lower surface portion of each of the pair of motor support tables to an outer radial direction of the outdoor fan is provided at at least one of lower and upper sides of each of the motor support tables, wherein the rectifying unit is configured to be uniformly upwardly sloped from an inside of the motor support table to an outside of the motor support table.

FIG.4



EP 2 535 660 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an outdoor unit for an air conditioner configured so that air sucked from a lateral side through a heat exchanger by an outdoor fan is upwards blown out.

2. Description of the Related Art

[0002] There is known an outdoor unit for an air conditioner that has an air blower at the upper portion of a housing and air sucked from a side surface of the housing is upwards blown out by an air blower (for example, see Japanese Patent No. 3,985,840). In an outdoor unit disclosed in this patent document, a motor of the air blower is supported from the lower side so as to be mounted on a motor support table configured to be U-shaped in section. The motor support table is disposed so that an U-shaped opening thereof faces the motor side, and a rectifying member for blocking the U-shaped opening is provided, thereby suppressing occurrence of eddy of airflow. Furthermore, the motor support table is provided with a triangular rectifying member on a surface of the motor support table which is located at the upstream side of air flow passing through the surrounding area of the motor support table so that the triangular rectifying member projects to the upstream side of the airflow. The airflow is rectified by the triangular rectifying member to reduce the ventilation resistance (resistance to the airflow).

[0003] In the outdoor unit described above, the apex of the triangular rectifying member which faces the upstream side of the airflow is located substantially at the center portion in the width direction of the motor support table, whereby the airflow is substantially equally and straight rectified to the downstream side of the airflow at both the sides of the apex portion of the rectifying member. However, in an outdoor unit in which flow of air sucked from the side surface is bent and then the air is blown out from the upper side, it is expected that the flow of the air is complicated and thus the resistance to airflow cannot be so greatly reduced by merely making the air flow substantially equally and straight upwards (to the downstream side of the airflow) at both the right and left sides of the apex portion of the rectifying member.

[0004] Furthermore, there is known an outdoor unit for an air conditioner in which a heat exchanger disposed on the bottom plate of a housing to form at least one side surface of the housing and an axial-flow type air blower disposed at the upper side of the heat exchanger are provided so that air sucked through the heat exchanger is upwardly blown out by the air blower. In this type of outdoor unit, the heat exchanger is designed to have a substantially U-shaped section, and disposed on the bottom plate along three surfaces of the back surface and

both the side surfaces of the housing to save the installation area (space) with securing a heat exchange area (see JP-A-2004-156800, for example).

[0005] In such an outdoor unit, the outer diameter of a propeller fan (bladed wheel) of an air blower is increased to increase the airflow amount (air blowing amount) with saving the space of the housing. In this case, in connection with the increase of the outer diameter of the propeller fan, the inner diameter of the bell mouth disposed around the propeller fan also increases, so that the inner peripheral surface of the bell mouth is located at a more exterior position as compared with the inner surface of the heat exchanger. Therefore, a step is formed between the inner surface of the heat exchanger and the inner peripheral surface of the bell mouth. Accordingly, air trap (retention) occurs at this step, so that airflow is deteriorated and ventilation resistance (resistance to airflow) increases. Therefore, an outdoor unit for an air conditioner that can reduce the ventilation resistance with increasing the airflow amount has been required.

SUMMARY OF THE INVENTION

[0006] The present invention has been implemented in view of the foregoing situation, and has an object to provide an outdoor unit for an air conditioner that can reduce resistance to airflow.

[0007] In order to attain the above object, according to a first aspect of the present invention, an outdoor unit for an air conditioner in which a pair of motor support tables are disposed at an upper portion of a housing, and an outdoor fan having a fan motor is supported on the pair of motor support tables, and air sucked from a side of the housing through a heat exchanger in the housing by the outdoor fan is upwardly blown out, is **characterized in that** a rectifying unit for guiding airflow passing through the heat exchanger and reaching a lower surface portion of each of the pair of motor support tables to an outer radial direction of the outdoor fan is provided at at least one of lower and upper sides of each of the motor support tables, wherein the rectifying unit is configured to be uniformly upwardly sloped from an inside of the motor support table to an outside of the motor support table.

[0008] In the above outdoor unit for the air conditioner, the rectifying unit may have an upstream rectifying member provided at the lower side of each of the motor support tables.

[0009] In the above outdoor unit for the air conditioner, each of the motor support tables may be configured to have a substantially U-shaped section and disposed so that an opening of the U-shaped motor support table faces the lower side, and the upstream rectifying member may be provided at the lower side of the motor support table so as to cover the opening.

[0010] In the above outdoor unit for the air conditioner, the upstream rectifying member may be configured to have a downwardly tapered and substantially triangular shape in section, and an apex of the triangular shape

may be located to be displaced to the fan motor side in the width direction of the motor support table.

[0011] In the above outdoor unit for the air conditioner, a lower end portion of the upstream rectifying member may project inwardly to a motor support side as compared with an inner surface of the motor support table.

[0012] In the above outdoor unit for the air conditioner, the upstream rectifying member may comprise a center side rectifying member provided in the neighborhood of the fan motor and a side rectifying member adjacent to the center side rectifying member, and a lower end portion of the center side rectifying member may project inwardly to a motor support side as compared with an inner surface of the motor support table and may be located to be nearer to the fan motor than a lower end portion of the side rectifying member.

[0013] In the above outdoor unit for the air conditioner, the rectifying unit may further have a downstream rectifying member provided at the upper side of each of the motor support tables, and the downstream rectifying member may be configured to guide airflow passing through a first space between the pair of motor support tables to the outer radial direction of the outdoor fan in accordance with airflow passing through second spaces at the outside of the pair of motor support tables.

[0014] In the above outdoor unit for the air conditioner, the rectifying unit may be configured to have a rhombic shape in section by the upstream rectifying member and the downstream rectifying member, and an upper end portion of the rhombic rectifying unit may be directed upwardly and outwardly to a downstream side of the airflow.

[0015] In the above outdoor unit for the air conditioner, the rectifying unit may have a downstream rectifying member provided at the upper side of each of the motor support tables, and the downstream rectifying member may be configured to guide airflow passing through a first space between the pair of motor support tables to the outer radial direction of the outdoor fan in accordance with airflow passing through second spaces at the outside of the pair of motor support tables.

[0016] In the above outdoor unit for the air conditioner, the downstream rectifying member may have a vertical plate portion extending upwardly along an outer surface of the motor support table, and a slope plate portion extending upwardly and outwardly from the inner surface of the motor support table to an upper end of the vertical plate portion.

[0017] In the above outdoor unit for the air conditioner, the downstream rectifying member may be designed to have an upwardly tapered and substantially triangular shape in section, and an apex portion of the upper end of the downstream rectifying member may be located to be displaced to an outer surface side of the housing in the width direction of the motor support table.

[0018] In the above outdoor unit for the air conditioner, the fan motor may be fixed to the motor support table through a stay disposed on the upper surface of the motor support table, and the downstream rectifying member

may be disposed integrally over both the sides of the stay in the longitudinal direction of the motor support table and has a cut-out portion through which the stay is upwardly exposed.

[0019] In the above outdoor unit for the air conditioner, the rectifying unit further may have an upstream rectifying member provided at the lower side of each of the motor support tables.

[0020] According to a second aspect of the present invention, an outdoor unit for an air conditioner that may have a heat exchanger disposed on a bottom plate of a housing to form at least one side surface of the housing, an axial-flow type air blower disposed above the heat exchanger and a bell mouth provided around a propeller fan of the air blower, is **characterized in that** the bell mouth is configured so that the inner peripheral surface thereof is outwardly larger in diameter than the inner surface 21A of the heat exchanger, and has airflow deflecting plates which are upwardly sloped from an upper end portion of the inner surface of the heat exchanger to the inner peripheral surface of the bell mouth.

[0021] In the above outdoor unit for the air conditioner according to claim 14, the airflow deflecting plate may be provided at a position lower than a tip portion of the propeller fan.

[0022] In the above outdoor unit for the air conditioner, the heat exchanger may have a back surface portion and both side surface portions disposed along a back surface and both right and left side surfaces of the housing, and may be configured to be substantially U-shaped in section, and the airflow deflecting plates may be provided to the back surface portion and both the side surface portions of the heat exchanger.

[0023] The above outdoor unit for the air conditioner may further comprise a support frame that extends along an upper surface portion of the heat exchanger and supports the pair of motor support tables for supporting the fan motor of the air blower, wherein the airflow deflecting plate is fixed to the support frame.

[0024] According to the present invention, air reaching the whole area of the lower surface portion of the motor support tables can be guided to the outer radial direction of the outdoor fan by the rectifying members, so that the ventilation resistance can be reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025]

Fig. 1 is a longitudinally sectional view showing an air conditioner according to an embodiment of the present invention;

Fig. 2 is a cross-sectional view showing the air conditioner;

Fig. 3 is a perspective view showing a support structure of a fan motor;

Fig. 4 is a cross-sectional view showing an air blower;

Fig. 5 is another cross-sectional view showing the

air blower;

Fig. 6 is a cross-sectional view showing a motor support table to which an upstream side rectifying member and a downstream side rectifying member are secured;

Fig. 7 is a perspective view showing the upstream side rectifying member;

Fig. 8 is a perspective view showing the downstream side rectifying member;

Fig. 9 is a perspective view showing a rectifying unit according to a second embodiment;

Fig. 10 is a perspective view showing a rectifying unit according to a third embodiment;

Fig. 11 is a perspective view showing a rectifying unit according to a fourth embodiment;

Fig. 12 is a cross-sectional view showing the rectifying unit;

Fig. 13 is a cross-sectional view showing a rectifying unit according to a fifth embodiment;

Fig. 14 is a bottom view showing the rectifying unit when the rectifying unit is viewed from the bottom side;

Fig. 15 is a side view showing an outdoor unit according to a six embodiment when the outdoor unit is viewed from the right side;

Fig. 16 is a top view showing an internal construction of the outdoor unit;

Fig. 17 is a perspective view showing a support structure of a fan motor;

Fig. 18 is a cross-sectional view showing an outdoor fan and a bell mouth;

Fig. 19 is a bottom view showing the arrangement relation between a rectifying plate and a support frame;

Fig. 20 is a perspective view showing a bell mouth and an airflow deflecting plate; and

Fig. 21 is a cross-sectional view showing the bell mouth and the air] flow deflecting plate.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0026] Embodiments according to the present invention will be described with reference to the drawings.

[First Embodiment]

[0027] An air conditioner according to an air conditioner according to a first embodiment of the present invention is constructed by an outdoor unit 10 and an indoor unit (not shown), and refrigerant is made to flow through a refrigerant circuit containing respective parts connected through a refrigerant pipe to perform cooling operation and heating operation. The outdoor unit 10 is disposed outdoors. Under cooling operation, refrigerant in the refrigerant circuit is heat-exchanged with outdoor air to be condensed, so that heat is irradiated to the outdoor air. Under heating operation, the refrigerant is heat-exchanged with outdoor air to be vaporized, so that heat is

taken from the outdoor air. The up-and-down direction and right and left direction described below are defined as directions when the outdoor unit 10 is viewed from the front surface side thereof under the state that the outdoor unit 10 is installed.

[0028] Fig. 1 is a side cross-sectional view of the outdoor unit 10, and Fig. 2 is a top view showing the internal construction of the outdoor unit 10. The outdoor unit 10 has a unit case (housing) having a substantially rectangular parallelepiped box-like shape, and the unit case 11 has a bottom plate 12, support poles 14 extending from the four corners of the bottom plate 12 in the vertical direction and a front panel 15 (Fig. 2).

[0029] As shown in Fig. 2, a heat-exchanger 21 which is bent in a substantially U-shape in top view is disposed on the bottom plate 12, and as shown in Fig. 1, an air blowing device (outdoor fan) 22 is disposed above the heat-exchanger 21. As shown in Fig. 2, the heat-exchanger 21 constitutes the side surface portion of the unit case 11, and it is disposed so as to extend from the left edge portion of the unit case 11 along the left side surface, the back side surface and the right side surface of the unit case 11 as shown in Fig. 2.

[0030] As shown in Fig. 1, the air blowing device 1 has a fan motor (motor) 23 disposed above the heat-exchanger 21, and a propeller fan 24 secured to a motor shaft 51 of the fan motor 23.

[0031] Fig. 3 is a perspective view showing the support structure of the fan motor 23, and shows a state that a rectifying unit 60 (Fig. 4) described later is not secured.

[0032] An upper frame 16 which is formed in a frame-like shape along the U-shape of the heat exchanger 21 is provided on the upper surface of the heat exchanger 21. As shown in Fig. 3, the upper frame 16 has plate-like frame plates 16A, 16B and 16C extending along the upper surfaces of the left, back and right side surfaces of the U-shaped heat exchanger 21, and a joint plate 16D joining the front ends of the frame plates 16A and 16C as shown in Fig. 3. The four corners of the upper frame 16 are joined to respective support poles 14.

[0033] A pair of motor support tables 17 extending substantially in parallel to the frame plates 16A and 16C are bridged between the frame plate 16B and the joint plate 16D, and the fan motors 23 are fixed onto the motor support tables 17.

[0034] The fan motor 23 has a cylindrical body portion 52, and a motor shaft 51 (Fig. 1) that extends upwardly from the body portion 52 and supports the propeller fan 24. The propeller fan 24 has a resin hub 45 and plural blades which are integrally formed at fixed intervals on the outer periphery of the hub 45 so as to have a predetermined blade angle.

[0035] The body portion 52 is provided with heat radiating fins 53 on the outer peripheral portion thereof and a pair of mounting stay pieces 54 extending substantially horizontally along the outer peripheral portion of the body portion 52. The mounting stay pieces 54 are disposed in parallel to each other so as to sandwich the body portion

52 from the outside.

[0036] The fan motor 23 is mounted so that the body portion 52 is disposed between the motor support tables 17 and the mounting stay pieces 54 are mounted the motor support tables 17 and fixedly fastened onto the motor support tables 17 by plural fixing screws 55 penetrating through the mounting stay pieces 54 from the upper side. The fan motor 23 is disposed at an intermediate portion in the longitudinal direction of the motor support tables 17.

[0037] As shown in Fig. 1, a cylindrical bell mouth 25 for guiding air at the suction side of the propeller fan 24 to the air bow-out side is provided around the propeller fan 24, and an air blow-out opening 25A of the bell mouth 25 is covered a fan guard 27 (Fig. 4) for preventing the contact between the propeller fan 24 and a human body or the like. Furthermore, a face panel (not shown) is provided around the bell mouth 25 through a heat insulating material 26 formed of foamed polystyrene or the like. The propeller fan 24 is disposed substantially at the center of the U-shaped heat exchanger 21.

[0038] When the propeller fan 24 is rotated by the fan motor 23, outdoor air is sucked from the surroundings of the outdoor unit 10, more specifically, from the left, back and right side surfaces excluding the front side surface of the unit case 11 into the unit case 11 as indicated by arrows X in Fig. 1, and discharged to the outside through the air blow-out opening 25A of the bell mouth 25 provided to the upper surface portion of the unit case 11. That is, the outdoor unit 10 is configured in such an upward air blowing type that heat-exchanged air is blown out from the upper surface thereof.

[0039] A compressor (not shown), an accumulator 31, an oil separator 32 and a receiver tank 33 which constitute a part of a refrigerant circuit are provided on the bottom plate 12 in the unit case 11, and refrigerant circuit constituent parts such as valve bodies such as a four-way valve (not shown), an expansion valve (not shown), etc. are mounted in the unit case 11 so as to be connected to one another through a pipe. One end side of the pipe of these refrigerant circuit constituent parts is connected to an indoor unit through the heat exchanger 21, and the other end side of the pipe of the refrigerant circuit constituent parts is connected to the indoor unit, thereby constituting the refrigerant circuit in which refrigerant is circulated. The accumulator 31 is located substantially at the center of the bottom plate 12 below the fan motor 23.

[0040] In this construction, the compressor is disposed at the front surface side of the unit case 11, and an electrical component box 34 in which various kinds of electronic component units such as a control board for controlling the air conditioner, etc. are mounted is disposed in a space above the compressor. Therefore, a worker can easily perform a maintenance work of parts in the unit case 11 from the front surface side by detaching the front panel 15. Reference numeral 35 represents a cover plate which is provided above the compressor and is used to prevent rain water from directly impinging against the

compressor.

[0041] Figs. 4 and 5 are cross-sectional view showing the air blowing device 22.

[0042] As shown in Figs. 4 and 5, the motor support tables 17 are provided with rectifying units 60 for reducing the ventilation resistance to airflow flowing around the motor support tables 17. Each rectifying unit 60 has an upstream rectifying member 61 located at the upstream side of each motor support table 17, and a downstream rectifying member 81 located at the downstream side of each motor support table 17. The upstream rectifying member 61 and the downstream rectifying member 81 are formed of metal plate members.

[0043] In this embodiment, the motor support tables 17 are provided substantially at the center of the opening portion 16E of the frame-like upper frame 16. Therefore, air flow passing through the opening portion 16E of the upper frame 16 contains airflow passing through a first space P at the outside of each motor support table 17 and airflow passing through the gap between the pair of motor support tables 17, that is, through a second space Q inside the pair of the motor support tables 17.

[0044] Fig. 6 is a cross-sectional view showing the motor support table 17 and the upstream and downstream rectifying members 61 and 81 secured to the motor support table 17. The motor support table 17, the upstream rectifying member 61 and the downstream rectifying member 81 are provided symmetrically between the right and left sides with respect to the fan motor 23. Therefore, in order to simplify the description, these parts at the right side will be representatively described.

[0045] As shown in Figs. 4 to 6, the motor support table 17 is designed as a rod member having a U-shaped section, and it is secured to the upper frame 16 with the opening 71 of the U-shape facing the downward direction. The motor support table 17 has a substantially horizontal upper plate portion (upper surface portion) 73 on which each mounting stay piece 54 is mounted, an outer plate portion (outer surface) 73 extending downwardly from the outer end in the width direction of the upper plate portion 72 and an inner plate portion (inner surface) 74 extending downwardly from the inner end in the width direction of the upper plate portion 72 as shown in Fig. 3. The motor support tables 17 are formed of metal channel members, and they can be easily obtained.

[0046] Fig. 7 is a perspective view showing the upstream rectifying member 61.

[0047] The upstream rectifying member 61 is formed of a rod member having a substantially V-shaped section, and it has a vertical plate portion 62 extending downwardly and substantially vertically along the inner plate portion 74 of the motor support table 17, and a slope plate portion 63 extending upwardly from the lower end of the vertical plate portion 62 to the lower end of the outer plate portion 73 of the motor support table 17.

[0048] The upstream rectifying member 61 is disposed so as to cover the opening 71 of the lower surface portion of the motor support table 17 from the lower side thereof,

and provided as one body substantially over the whole length of the motor support table 17 so as to be overlapped with the substantially whole length of the opening portion 16E of the upper frame 16. The cross-sectional shape of the upstream rectifying member is uniform over the whole length thereof.

[0049] Fixing plate portions 64 are formed at the upper ends of the vertical plate portion 62 and slope plate portion 63 at an intermediate portion in the longitudinal direction of the upstream rectifying member 61 so as to project upwardly and come into contact with the outer surfaces of the outer and inner plate portions 73 and 74 of the motor support table 17. Furthermore, the upper ends of the vertical plate portion 62 and slope plate portion 62 at which the fixing plate portions 64 are not formed serve as contact portions 65 which come into contact with the lower end portions of the outer plate portion 73 and inner plate portion 74.

[0050] the upstream rectifying member 61 are fixedly fastened to the outer plate portion 73 and the inner plate portion 74 by plural bolts 66 inserted through holes 64A formed in the fixing plate portions 64 and holes (not shown) formed in the outer plate portion 73 and the inner plate portion 74. When the upstream rectifying members 61 are fixed to the motor support tables 17, each of the upstream rectifying member 61 has a substantially downwardly tapered triangular (convex) shape. As shown in Fig. 6, the cross-sectional shape of the upstream rectifying member 61 is substantially V-shape whose apex portion 61A is displaced inwardly to the inner space Q side. Furthermore, the apex portion 61A of the V-shape projects to the upstream side of the airflow. The outer surface portion of the slope plate portion 63 serves as a slope surface 63A which upwardly slopes from the apex portion 61A to the outer surface side of the unit case 11. The slope surface 63A is designed to be uniformly sloped over the area from the inner plate portion 74 of the motor support table 17 to the outer plate portion 73 of the motor support table 17.

[0051] As described above, the apex portion 61A of the upstream rectifying member 61 is located to be displaced to the fan motor 23 side in the width direction of the motor support table 17, and located at the lower end of the vertical plate portion 62. Therefore, air which ascends from the lower side of the upstream rectifying member 61 and reaches the whole area of the lower surface portion of the motor support table 17 impinges against the slope plate portion 63, and is rectified as airflow W1. The airflow W1 is directed obliquely upwardly along the slope surface 63A to the outer surface side of the unit case 11, and finally flows in the outer radial direction of the propeller fan 24. That is, as compared with the construction that the apex portion of the upstream rectifying member is located at the center in the width direction of the motor support table 17 (i.e., without being displaced to the fan motor side), a larger amount of airflow can be directed along the slope surface 63A to the outer surface side of the unit case 11. Therefore, a larger

amount of airflow can be directed to the outer radial portion side of the propeller fan 24 at which the rotational speed is higher, thereby increasing the amount of airflow.

[0052] Fig. 8 is a perspective view showing the downstream rectifying members 81.

[0053] As shown in Figs. 5, 6 and 8, each of the downstream rectifying members 81 is formed in a rod-like shape having a substantially inverted V-shaped section, and it has a vertical plate portion 82 extending substantially vertically upwardly along the outer plate portion 73 of the motor support table 17, and a slope plate portion 83 which extends along the inner plate portion 74, bends to the upper end of the vertical plate portion 82 and extends obliquely upwardly.

[0054] In this embodiment, plural (e.g., two) downstream rectifying members 81 are provided at both the end sides of each motor support table 17 exception for the center portions at which the stay pieces 54 of the fan motor 23 are provided. Each of the downstream rectifying members 81 is disposed so as to cover the upper plate portion 72 as the upper surface of the motor support table 17.

[0055] Fixing plate portions 84 are formed at the lower ends of the vertical plate portion 82 and slope plate portion 83 at an intermediate portion in the longitudinal direction of the downstream rectifying member 81 so as to protrude downwardly and come into contact with the outer surfaces of the inner plate portion 74 and outer plate portion 73 of the motor support table 17. Furthermore, portions of the lower ends of the vertical plate portion 82 and slope plate portion 83 at which the fixing plate portions 84 are not formed serve as contact portions 85 which come into contact with the outer surfaces of the upper end portions of the inner plate portion 74 and outer plate portion 73.

[0056] The downstream rectifying member 81 are fixedly fastened to the outer plate portion 73 and the inner plate portion 74 by bolts inserted through holes 84a formed in the fixing plate portions 84.

[0057] When the downstream rectifying members 81 are fixed to the motor support tables 17, each downstream rectifying member 81 has a substantially upwardly tapered triangular (convex) shape. As shown in Fig. 6, the cross-sectional shape of the downstream rectifying member 81 is substantially inverted V-shape whose apex portion 81A is displaced outwardly to the outer space P side. Furthermore, the apex portion 81A of the inverted V-shape projects to the downstream side of the airflow. The outer surface portion of the slope plate portion 83 serves as a slope surface 83 which is designed to be uniformly sloped over the area from the inner plate portion 74 of the motor support table 17 to the outer plate portion 73 of the motor support table 17 and reaches the apex portion 81a.

[0058] The apex portion 81a of the downstream rectifying unit 81 is located to be displaced to the outer surface side of the unit case 11 and also located at the upper end of the vertical plate portion 82. Air which is upwardly

blown from the upstream side through the motor support tables 17 is rectified by the downstream rectifying member 81 when passing through the first spaces P at the outside and the second spaces Q at the inside. Specifically, the air passing through the second space Q is outwardly attracted by air stream flowing through the first spaces P to be rectified as airflow W2, and obliquely upwardly flows along the slope surface 83A to the outer surface side of the unit case 11.

[0059] That is, according to the first embodiment, as compared with a construction that no downstream rectifying member 81 is provided at the upper plate portion 72 side of the motor support table 17, airflow can be more greatly suppressed from being disturbed above the upper plate portion 72, and so the ventilation resistance (resistance to airflow) can be reduced more greatly. Furthermore, according to the first embodiment, as compared with a construction that the apex portion of the downstream rectifying member is located substantially at the center in the width direction of the motor support table 17 (i.e., without being displaced inwardly or outwardly), a larger amount of air can be made to flow to the outer surface side of the unit case 11 by the slope surface 83A. Therefore, a larger amount of airflow can be guided to the outer radial side of the propeller fan 24 at which the rotational speed is higher, and the amount of airflow can be increased.

[0060] As shown in Fig. 6, the upstream rectifying member 61 and the downstream rectifying member 81 are secured to each of the motor support tables 17 to form rectifying units 60 on the motor support tables 17, and each of the rectifying unit 60 is designed in a substantially rhombic shape (diamond shape) in section. The four plate portions of each rectifying unit 60 which are viewed in cross-section, that is, the vertical plate portion 62, the slope plate portion 63, the slope plate portion 83 and the vertical plate portion 82 are formed to have substantially the same length. The rectifying unit 60 is disposed to be tilted upwardly and outwardly so that a line L (Fig. 6) passing through the apex portion 61A and the apex portion 81A is inclined to the upper side of the outer surface of the unit case 11.

[0061] When the propeller fan 24 is rotated by the fan motor 23, air around the outdoor unit 10 is passed through the heat exchanger 21 and sucked into the unit case 11. Thereafter, the airflow is deflected to the upper side and directed to the air blowing device 22 side, so that the air is blown out from the air blow-out opening 25A upwardly. At this time, airflow flowing around the motor support tables 17 is rectified by the slope surface 63A and the slope surface 83A of the rectifying unit 60 so that the air flows upwardly and outwardly, and a large amount of air flows to the outer radial portion side of the propeller fan 24. Therefore, the air flowing around the motor support tables 17 can be prevented from impinging against the surfaces of the motor support tables 17 substantially perpendicularly, and also a large amount of air can be prevented from flowing to the fan motor 23 side, so that the airflow

can be smoothly led to the propeller fan 24.

[0062] Furthermore, the vertical plate portion 62, the slope plate portion 63, the slope plate portion 83 and the vertical plate portion 82 are designed to have substantially the same length. Therefore, inner airflow which flows along the vertical plate portion 62 and the slope plate portion 83 through the second space Q and outer airflow which flows along the slope plate portion 63 and the vertical plate portion 82 through the first space P are substantially equal to each other in air passing distance. Therefore, disturbance of the airflow can be prevented, and the ventilation resistance of the rectifying unit 60 can be reduced.

[0063] As described above, according to the first embodiment to which the present invention is applied, the upstream rectifying members 61 are provided to the pair of motor support tables 17 for supporting the fan motor 23 of the air blowing device 22 so as to cover the openings of the motor support tables 17 having the U-shaped section so that each upstream rectifying member 61 is uniformly and upwardly sloped over the area from the inner plate portion 74 to the outer plate portion 73 of the motor support table 17. Accordingly, air which is sucked from the side surface of the unit case 11 through the heat exchanger 21 and reaches the overall area of the lower surface portion of each of the motor support tables 17 is guided to the outer radial direction (the outer peripheral direction) of the propeller fan 24 of the air blowing device 22. Therefore, the air reaching the overall area of the lower surface portions of the motor support tables 17 can be guided to the outer radial direction of the propeller fan 24, so that the ventilation resistance can be reduced.

[0064] The motor support tables 17 are designed to have a U-shaped section, and disposed with the opening 71 of the U-shape placed face down. The lower surface portions of the motor support tables 17 are provided with the upstream rectifying members 61 so that the openings 71 of the motor support tables 17 are covered by the upstream rectifying members 61. Therefore, the rigidity of the motor support tables 17 can be enhanced, and the openings 71 can be blocked by the upstream rectifying members 61, so that the construction can be simplified and the ventilation resistance can be reduced. Furthermore, the opening 71 of the U-shaped motor support table 17 faces the lower side, and the rigidity in the up-and-down direction can be secured by only the motor support tables 17 alone, so that the weight can be reduced.

[0065] Furthermore, the downstream rectifying members 81 are also provided to the pair of motor support tables 17 so as to cover the upper plate portions 72 of the motor support tables 17 having the U-shaped section so that each downstream rectifying member 81 is uniformly and upwardly sloped over the area from the inner plate portion 74 to the outer plate portion 73 of the motor support table 17 and airflow passing through the second space Q between the pair of motor support tables 17 can be guided to the outer radial direction of the propeller fan 24 in accordance with the airflow passing through the

first spaces Pat the outside of each motor support table 17. Therefore, the air can be guided to the outer radial direction of the propeller 24 by the downstream rectifying member 81, and the ventilation resistance can be reduced.

[0066] Still furthermore, the upstream rectifying members 61 and the downstream rectifying members 81 are provided to form the substantially rhombic rectifying units 60 in cross-sectional view on the pair of motor support tables 17, and the apex portion 81A as the upper end portion of the rectifying unit 60 is directed upwardly and outwardly to the downstream side. Therefore, the air can be guided to the outer radial direction of the propeller fan 24 by the rectifying unit 60, and the ventilation resistance can be reduced. The rectifying unit 60 is rhombic, and the lengths of the passages of the inner surface and outer surfaces of the rectifying unit 60 are substantially equal to each other, so that the disturbance of the airflow can be reduced and the ventilation resistance can be reduced.

[0067] When the rectifying unit is provided to the lower surface side (i.e., the upstream side) of each motor support table 17 in the outdoor unit, the airflow is not rectified at the upper surface side (i.e., the downstream side) of each motor support table 17, and thus the ventilation resistance is not so greatly reduced.

[0068] According to the first embodiment, the fan motor 23 of the air blowing device 22 is supported on the pair of motor support tables 17, air sucked from the side of the unit case 11 through the heat exchanger 21 by the air blowing device 22 is upwardly blown out through the first space P at the outside of each motor support table 17 and the second space Q between the pair of motor support tables 17, and the downstream rectifying member 81 which is formed to be uniformly upwardly sloped from the inner plate portion 74 to the outer plate portion 73 of each motor support table 17 and can guide the airflow passing through the second space Q to the outer radial direction of the air blowing device 22 in accordance with the airflow passing through the first spaces P is provided to the upper plate portion 72 of each motor support table 17. Therefore, the air passing through the second space Q can be made to flow to the outer radial direction of the air blowing device 22, and the ventilation resistance can be reduced.

[0069] The downstream rectifying member 81 has the vertical plate portion 82 which upwardly extends along the outer plate portion 73 of each motor support table 17 and the slope plate portion 83 which upwardly slopes from the inner plate portion 74 of each motor support table 17 to the upper end of the vertical plate portion 82. Accordingly, the airflow passing through the first space P can be rectified by the vertical plate portion 82, and the airflow passing through the second space Q can be rectified by the slope plate portion 83, so that disturbance of air at the downstream side of each motor support table 17 can be prevented and thus the ventilation resistance can be reduced. Furthermore, the air reaching the whole

area of the lower surface portion of each motor support table 17 can be guided to the outer radial direction of the air blowing device 22 by the upstream rectifying member 61 at the lower surface portion of each motor support table 17, so that the ventilation resistance can be reduced.

[0070] Furthermore, the downstream rectifying member 81 and the upstream rectifying member 61 are provided, whereby the rectifying units 60 having the substantially rhombic (diamond) shape in section are formed on the respective motor support tables 17, and the apex portion 81a as the upper end portion of the rectifying unit 60 is upwards and outwards oriented to the downstream side. Accordingly, air can be guided to the outer radial direction of the air blowing device 22 by the rectifying units 60, and the ventilation resistance can be reduced. Furthermore, the rectifying unit 60 is rhombic, and the inner and outer passages of the rectifying unit 60 are substantially equal to each other in length, so that the ventilation resistance can be reduced.

[0071] The first embodiment is an example to which the present invention is applied, and the present invention is not limited to the first embodiment. In the first embodiment, one upstream rectifying member 61 is provided substantially over the whole length of each motor support table 17, however, it may be provided to the motor support table 17 while being divided into plural parts in the longitudinal direction, thereby facilitate the assembly of the upstream rectifying member 61 to each motor support table 17.

[0072] Furthermore, in the first embodiment, the rectifying unit 60 is constructed by both the upstream rectifying unit 61 and the downstream rectifying unit 81. However, the present invention is not limited to this embodiment. The rectifying unit 60 may be constructed by at least one of the downstream rectifying member 81 and the upstream rectifying member 61. In this case, the apex portion 61A of the upstream rectifying member 61 or the apex portion 81A of the downstream rectifying member 81 is displaced inwardly to the inner space Q side or outwardly to the outer space P side.

[0073] When the rectifying unit 60 is constructed by only the downstream rectifying member 81, the opening 71 of the U-shaped motor support table 17 is preferably blocked by a lidmember or the like. Furthermore, the downstream rectifying member 81 may be provided on the upper surface of the motor support table 17 having a rectangular section.

[Second Embodiment]

[0074] A second embodiment according to the present invention will be described hereunder with reference to Fig. 9. In the second embodiment, the same elements as the first embodiment are represented by the same reference numerals, and the description thereof is omitted.

[0075] In the first embodiment, a pair of downstream

rectifying members 81 are provided at both the end sides of each motor support table 17 except for the center portion of the motor support table 17 at which the stay pieces 54 of the fan motor 23 are provided. However, in the second embodiment, a downstream rectifying member 281 is provided integrally (as one body) without being divided into plural parts (i.e., two parts).

[0076] Fig. 9 is a perspective view showing a rectifying unit 260 according to the second embodiment.

[0077] As shown in Fig. 9, each of the motor support tables 17 is provided with the rectifying unit 260 for reducing the ventilation resistance of air flow passing around the motor support table 17, and the rectifying unit 260 has an upstream rectifying unit 61 and a downstream rectifying member 281 covering the upper plate portion 72. The downstream rectifying member 281 has a vertical plate portion 82 and a slope plate portion 83.

[0078] The downstream rectifying member 281 is integrally formed as if the pair of downstream rectifying members 81 of the first embodiment are joined to each other by a plate portion 286 constructed by extending the vertical plate portion 82 in the longitudinal direction. The a cut-out portion 287 is formed at an intermediate portion in the longitudinal direction of each downstream rectifying member 281. The end portions of the stay pieces 54 and the respective fixing bolts 55 are exposed from the cut-out portion 287. Therefore, the fan motor 23 can be easily detached through the cut-out portion 287 without detaching the downstream rectifying member 281.

[Third Embodiment]

[0079] A third embodiment according to the present invention will be described hereunder with reference to Fig. 10. In this third embodiment, the same elements as the first embodiment are represented by the same reference numerals, and the description thereof is omitted.

[0080] In the first embodiment, the rectifying unit 60 has the upstream rectifying member 61 and the downstream rectifying member 81. However, the third embodiment is different from the first embodiment in that the downstream rectifying member 81 is not provided, and the upstream rectifying member is provided divisionally with being divided into two or more parts (two parts in this embodiment).

[0081] Fig. 10 is a perspective view showing a rectifying unit 360 according to the third embodiment. Here, Fig. 10 is a perspective view of the rectifying member when the inside of the bell mouth 25 is seen through.

[0082] As shown in Fig. 10, the rectifying unit 360 for reducing the ventilation resistance of air flowing around each motor support table 17 is provided to each motor support table 17. Each rectifying unit 360 has a pair of upstream rectifying members 361 which cover the opening 71 of the U-shaped motor support table 17. No rectifying member is provided at the upper plate portion 72 side.

[0083] The upstream rectifying members 31 are con-

figured as a pair so as to extend in the longitudinal direction of each motor support table 17, and separated from each other at an intermediate portion in the longitudinal direction of the motor support table 17. Accordingly, a gap is formed between the upstream rectifying members 361. The upstream rectifying members 31 are provided as a pair so as to straddle over the substantially whole width of the opening portion 16e of the upper frame 16.

[0084] Each of the upstream rectifying members 361 has a vertical plate portion 62 and a slope plate portion 63, and it is designed in a downwardly tapered and substantially triangular (convex) shape. Air which flows from the upstream side to the whole area of the lower surface portion of the motor support table 17 flows obliquely upwardly to the outer surface side of the unit case 11 along the slope surface 63A of the slope plate portion 63, and then flows to the outer radial direction of the propeller fan 24.

[0085] In the third embodiment, each of the upstream rectifying members 361 is divided into plural parts (two parts in this embodiment) in the longitudinal direction of the motor support table 17. Therefore, the plural upstream rectifying members 361 can be inserted from the opening portion 16E of the frame-shaped upper frame 16 at the upper side of the heat exchanger 21, and fixed to the motor support table 17, so that the assembling performance is excellent. Furthermore, even when water or the like invades into the upstream rectifying members 361, the water or the like can be easily discharged from the gap between the upstream rectifying members 361.

[Fourth Embodiment]

[0086] A fourth embodiment according to the present invention will be described with reference to Figs. 11 and 12. In the third embodiment, the same elements as the first embodiment are represented by the same reference numerals, and the description thereof is omitted.

[0087] In the first embodiment, the upstream rectifying member 61 has the vertical plate portion 62 extending substantially vertically downwardly along the inner plate portion 74 of the motor support table 17, and the apex portion 61A is located at the lower end of the vertical plate portion 62. However, the fourth embodiment is different from the first embodiment in that the upstream rectifying member projects to the fan motor 23 side, and the apex portion of the upstream rectifying member is located to be nearer to the fan motor 23 side than the inner plate portion 74 of the motor support table 17 as shown in Fig. 12. In the fourth embodiment, the downstream rectifying member 81 is not provided.

[0088] Fig. 11 is a perspective view showing the rectifying unit according to the fourth embodiment. Here, Fig. 11 is a perspective view of the rectifying unit when the inside of the bell mouth 25 is seen through.

[0089] As shown in Fig. 11, each of the motor support tables 17 is provided with a rectifying unit 460 for reducing the ventilation resistance of air flowing around each mo-

tor support table 17. Each rectifying unit 460 has a pair of upstream rectifying members 461 which cover the opening 71 of the U-shaped motor support table 17 from the lower side. In this case, the downstream rectifying member is not provided at the upper plate portion 72 side.

[0090] The upstream rectifying members 461 are provided as a pair so as to extend in the longitudinal direction of each motor support table 17, and are separated from each other at an intermediate portion in the longitudinal direction so that a gap is formed between the upstream rectifying members 461. The upstream rectifying members 461 are provided as a pair, so that the upstream rectifying members 461 straddle over the substantially whole length of the opening portion 16E of the upper frame 16.

[0091] Fig. 12 is a cross-sectional view of the rectifying unit 460. The rectifying units 460 are provided symmetrically between the right and left sides, and only the rectifying unit 460 at the right side will be described hereunder.

[0092] As shown in Figs. 11 and 12, the upstream rectifying member 461 is designed in a rod-like shape having a substantially V-shaped section, and it has an inward slope plate portion 462 extending inwardly and downwardly from the inner plate portion 74 side to the fan motor 23 side, and an outward slope plate portion 463 extending upwardly and outwardly from the lower end of the inward slope portion 462 to the lower end of the outer plate portion 73 of the motor support table 17. The upstream rectifying member 461 is disposed so as to cover the opening 71 of the lower surface portion of the motor support table 17 from the lower side, and the cross-sectional shape thereof is uniform over the whole length thereof.

[0093] Fixing plate portions 464 which project upwardly and come into contact with the outer surfaces of the inner and outer plate portions 74 and 73 of the motor support table 17 are formed at the upper ends of the inward and outward slope plate portion 462 and 463. The fixing plate portions 464 are fixed to the inner plate portion 74 and the outer plate portion 73 by bolts 86 which are inserted through the fixing plate portions 464 and fastened to the inner and outer plate portions 74 and 73, whereby the upstream rectifying member 461 is fixed to the motor support table 17.

[0094] The upstream rectifying member 461 is designed to have a downwardly tapered and substantially triangular (convex) shape in section, and the apex portion as the lower end of the triangle (the lower end portion of the rectifying member) 461A projects to be nearer to the fan motor 23 side than the inner plate portion 74 of the motor support table 17. That is, the upstream rectifying member is designed to be an inwardly displaced V-shaped section. The outer surface portion of the outward slope portion 463 serves as a slope surface 463A which is upwardly sloped from the apex portion 461A to the outer surface side of the unit case 11. The slope surface 463A is designed to be uniformly upwardly sloped from

a more interior position than the inner plate portion 74 to the outer plate portion 73 of the motor support table 17.

[0095] As described above, the apex portion 461A of the upstream rectifying member 461 is located at the more interior position than the inner plate portion 74. Therefore, a larger amount of air containing air flowing at the center side (the fan motor 23 side) of the unit case 11 can be rectified by the slope surface 463A because the apex portion 461A projects inwardly to the center side, so that a larger amount of air can be rectified obliquely upwardly to the outer surface side. Therefore, a large amount of air can be made to flow to the outer radial direction of the propeller fan 24, and the amount of airflow can be increased.

[Fifth Embodiment]

[0096] A fifth embodiment according to the present invention will be described with reference to Figs. 13 and 14. In the fifth embodiment, the same elements as the first embodiment are presented by the same reference numerals, and the description thereof is omitted.

[0097] In the first embodiment, the cross-sectional shape of the upstream side rectifying member 61 is uniform over the whole length thereof. However, the fifth embodiment is different from the first embodiment in that the rectifying member provided in the neighborhood of the fan motor 23 extends to the lower side of the fan motor 23.

[0098] Fig. 13 is a cross-sectional view showing a rectifying unit according to the fifth embodiment. Fig. 14 is a bottom view of the rectifying unit 560 according to the fifth embodiment.

[0099] As shown in Fig. 13 and 14, the rectifying unit 560 is provided for reducing the ventilation resistance of air flowing around each motor support table 17 is provided to the lower surface of the motor support table 17. Each rectifying unit 560 has a center side rectifying member 561 provided in the neighborhood of the fan motor 23, and a pair of side rectifying members 565 which are adjacent to both the end portions of the center side rectifying member 561. No rectifying member is provided at the upper plate portion 72 side.

[0100] Each side rectifying member 565 has a vertical plate portion 62 and a slope plate portion 63, and it is designed in a downwardly tapered and substantially triangular (convex) shape in section, and has an apex portion 61A at the lower end of the vertical plate portion 62.

[0101] The center side rectifying member 561 is designed in a rod-like shape having a substantially V-shaped section, and it has an inward slope plate portion 562 extending inwardly and downwardly from the inner plate portion 74 side to the lower side of the fan motor 23, and has an outward slope plate portion 563 extending outwardly and upwardly from the lower end of the inward slope plate portion 562 to the lower end of the outer plate portion 73 of the motor support table 17. The center side rectifying member 561 is designed to have a downwardly

tapered and substantially triangular (convex) shape in section, and the apex portion corresponding to the lower end of the triangle (the lower end portion of the rectifying member) 561A projects inwardly to be nearer to the fan motor 23 side than the inner plate portion 74 of the motor support table 17 as in the case of the embodiment shown in Fig. 12. The apex portion 561A is overlapped with the body portion 52 of the fan motor 23 in bottom view as shown in Fig. 14.

[0102] The outer surface portion of the outward slope plate portion 53 serves as a slope surface 563A which upwardly slopes from the apex portion 561A to the outer surface side of the unit case 11. The slope surface 563A upwardly and uniformly slopes from a more interior position than the inner plate portion 74 of the motor support table 17 to the outer plate portion 73.

[0103] Fixing plate portions 564 are formed at the upper ends of the inward slope plate portion 562 and the outward slope plate portion 563 so as to project upwardly and come into contact with the outer surfaces of the inner and outer plate portions 74 and 73 of the motor support tables 17. The center rectifying member 561 are fixed to the motor support tables 17 by bolts 86 inserted through the fixing plates 564 as in the case of the embodiment shown in Fig. 12.

[0104] As shown in Fig. 14, the center side rectifying member 561 is provided at the substantially center portion in the longitudinal direction of the motor support table 17 so that the length thereof corresponds to the length of the body portion 52 of the fan motor 23 in bottom view (Fig. 14), that is, the center side rectifying member 561 is overlapped with the body portion 52 when the body portion 52 is projected onto the motor support table 17 side.

[0105] According to the fifth embodiment, the apex portion 561A of the lower end of the center side rectifying member 561 provided in the neighborhood of the fan motor 23 projects inwardly so as to be nearer to the fan motor 23 side than the inner plate portion 74 of the motor support table 17, and also located to be nearer to the fan motor 23 side than the apex portions 61A of the lower end of the side rectifying members 565. Therefore, air which flows between the inner plate portion 74 of the motor support table 17 and the fan motor 23 side is also guided to the outer radial direction of the propeller fan 24 by the center side rectifying member 561, and also air which flows at other places is guided to the outer radial direction of the propeller fan 24 by the side rectifying members 565 under the state that the air is more easily passed therethrough. That is, at a place at which air impinges against the lower surface of the fan motor 23 and thus disturbance of airflow occurs more easily, the airflow at this place is deflected outwardly by the center side rectifying member 561 to reduce the ventilation resistance. Furthermore, at a place at which the fan motor 23 is located, the air can be guided to the outer radial direction of the propeller fan 24 by the side rectifying members 565 each having a smaller width than the center side

rectifying member 561 under the state that the ventilation resistance is smaller. Therefore, the amount of airflow can be increased as a whole.

5 [Sixth Embodiment]

[0106] A sixth embodiment according to the present invention will be described hereunder with reference to Figs. 15 to 21. In the sixth embodiment, the same elements as the first embodiment are represented by the same reference numerals, and the description thereof is omitted.

[0107] In the first embodiment, the rectifying unit 60 for reducing the ventilation resistance of the airflow passing around the motor support table 17 is provided to each of the motor support tables 17. The sixth embodiment is different from the first embodiment in that airflow deflecting plates 681 to 683 sloping upwardly are provided from the upper end portion of the inner surface 21A of the heat exchanger 21 to the inner wall 29 of the bell mouth 25 to reduce the ventilation resistance in the neighborhood of the bell mouth 25.

[0108] The air conditioner according to the sixth embodiment is constructed by an outdoor unit 610 and an indoor unit (not shown), and refrigerant is made to flow through a refrigerant circuit containing respective parts connected through a refrigerant pipe to perform cooling operation and heating operation. The outdoor unit 610 is disposed outdoors. Under cooling operation, refrigerant in the refrigerant circuit is heat-exchanged with outdoor air to be condensed, so that heat is irradiated to the outdoor air. Under heating operation, the refrigerant is heat-exchanged with outdoor air to be vaporized, so that heat is taken from the outdoor air. The up-and-down direction and right and left direction described below are defined as directions when the outdoor unit 610 is viewed from the front surface side thereof under the state that the outdoor unit 610 is installed.

[0109] Fig. 15 is a side view of the outdoor unit 610 according to the sixth embodiment when the outdoor unit 610 is viewed from the right side, and Fig. 16 is a top view of the inner construction of the outdoor unit 610.

[0110] The outdoor unit 610 has a unit case (housing) 11. As shown in Fig. 16, a heat exchanger 21 is disposed on the bottom plate 12 of the unit case 11. As shown in Fig. 15, an outdoor fan (axial-flow type air blower) 622 is disposed at the upper side of the heat exchanger 21. The outdoor fan 622 is the same type fan as the air blowing device 22 according to the first embodiment. The propeller fan 24 of the outdoor fan 622 is disposed substantially at the center of the U-shaped heat exchange 21 in top view.

[0111] The bell mouth 25 for guiding air at the suction side of the propeller fan 24 to the air blow-out side is provided around the propeller fan 24. This bell mouth 25 is formed by resin molding so as to have a desired shape with reduced weight. As shown in Fig. 15, the bell mouth 25 is designed in a cylindrical shape so as to have an air

blow-out opening 25A and an air suction opening 25B which is larger in diameter than the air blow-out opening 25A. The bell mouth 25 has an inner wall 29 which inter-communicates with the air blow-out opening 25A and slopes so as to gradually increase in diameter to the air suction opening 25B.

[0112] A compressor 30 (Fig. 15), an accumulator 31, an oil separator 32 and a receiver tank 33 (Fig. 16) which constitute a part of the refrigerant circuit are provided on the bottom plate 12 in the unit case 11, and refrigerant circuit constituent parts such as valve bodies such as a four-way valve 39, an expansion valve (not shown), etc. are also mounted in the unit case 11 while connected to one another through pipes.

[0113] The unit case 11 has a partition plate 635 at the front surface side of the unit case 11 so as to upwardly extend from the bottom plate 12. The partition plate 635 straightly upwardly extends to some midpoint and then slopes obliquely frontward, and the upper end portion thereof is connected to an electrical component box 34 disposed at the front surface side of the bell mouth 25. The inside of the unit case 11 is partitioned into a heat exchange chamber 36 and a machine chamber 37 by the partition plate 635. A compressor and the refrigerant circuit constituent parts which are required to be subjected to maintenance at high frequency are mounted in the machine chamber 37m, and the heat exchanger 21, the accumulator 31 as a pressure container, the oil separator 32 and the receiver tank 33 which are required to be subjected to maintenance at low frequency are mounted in the heat exchange chamber 36. Therefore, in this embodiment, a worker can easily perform the maintenance work for the compressor 30 and the electrical component box 34 in the unit case 11 from the front surface side by detaching a front panel 15. Furthermore, rain drops can be prevented from directly impinging against equipment such as the compressor 30, etc. mounted in the machine chamber 37 by the partition plate 635.

[0114] The accumulator 31 is a pressure container for separating flow-in refrigerant into gas and liquid to prevent liquid refrigerant from flowing into the compressor 30. In this embodiment, the accumulator 31 is disposed substantially at the center of the bottom plate 12, and it is designed to have a higher shape than the compressor 30, the oil separator 32, etc. Therefore, the upper portion of the accumulator 31 is provided with a support member 38 through which the accumulator 31 is supported by the unit case 11, whereby the accumulator 31 is prevented from being swung.

[0115] Fig. 17 is a perspective view showing the support structure of the fan motor 2w3.

[0116] As shown in Fig. 17, the upper frame 616 has plate-like frame plates (support frames) 616A, 616B and 616C provided along the respective upper surfaces of the U-shaped heat exchanger 21 (Fig. 16), and a joint plate 616D for joining the front ends of the frame plates 616A and 616C. The four corners of the upper frame 616 are joined to respective support poles 14.

[0117] The respective frame plates 616A, 616B and 616C have fixing piece portions 616A1, 616B1 and 616C1 which are formed by vertically downwardly bending the inner edge portions of the frame plates 616A, 616B and 616C, and airflow deflecting plates described later are provided to the fixing piece portions 616A1, 616B1 and 616C1, respectively.

[0118] A pair of motor support tables 17 extending substantially in parallel to the frame plates 616A and 616C are bridged between the frame plate 616B and the joint plate 616D, and the fan motor 23 is fixed on the motor support tables 17 so as to be located between the motor support tables 17, for example.

[0119] Furthermore, the motor support tables 17 are located to be spaced from the substantially center portions in the longitudinal direction of the frame plate 616B and the joint plate 616D (the width direction of the unit case 11: the direction of A in Fig. 17) at an equal distance. Furthermore, the fan motor 23 is fixed at the substantially center portion in the longitudinal direction of each of the motor support tables 17 (the depth direction of the unit case 11: the direction of B in Fig. 17). That is, the fan motor 23 (and the propeller fan 24) is located at the substantially center position of the U-shaped heat exchanger 21, and the also located substantially above the accumulator 31.

[0120] The relation between the fixing height position of the fan motor 23 and the airflow amount when the propeller fan 24 is rotated is known. Therefore, the fixing height position of the fan motor 23 can be easily adjusted by inserting a space (not shown) between the stay piece 54 of the fan motor 23 and the motor support 17.

[0121] Fig. 18 is a cross-sectional view showing the outdoor fan 622 and the bell mouth 25.

[0122] As described above, in the sixth embodiment, when the propeller fan 24 of the outdoor fan 622 is rotated, outdoor air is sucked from the left surface side, the back surface side and the right surface side of the unit case 11 except for the front surface through heat exchanger 21 into the unit case 11, and discharged to the outside through the air blow-out opening 25A of the bell mouth 25 which is provided to the upper surface portion of the unit case 11.

[0123] In this case, the fan motor 23 of the outdoor fan 622 and the motor support tables 17 for supporting the fan motor 23 are provided so as to extend in the flow passage of air, so that they serve as ventilation resistance (resistance to airflow) which disturbs airflow. Therefore, according to this embodiment, a rectifying member 661 and a rectifying plate 640 are provided below (at the upstream side of) the motor support tables 17 and the fan motor 23 so as to reduce the ventilation resistance of air flowing at the lower side of the motor support tables 17 and the fan motor 23.

[0124] The rectifying member 661 and the rectifying plate 640 are formed of metal plate members. The rectifying members 661 are secured to the lower surfaces of the motor support tables 17, and the rectifying plate

640 are bridged between the motor support tables 17 at the lower position of the fan motor 23.

[0125] Each rectifying member 661 is designed in a rod-like shape having a substantially V-shaped section. As shown in Fig. 18, the rectifying member 661 has a vertical plate portion 662 extending vertically downwardly along the inner plate portion 74 of each motor support table 17, a slope plate portion 663 extending obliquely upwardly from the lower end of the vertical plate portion 662 to the lower end of the outer plate portion 73 of the motor support table 17, and a fixing plate portion 664 which is continuous with the slope plate portion 663 and substantially vertically upwardly extends along the outer plate portion 73.

[0126] The rectifying member 661 is disposed so as to cover the opening of the lower surface of the motor support table 17 from the lower side, and provided integrally (as one body) over the substantially whole length of the motor support table 17 so as to be overlapped with the substantially whole length of the opening portion 616E of the upper frame 616. The cross-sectional shape of the rectifying member 661 is uniform over the whole length thereof.

[0127] The rectifying member 661 sandwiches the motor support table 17 between the vertical plate portion 662 and the fixing plate portion 664, and is fixedly fastened to the inner plate portion 74 and the outer plate portion 73 of the motor support table 17 by bolts 666 inserted through holes (not shown) formed in the vertical plate portion 662 and the fixing plate portion 664.

[0128] When the rectifying member 661 is fixed to the motor support table 17, it has a downwardly tapered and substantially triangular (convex) shape in section, and the V-shaped apex portion 661A thereof projects to the upstream side of airflow. The outer surface portion of the slope plate portion 663 serves as a slope surface 663A which is upwardly sloped from the apex portion 661A to the outer surface side of the unit case 11. The slope surface 663A is formed to be uniformly upwardly sloped from the inner plate portion 74 of the motor support table 17 to the outer plate portion 73 of the motor support table 17.

[0129] The apex portion 661A of the rectifying member 661 is located to be displaced to the fan motor 23 side in the width direction of the motor support table 17 (i.e., the apex portion 661A is inwardly displaced), and located at the lower end of the vertical plate portion 662. Accordingly, the whole area corresponding to the lower surface of the motor support table 17 can be formed as the slope plate portion 663. Therefore, air reaching the whole area of the lower surface portion of the motor support table 17 can be enabled to obliquely upwardly flow along the slope surface 663A to the outer surface side of the unit case 11 and further flow to the outer radial direction of the propeller fan 24. Therefore, a larger amount of airflow can be made to flow to the outer radial portion side of the propeller fan 24 at which the rotational speed is higher, so that the airflow amount can be increased and the ventilation resistance caused by the motor support tables 17

can be reduced.

[0130] Furthermore, the rectifying plate 640 is formed of a plate member which is bent to be substantially V-shaped in section, and it has a slope plate portion 642 (having a substantially V-shaped section) which has an apex portion 641 extending along the motor support table 17 below the substantially center portion of the fan motor 23 and is upwardly sloped from the apex portion 641 to the lower ends of the outer plate portions 73 of the motor support tables 17 and has an apex portion 641, and fixing plate portions 643 which are continuous with the slope plate portion 642 and substantially vertically upwardly extend along the outer plate portions 73.

[0131] As shown in Fig. 19, the rectifying member 640 is provided at the lower side of the fan motor 23 so as to be overlapped with the fan motor 23 in plan view. The rectifying plate 640 prevents air from staying below the fan motor 23 to reduce the ventilation resistance of airflow. Therefore, it is desired to have such a size that the fan motor 23 is covered by the rectifying plate 640. When the rectifying plate 640 is excessively large in size, the amount of air flowing around the fan motor 23 is reduced by the rectifying plate 640, and the fan motor 23 may be insufficiently cooled. Therefore, in this embodiment, the length L1 of the rectifying plate 640 in the extending direction of the motor support table 17 is set to be smaller than the outer diameter L2 of the fan motor 23 as shown in Fig. 19, whereby the fan motor 23 can be cooled and also the ventilation resistance can be reduced.

[0132] As described above, according to the sixth embodiment, the rectifying member 661 is secured to the lower surface of the motor support table 17, and thus the rectifying plate 640 is secured to the motor support table 17 while overlaid on the rectifying member 661. Specifically, the fixing plate portions 643 of the rectifying plate 640 are overlaid on the fixing plate portions 664 of the rectifying members 661, and fixed to the outer plate portions 73 of the motor support tables 17 by bolts 666 together with the fixing plate portions 664.

[0133] When the rectifying plate 640 is fixed to the motor support table 17, it has a downwardly tapered and substantially triangular (convex) shape in section, and the apex portion 641 of the V-shaped rectifying plate 640 projects to the upstream side of airflow substantially at the center portion of the fan motor 23. The outer surface portion of the slope plate portion 642 serves as the slope surface 642A which upwardly slopes from the apex portion 641 to the outer surface side of the unit case 11. This slope surface 642A is formed to be uniformly upwardly sloped from the apex portion 641 to the outer plate portions 73 of the motor support tables 17.

[0134] Accordingly, air which reaches the whole area of the lower surface portion of the fan motor 23 can be made to flow obliquely upwardly along the slope surface 642A to the outer surface side of the unit case 11, and further flow to the outer radial direction of the propeller fan 24. Therefore, a larger amount of air can be made to flow to the outer radial portion side of the propeller fan

24 at which the rotational speed is higher. Therefore, the airflow amount can be increased, and the ventilation resistance caused by the fan motor 23 can be reduced.

[0135] Furthermore, the apex portion 641 of the rectifying plate 640 is located below the substantially center portion of the fan motor 23, and thus air reaching the lower surface portion of the fan motor 23 can be substantially equally divided, so that the air can be efficiently discharged to the outside of the unit case 11 with suppressing unevenness of the airflow amount.

[0136] In the sixth embodiment, the gradient angles of the slope plate portions 642 and 664 of the rectifying plate 640 and the rectifying member are set to be substantially equal to each other. According to this embodiment, the rectifying plate 640 and the rectifying member 6612 are brought into close contact with each other. Therefore, the ventilation resistance can be reduced, and the airflow directions of air flowing along the slope surfaces 642A and 663A of the rectifying plate 640 and the rectifying member 661 can be coincident with each other, and thus the rectifying effect can be enhanced.

[0137] Furthermore, as described above, in the sixth embodiment, the upper portion of the accumulator 31 is provided with the support member 38 through which the accumulator 31 is supported by the unit case 11. The support member 38 also causes ventilation resistance as in the case of the fan motor 23 and the motor support tables 17. Therefore, the support member 38 is formed of a metal round rod, and fixing portions 38A and 38b are formed at both the ends of the round rod. One fixing portion 38A is fixed to the upper portion of the accumulator 31, and the other fixing portion 38 is fixed to the frame plate 616B located at the back surface side of the upper frame 616.

[0138] Accordingly, the support member 38 is formed of a round rod, whereby the projection area thereof can be reduced, and the outer surface of the support member 38 is made smooth. Therefore, the ventilation resistance can be reduced.

[0139] Furthermore, in the sixth embodiment, as shown in Fig. 19, the support member 38 is disposed so as to be overlapped with the apex portion 641 of the rectifying plate 640 in plan view. According to this construction, air which is disturbed when passing over the support member 38 is divided by the apex portion 641 of the rectifying plate 640, so that the disturbance of the air can be suppressed to the minimum one. Therefore, as compared with a case where the support member 38 is provided at other places, the ventilation resistance can be more greatly reduced, and the ventilation resistance of the outdoor unit can be reduced.

[0140] As shown in Fig. 19, in the outdoor unit 610 of the sixth embodiment, the diameter L4 of the air suction opening 25B (Fig. 15) of the bell mouth 25 is set to be larger than the width L3 of the opening portion of the upper frame 616 disposed above the heat exchanger 22, and thus the outer diameter of the propeller fan 24 can be increased, so that the airflow amount can be in-

creased. In this case, as shown in Fig. 15, in connection with the increase of the outer diameter of the propeller fan 24, the inner wall (inner peripheral surface) 29 of the bell mouth 25 is located at a more exterior position as compared with the inner surface 21A of the heat exchanger 21, so that a step 70 is formed between the inner surface 21A of the heat exchanger and the inner wall 29 of the bell mouth 25. Accordingly, air trap (stay) occurs at this step 70, so that airflow is deteriorated and the ventilation resistance is increased.

[0141] Therefore, as shown in Fig. 20, the upper frame 616 is provided with the airflow deflecting plates 681 to 683 which upwardly slope from the upper end portion of the inner surface 21A of the heat exchanger 21 to the inner wall 29 of the bell mouth 25. In the sixth embodiment, the heat exchanger 21 is bent to be substantially U-shape in section, and thus the airflow deflecting plates 681 to 683 are disposed at the portions corresponding to the left side surface, back surface and right side surface of the unit case 11.

[0142] The airflow deflecting plates 681 and 683 disposed on both the side surfaces have the same shape, and thus the airflow deflecting plate 681 will be described hereunder.

[0143] The airflow deflecting plate 681 has a trapezoidal airflow deflecting plate body 681A which is narrower in width at the upper portion thereof, and a fixing plate portion 681B which is continuous with the lower end of the airflow deflecting plate body 681A and extends vertically downwardly. The fixing plate portion 681B is fixed to the fixing piece portion 616A1 of the frame plate 616A disposed at the left side surface side of the upper frame 616 by bolts 685. The airflow deflecting plate 683 has an airflow deflecting plate body 683A and a fixing plate portion 683B.

[0144] The airflow deflecting plate 682 disposed at the back surface side has substantially the same construction as the airflow deflecting plate 681, and has an airflow deflecting body 682A and a fixing plate portion 682B. The motor support tables 17 are fixed to the frame plate 616B at the back surface side, and cutouts 682C for avoiding the motor support tables 17 are formed in the airflow deflecting body 682A.

[0145] According to this construction, the outdoor unit is provided with the airflow deflecting plates 681 to 683 which are upwardly sloped from the upper end portion of the inner surface 21A of the heat exchanger 21 to the inner wall 29 of the bell mouth 25. Accordingly, air flows to the inner wall 29 of the bell mouth 25 in a direction indicated by an arrow D in Fig. 21 along the airflow deflecting plates 681 to 683, whereby air can be prevented from staying at the step 70 between the inner surface 21A of the heat exchanger 21 and the inner wall 29 of the bell mouth, and the ventilation resistance can be reduced.

[0146] Furthermore, as shown in Fig. 21, the airflow deflecting plates 681 to 683 are provided to be sloped at such an angle that the upper end portions 681A 1 to

683A1 are positionally lower than the tip portions 46A of the blades 46 of the propeller fan 24. According to this construction, air can be prevented from being trapped (staying) at the step 70 between the inner surface 21A of the heat exchanger 21 and the inner wall 29 of the bell mouth 25 with preventing the interference between the airflow deflecting plates 681 to 683 and the propeller fan 24.

[0147] As described above, according to the sixth embodiment, in the outdoor unit 610 for the air conditioner which has the heat exchanger 21 disposed on the bottom plate 12 of the unit case 11 to form at least one side surface of the unit case 11, the outdoor fan 622 disposed above the heat exchanger 21 and the bell mouth 25 provided around the propeller fan 24 of the outdoor fan 622, the bell mouth 25 is configured so that the inner wall 29 thereof is outwardly larger in diameter than the inner surface 21A of the heat exchanger 21. Therefore, the outer diameter of the propeller fan 24 can be increased, and the airflow amount can be increased. Furthermore, the airflow deflecting plates 681 to 683 which upwardly slope from the upper end portion of the inner surface 21A of the heat exchanger 21 to the inner wall 29 of the bell mouth 25 are provided. Therefore, air flows along the airflow deflecting plates 681 to 683 to the inner wall 29, whereby air can be prevented from staying at the step 70 between the inner surface 21A of the heat exchanger 21 and the inner wall 29 of the bell mouth 25, and thus the ventilation resistance can be reduced.

[0148] According to the sixth embodiment, the heat exchanger 21 is designed to have a substantially U-shaped section along the back surface and the right and left side surfaces of the unit case 11, and the airflow deflecting plates 681 to 683 are provided to the respective surfaces of the U-shaped unit case 11. Therefore, air can be prevented from staying at the step 70 between the inner surface 21a of the heat exchanger 21 and the inner wall 29 of the bell mouth 25 with implementing miniaturization of the unit case 11, and the ventilation resistance can be reduced.

[0149] Furthermore, according to the sixth embodiment, the frame plates 616A to 616C are provided so as to extend along the upper surface portion of the heat exchanger 21 and support the pair of motor support tables 17 for supporting the fan motor 23 of the outdoor fan 622, and the airflow deflecting plates 681 to 683 are fixed to the frame plates 616A to 616C, whereby the airflow deflecting plates 681 to 683 can be easily fixed.

[0150] The present invention is not limited to the above embodiments, and various modifications may be made to these embodiments. For example, in the sixth embodiment, the airflow deflecting plates 681 to 683 which are respectively fixed to the frame plates 616A to 616C are provided. However, the airflow deflecting plates 681 to 683 may be designed in a cylindrical shape, and fixed to the frame plates.

[0151] Furthermore, the airflow deflecting plates 681 to 683 are fixed to the fixing piece portions 616A1, 616B1

and 616C1 of the frame plates 616A to 616C. However, the airflow deflecting plates 681 to 683 may be fixed to other positions insofar as they are fixed to the frame plates 616A to 616C.

Claims

1. An outdoor unit for an air conditioner in which a pair of motor support tables are disposed at an upper portion of a housing, and an outdoor fan having a fan motor is supported on the pair of motor support tables, and air sucked from a side of the housing through a heat exchanger in the housing by the outdoor fan is upwardly blown out, **characterized in that** a rectifying unit for guiding airflow passing through the heat exchanger and reaching a lower surface portion of each of the pair of motor support tables to an outer radial direction of the outdoor fan is provided at at least one of lower and upper sides of each of the motor support tables, wherein the rectifying unit is configured to be uniformly upwardly sloped from an inside of the motor support table to an outside of the motor support table.
2. The outdoor unit for the air conditioner according to claim 1, wherein the rectifying unit has an upstream rectifying member provided at the lower side of each of the motor support tables.
3. The outdoor unit for the air conditioner according to claim 2, wherein each of the motor support tables is configured to have a substantially U-shaped section and disposed so that an opening of the U-shaped motor support table faces the lower side, and the upstream rectifying member is provided at the lower side of the motor support table so as to cover the opening.
4. The outdoor unit for the air conditioner according to claim 2 or 3, wherein the upstream rectifying member is configured to have a downwardly tapered and substantially triangular shape in section, and an apex of the triangular shape is located to be displaced to the fan motor side in the width direction of the motor support table.
5. The outdoor unit for the air conditioner according to any one of claims 2 to 4, wherein a lower end portion of the upstream rectifying member projects inwardly to a motor support side as compared with an inner surface of the motor support table.
6. The outdoor unit for the air conditioner according to any one of claims 2 to 4, wherein the upstream rectifying member comprises a center side rectifying member provided in the neighborhood of the fan motor and a side rectifying member adjacent to the cent-

er side rectifying member, and a lower end portion of the center side rectifying member projects inwardly to a motor support side as compared with an inner surface of the motor support table and is located to be nearer to the fan motor than a lower end portion of the side rectifying member.

7. The outdoor unit for the air conditioner according to any one of claims 2 to 4, wherein the rectifying unit further has a downstream rectifying member provided at the upper side of each of the motor support tables, and the downstream rectifying member is configured to guide airflow passing through a first space between the pair of motor support tables to the outer radial direction of the outdoor fan in accordance with airflow passing through second spaces at the outside of the pair of motor support tables. 10
8. The outdoor unit for the air conditioner according to claim 7, wherein the rectifying unit is configured to have a rhombic shape in section by the upstream rectifying member and the downstream rectifying member, and an upper end portion of the rhombic rectifying unit is directed upwardly and outwardly to a downstream side of the airflow. 20
9. The outdoor unit for the air conditioner according to claim 1, wherein the rectifying unit has a downstream rectifying member provided at the upper side of each of the motor support tables, and the downstream rectifying member is configured to guide airflow passing through a first space between the pair of motor support tables to the outer radial direction of the outdoor fan in accordance with airflow passing through second spaces at the outside of the pair of motor support tables. 30
10. The outdoor unit for the air conditioner according to claim 9, wherein the downstream rectifying member has a vertical plate portion extending upwardly along an outer surface of the motor support table, and a slope plate portion extending upwardly and outwardly from the inner surface of the motor support table to an upper end of the vertical plate portion. 40
11. The outdoor unit for the air conditioner according to any one of claims 9 and 10, wherein the downstream rectifying member is designed to have an upwardly tapered and substantially triangular shape in section, and an apex portion of the upper end of the downstream rectifying member is located to be displaced to an outer surface side of the housing in the width direction of the motor support table. 50
12. The outdoor unit for the air conditioner according to any one of claims 9 to 11, wherein the fan motor is fixed to the motor support table through a stay disposed on the upper surface of the motor support ta-

ble, and the downstream rectifying member is disposed integrally over both the sides of the stay in the longitudinal direction of the motor support table and has a cut-out portion through which the stay is upwardly exposed,

13. The outdoor unit for the air conditioner according to any one of claims 9 to 12, wherein the rectifying unit further has an upstream rectifying member provided at the lower side of each of the motor support tables.
14. An outdoor unit for an air conditioner that has a heat exchanger disposed on a bottom plate of a housing to form at least one side surface of the housing, an axial-flow type air blower disposed above the heat exchanger and a bell mouth provided around a propeller fan of the air blower, **characterized in that** the bell mouth is configured so that the inner peripheral surface thereof is outwardly larger in diameter than the inner surface 21A of the heat exchanger, and has airflow deflecting plates which are upwardly sloped from an upper end portion of the inner surface of the heat exchanger to the inner peripheral surface of the bell mouth.
15. The outdoor unit for the air conditioner according to claim 14, wherein the airflow deflecting plate is provided at a position lower than a tip portion of the propeller fan.
16. The outdoor unit for the air conditioner according to any one of claims 14 and 15, wherein the heat exchanger has a back surface portion and both side surface portions disposed along a back surface and both right and left side surfaces of the housing, and is configured to be substantially U-shaped in section, and the airflow deflecting plates are provided to the back surface portion and both the side surface portions of the heat exchanger.
17. The outdoor unit for the air conditioner according to any one of claims 14 to 16, further comprising a support frame that extends along an upper surface portion of the heat exchanger and supports the pair of motor support tables for supporting the fan motor of the airblower, wherein the airflow deflecting plate is fixed to the support frame.

FIG. 1

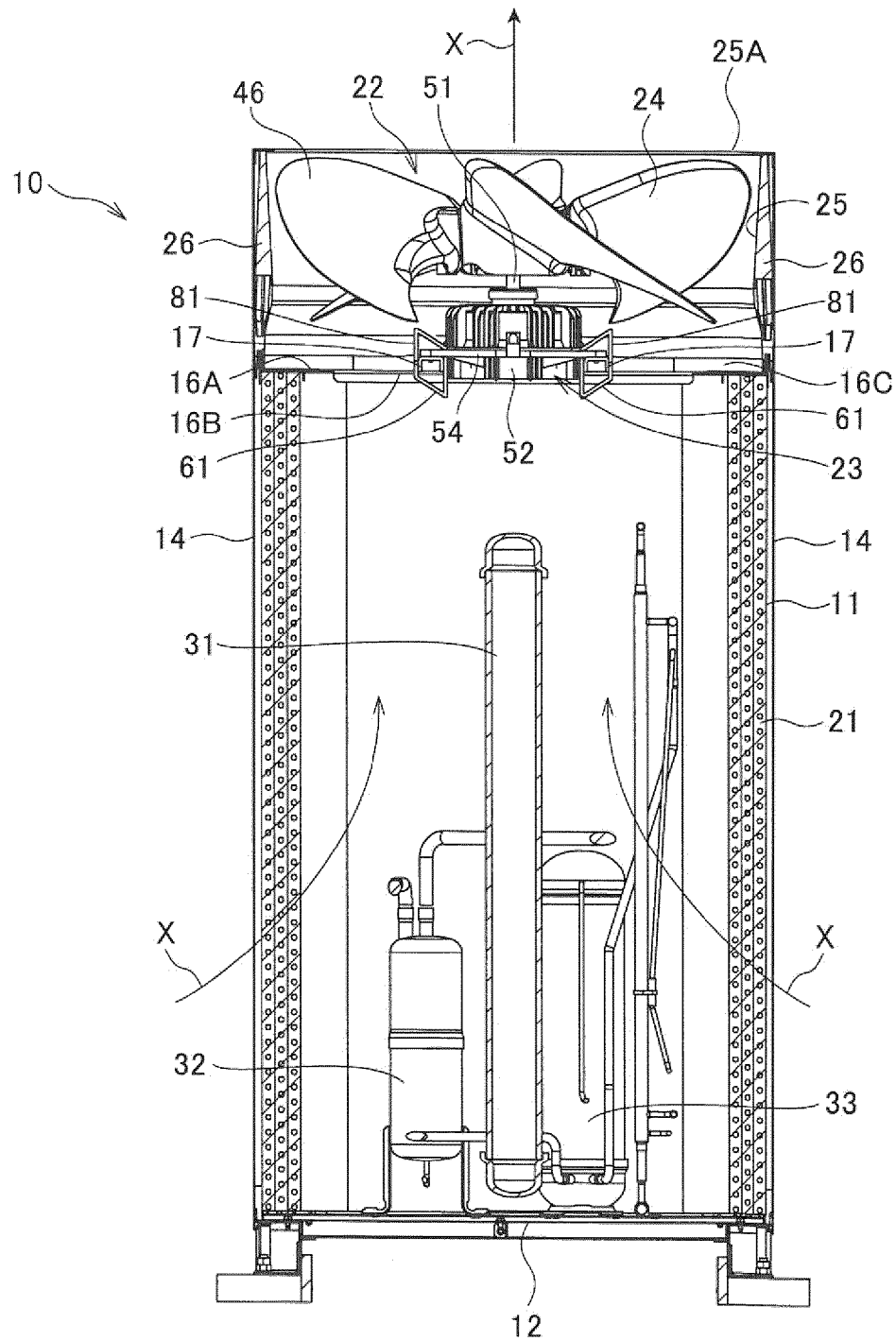
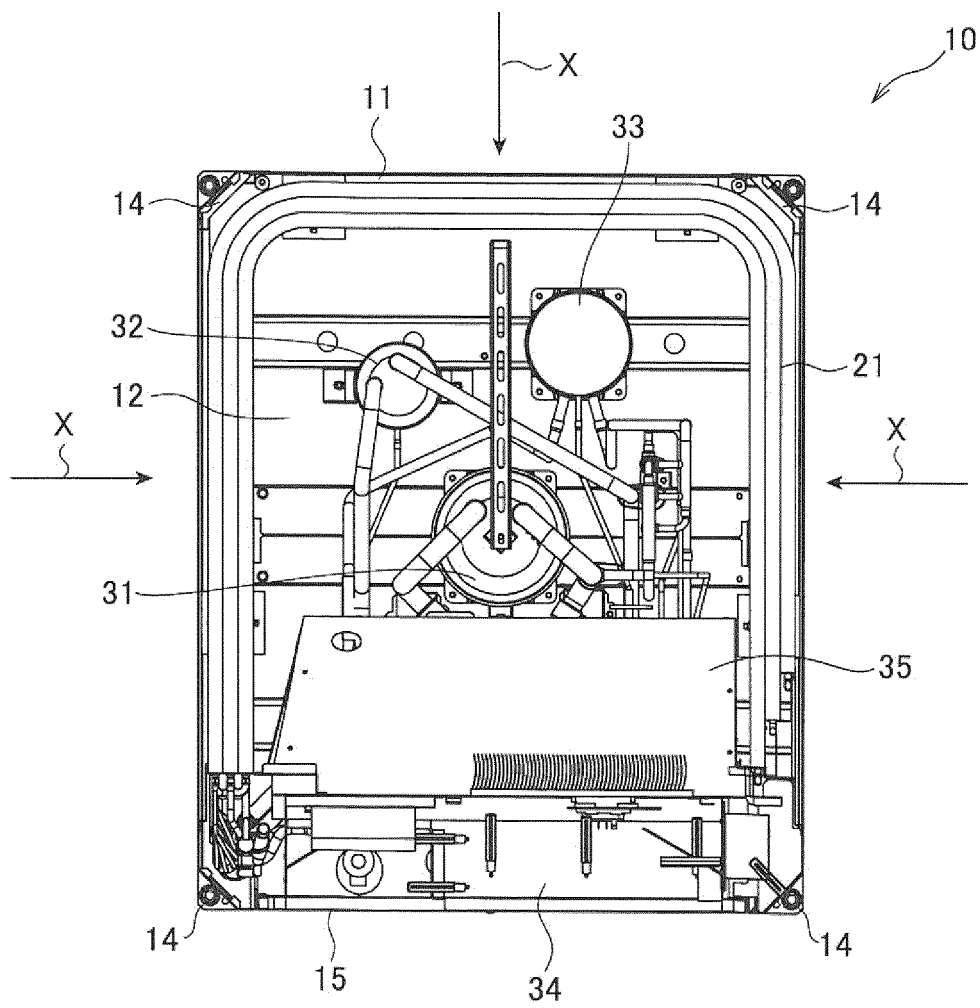


FIG.2



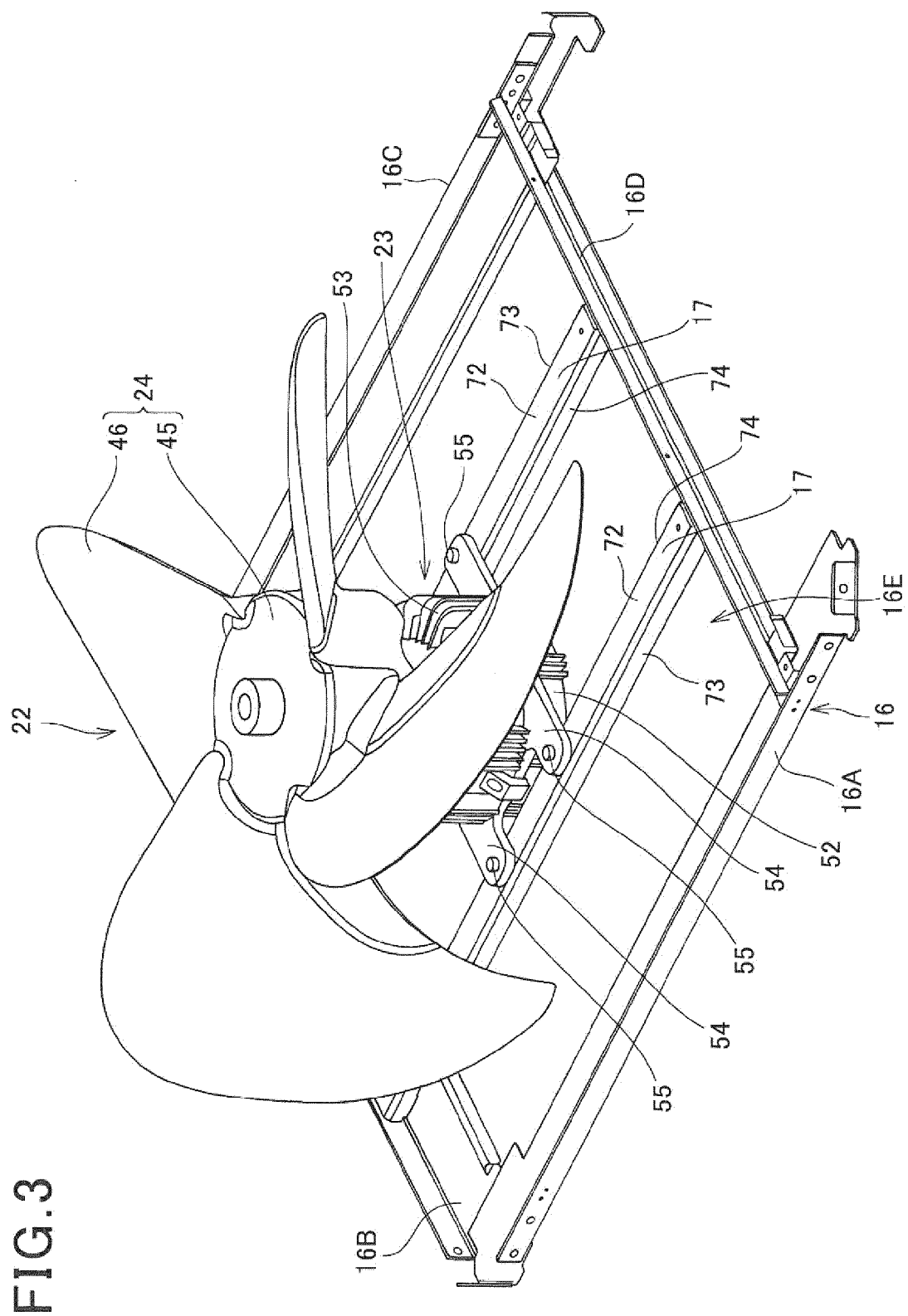


FIG. 4.

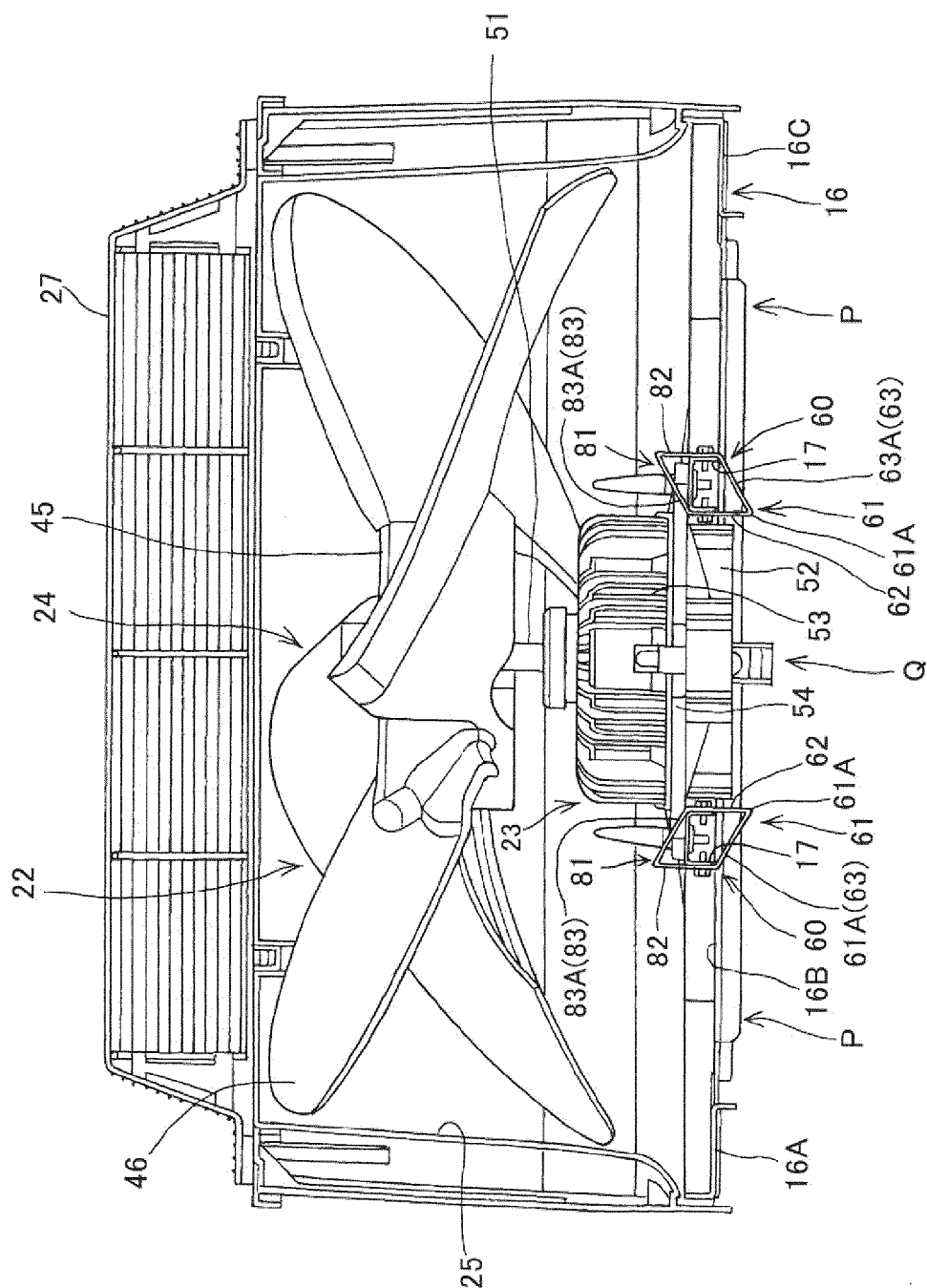


FIG.5

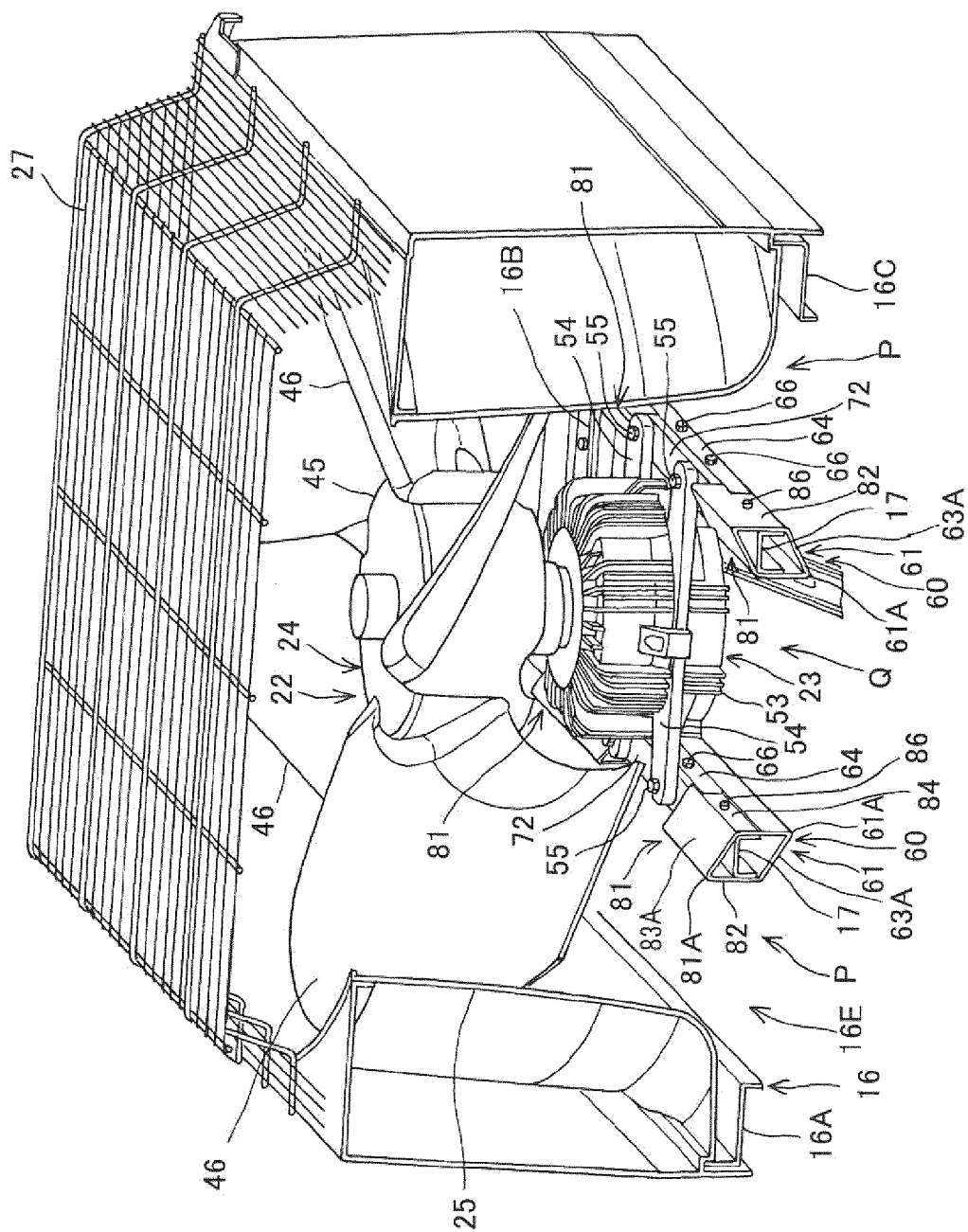


FIG.6

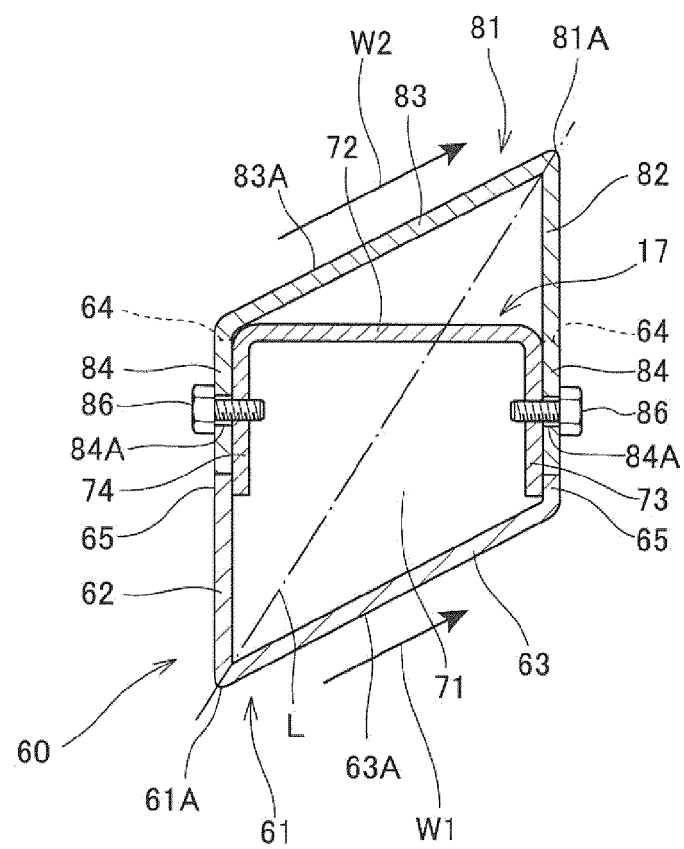


FIG. 7

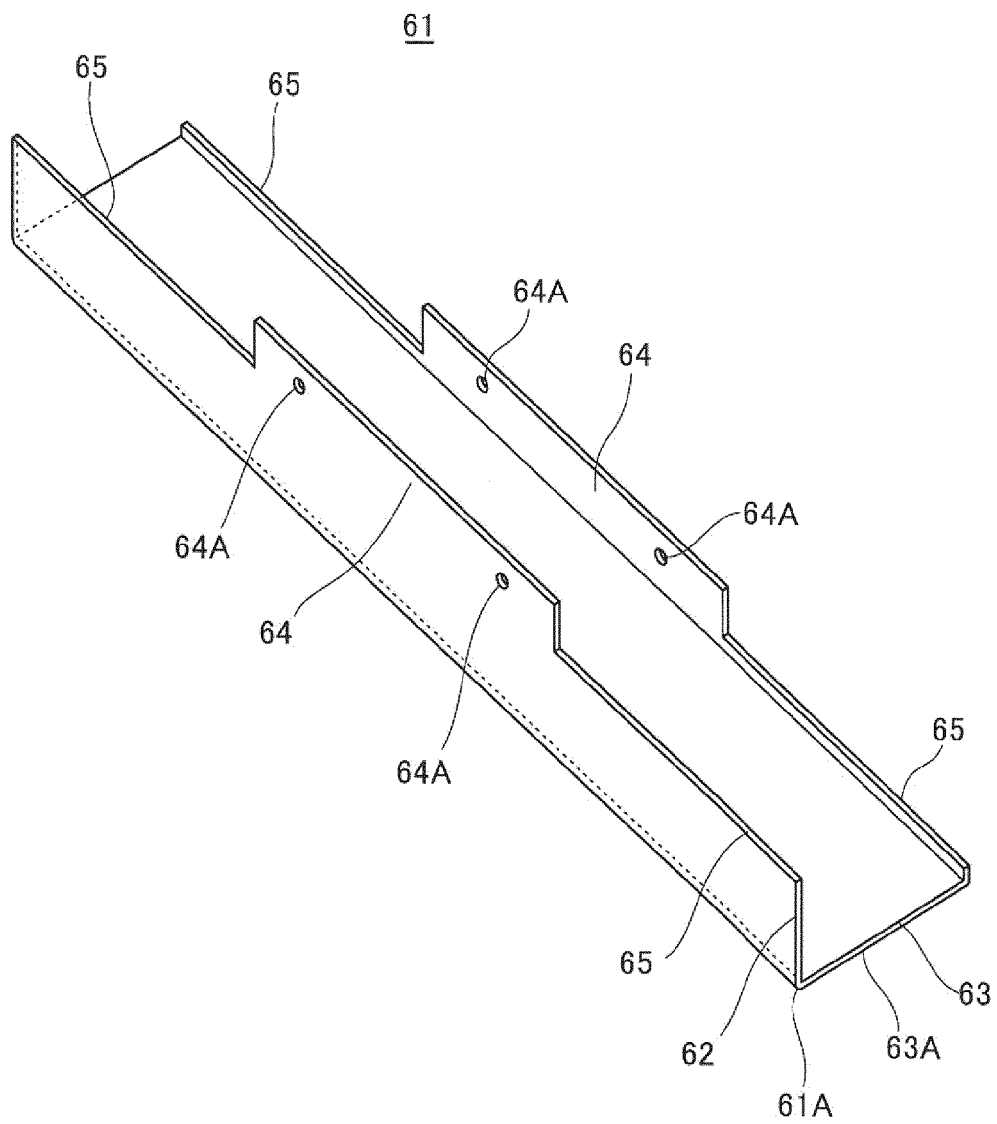


FIG.8

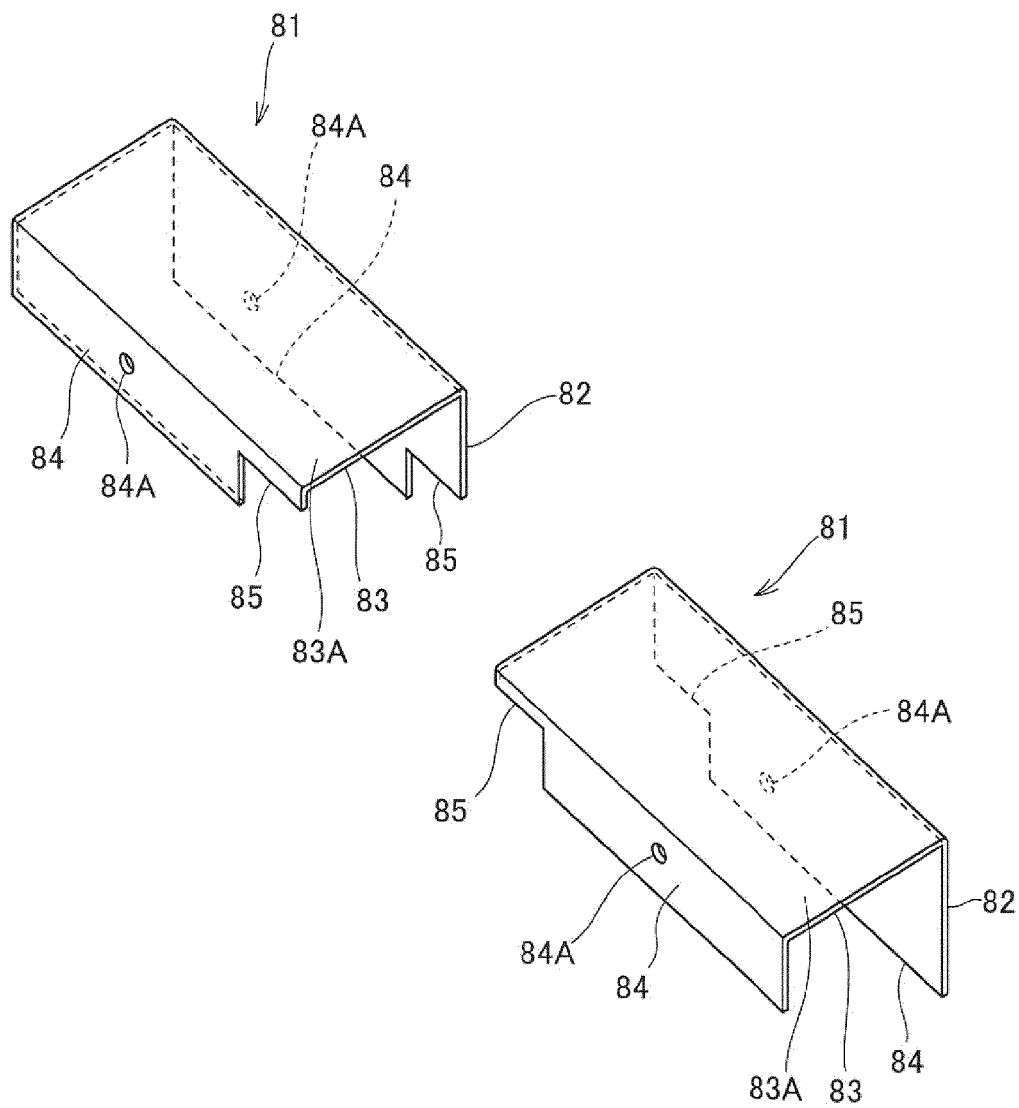


FIG.9

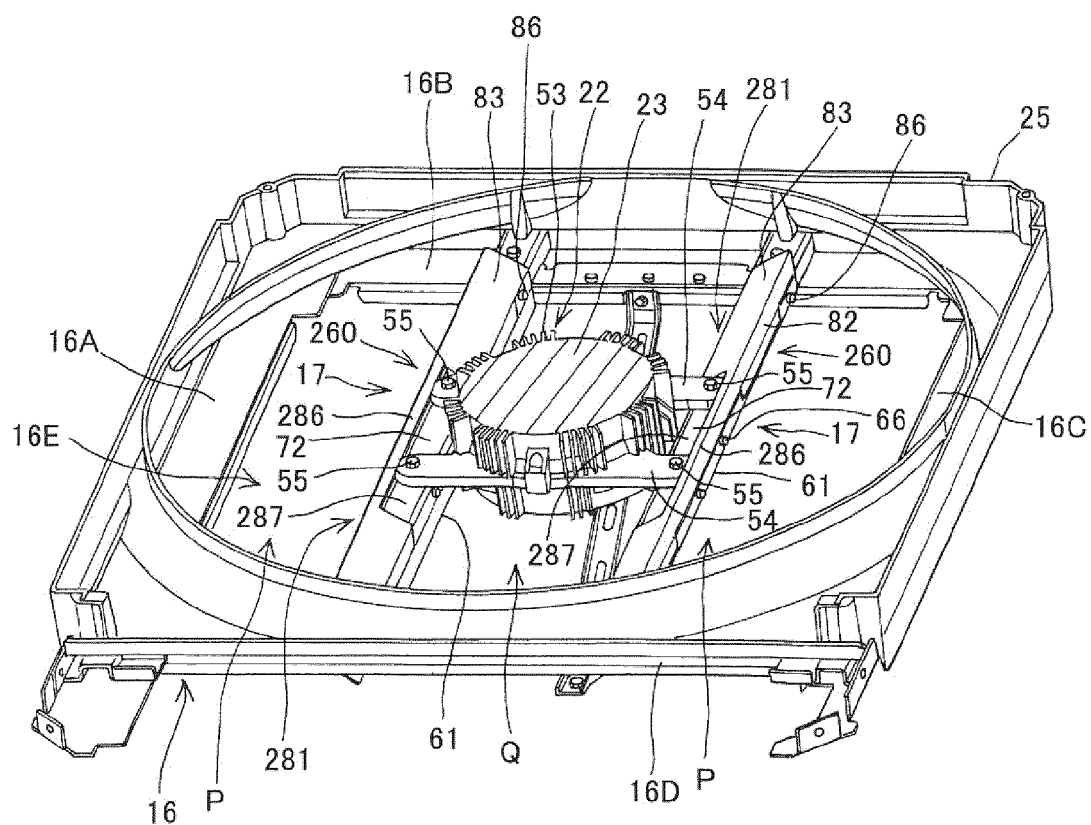
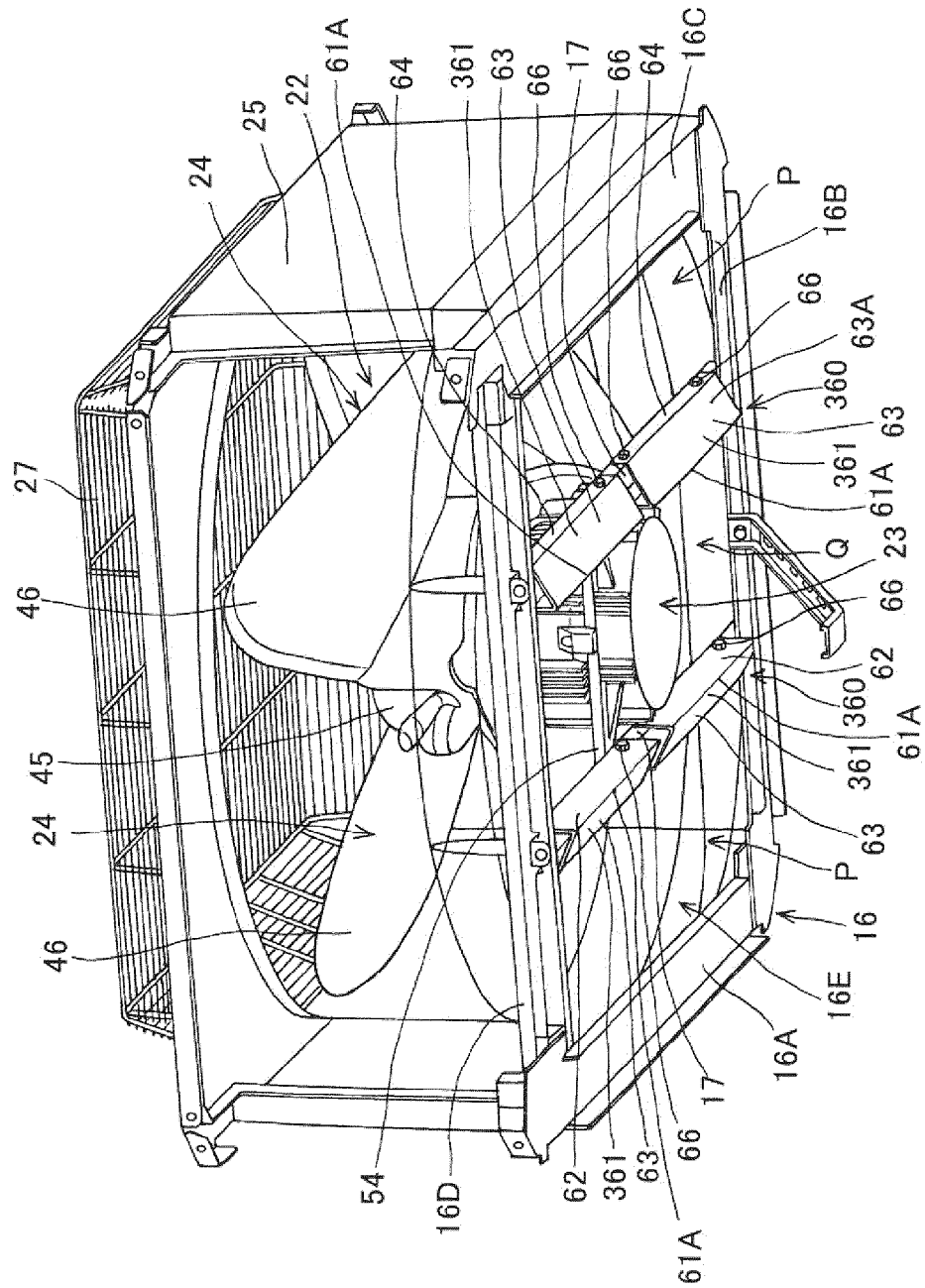


FIG.10



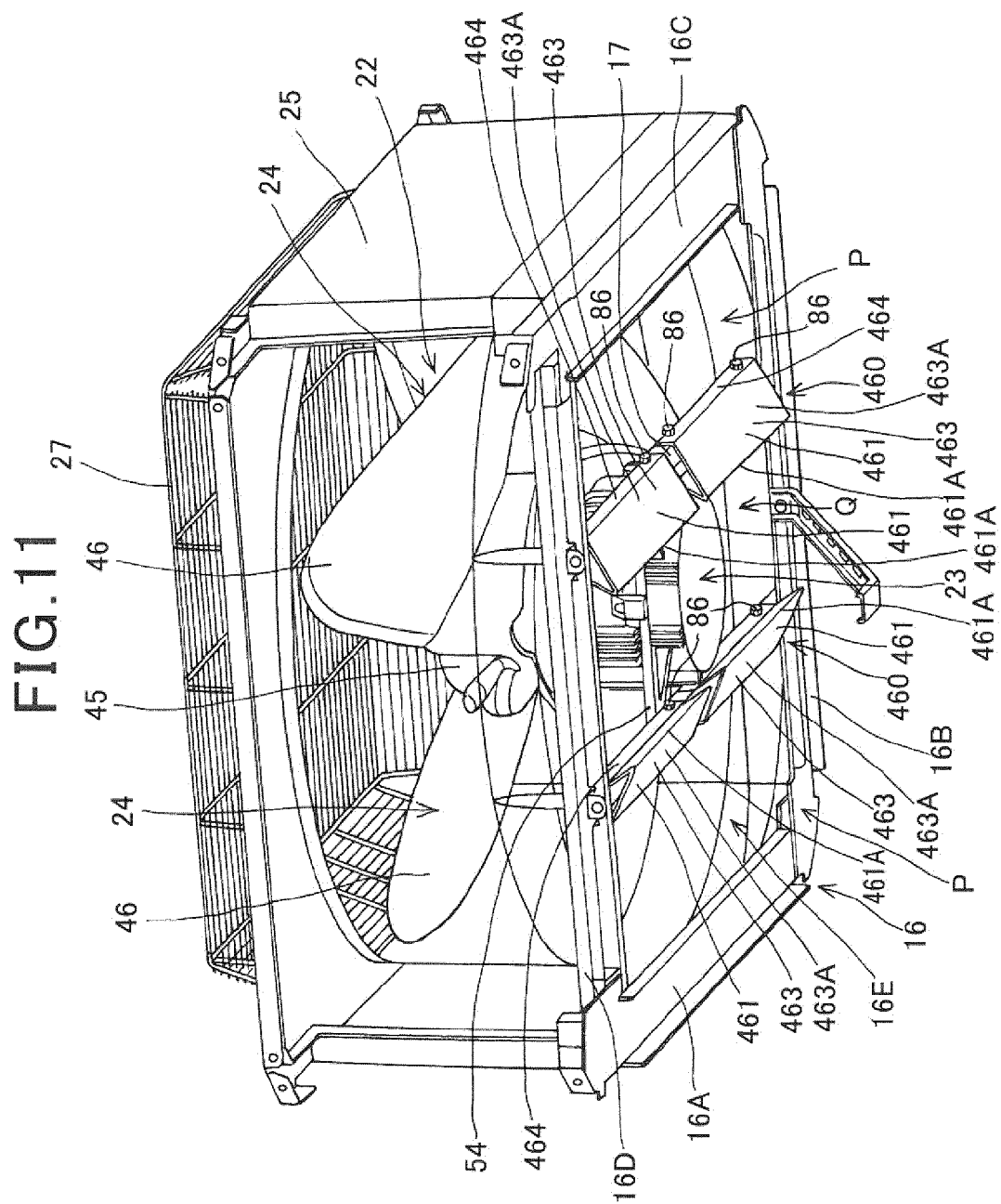


FIG.12

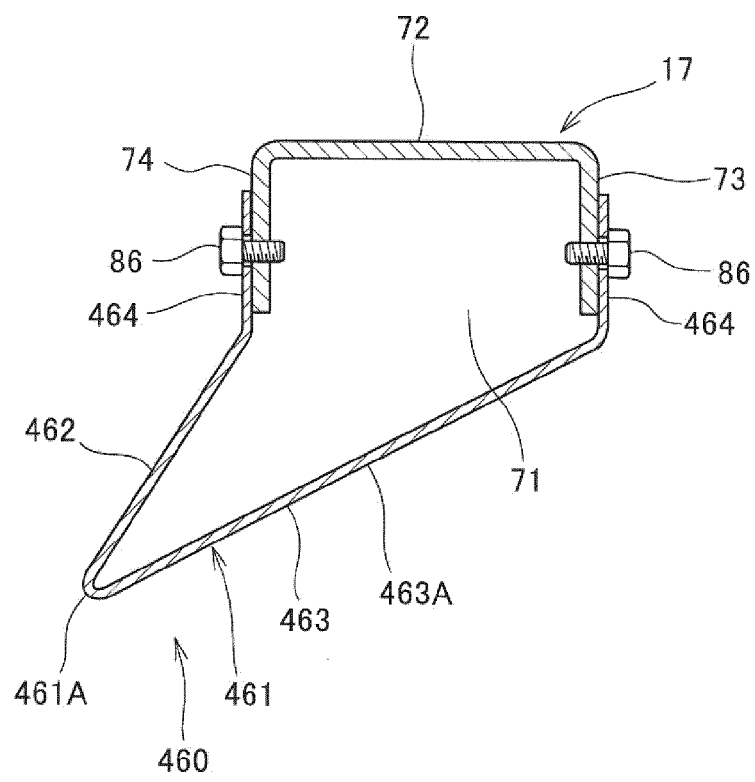


FIG.13

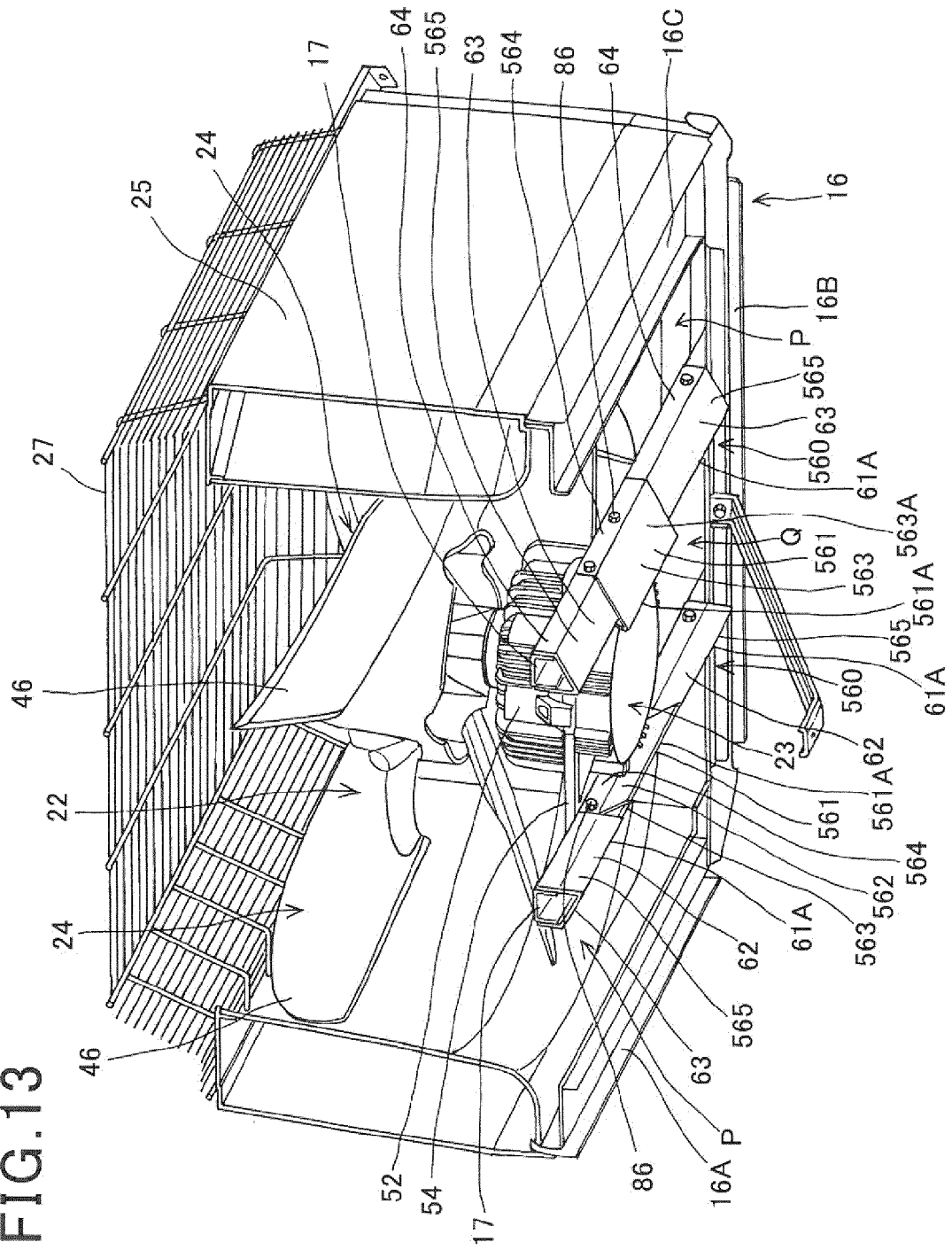


FIG.14

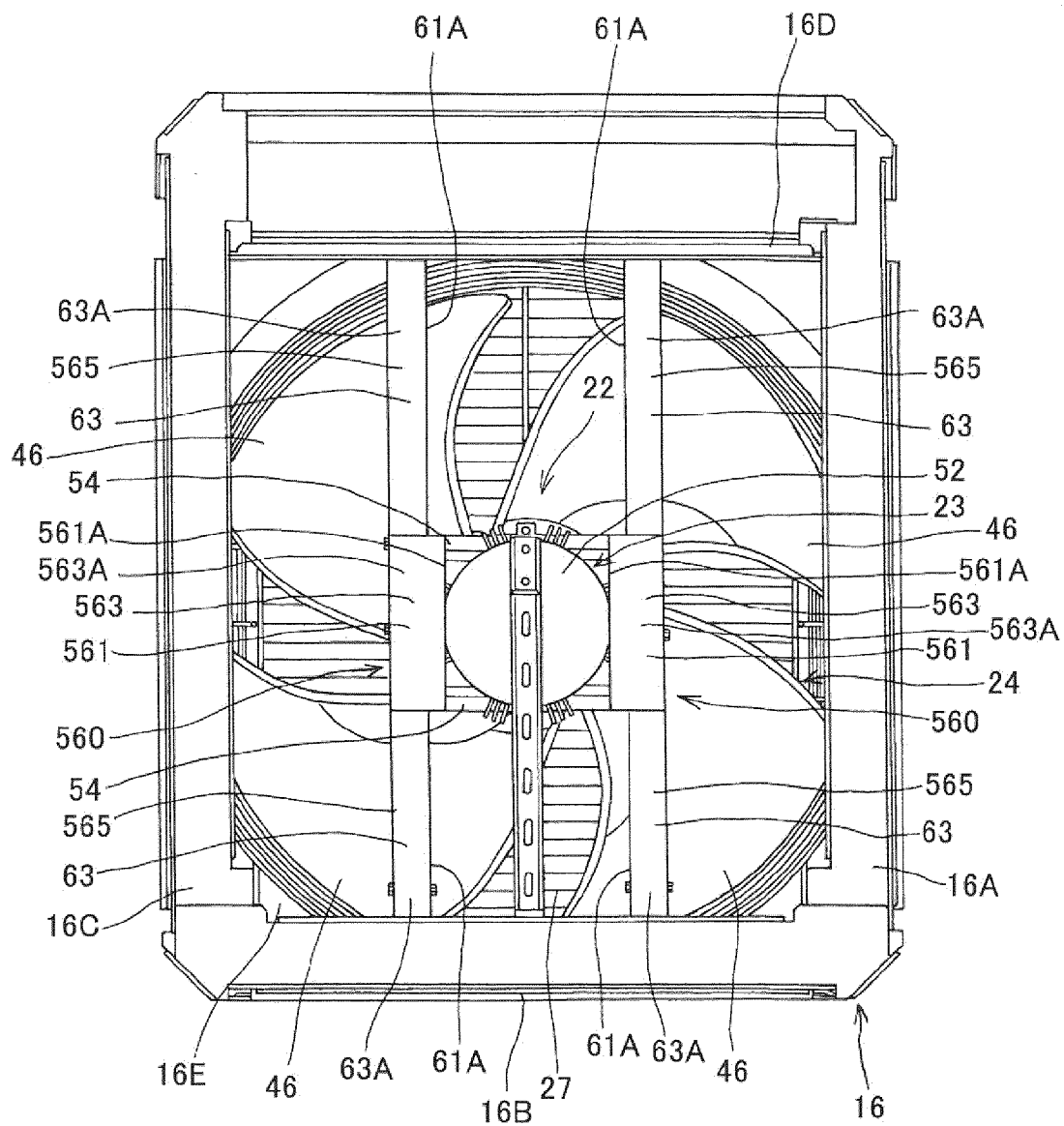


FIG.15

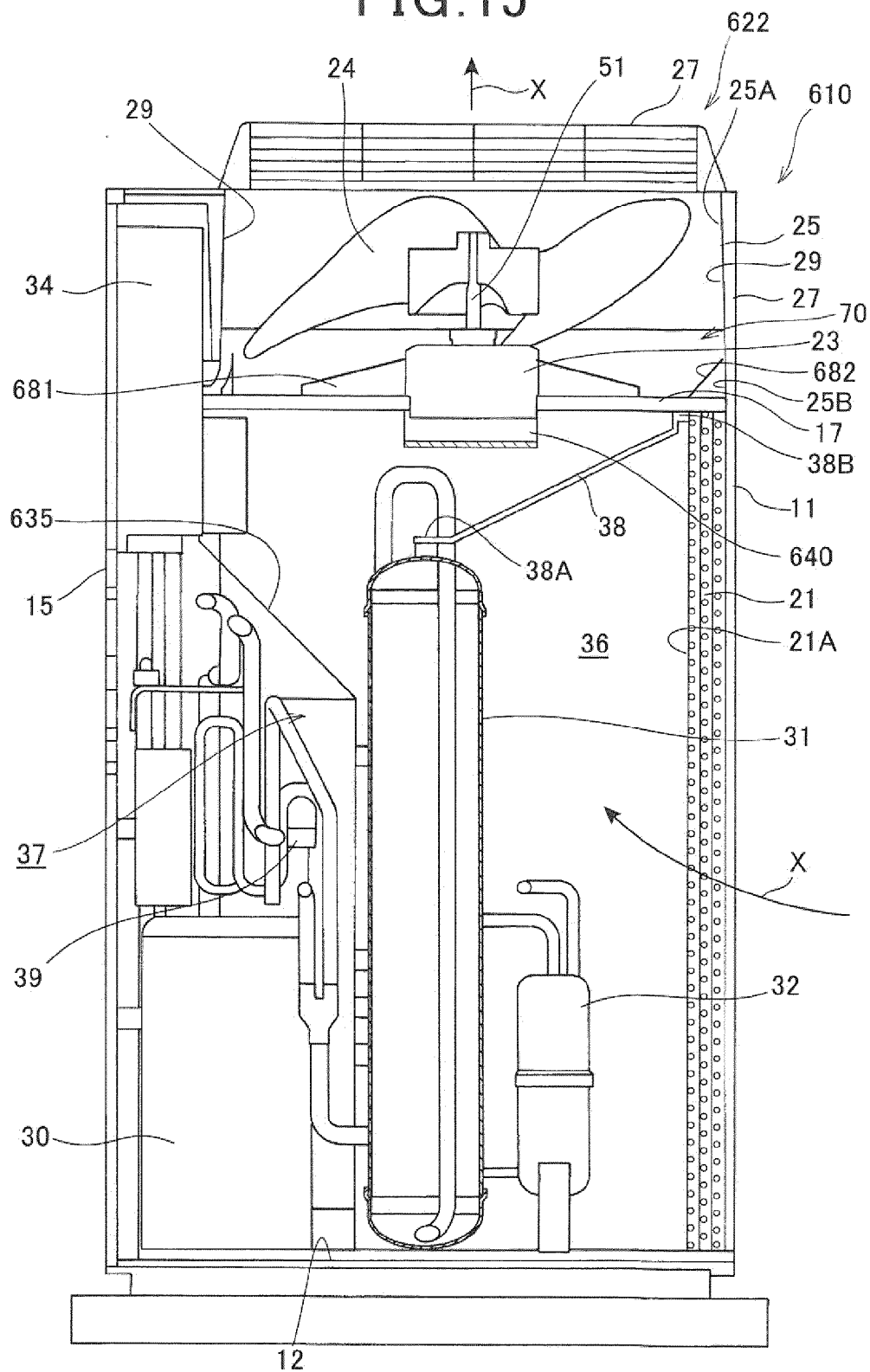
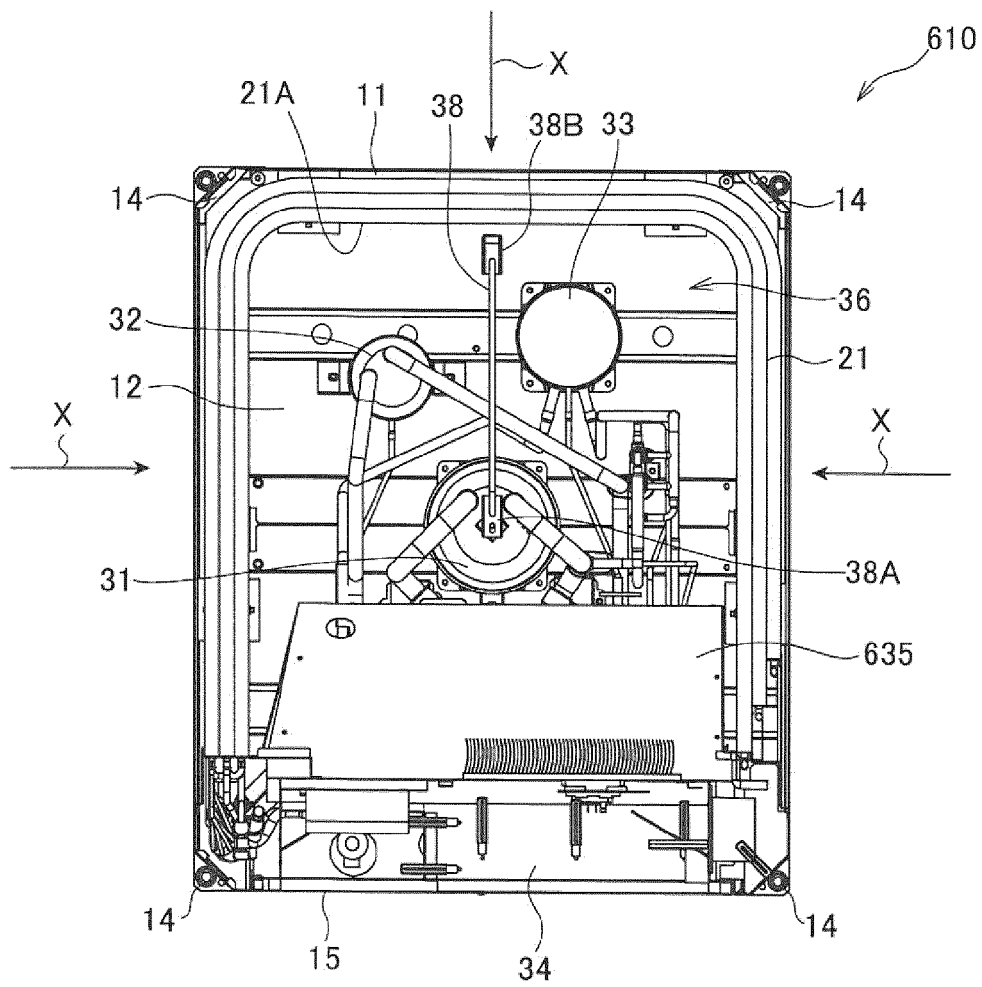


FIG.16



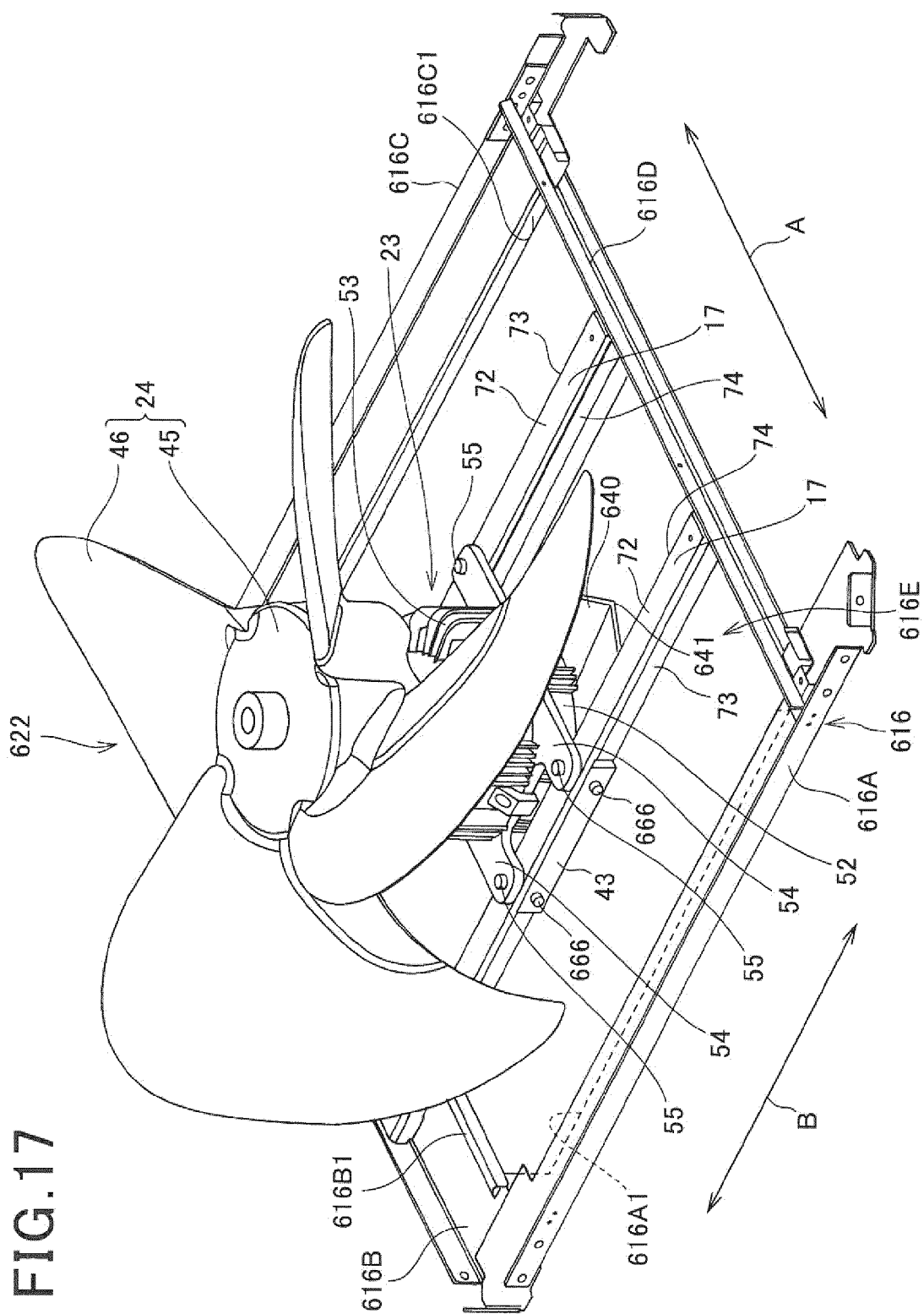


FIG.18

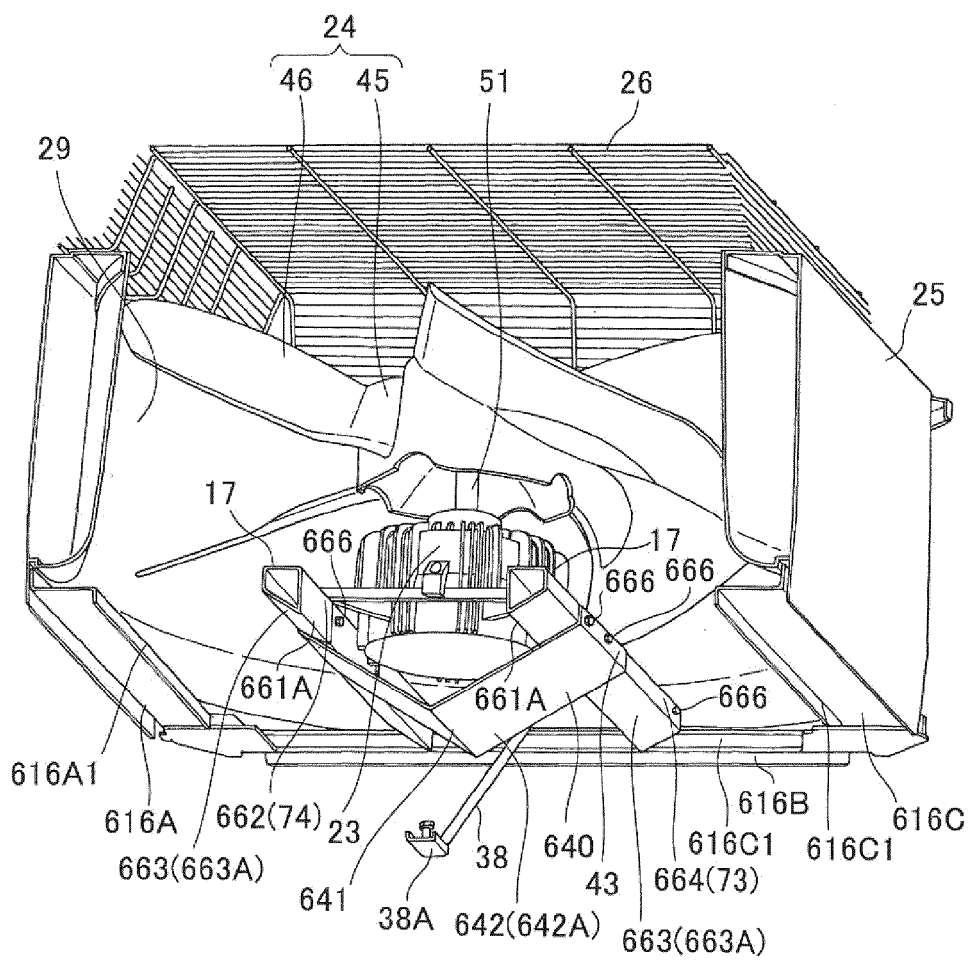


FIG.19

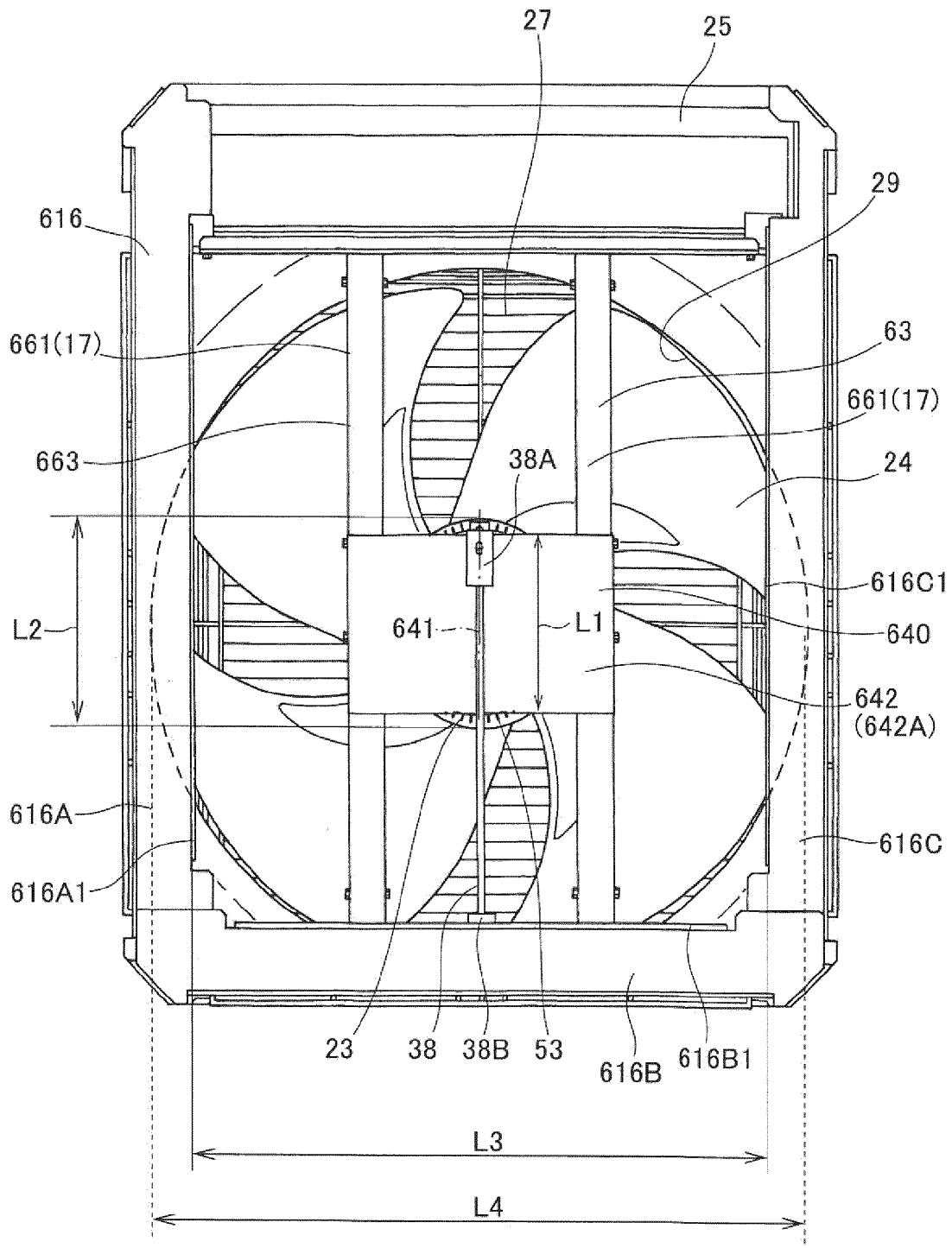


FIG.20

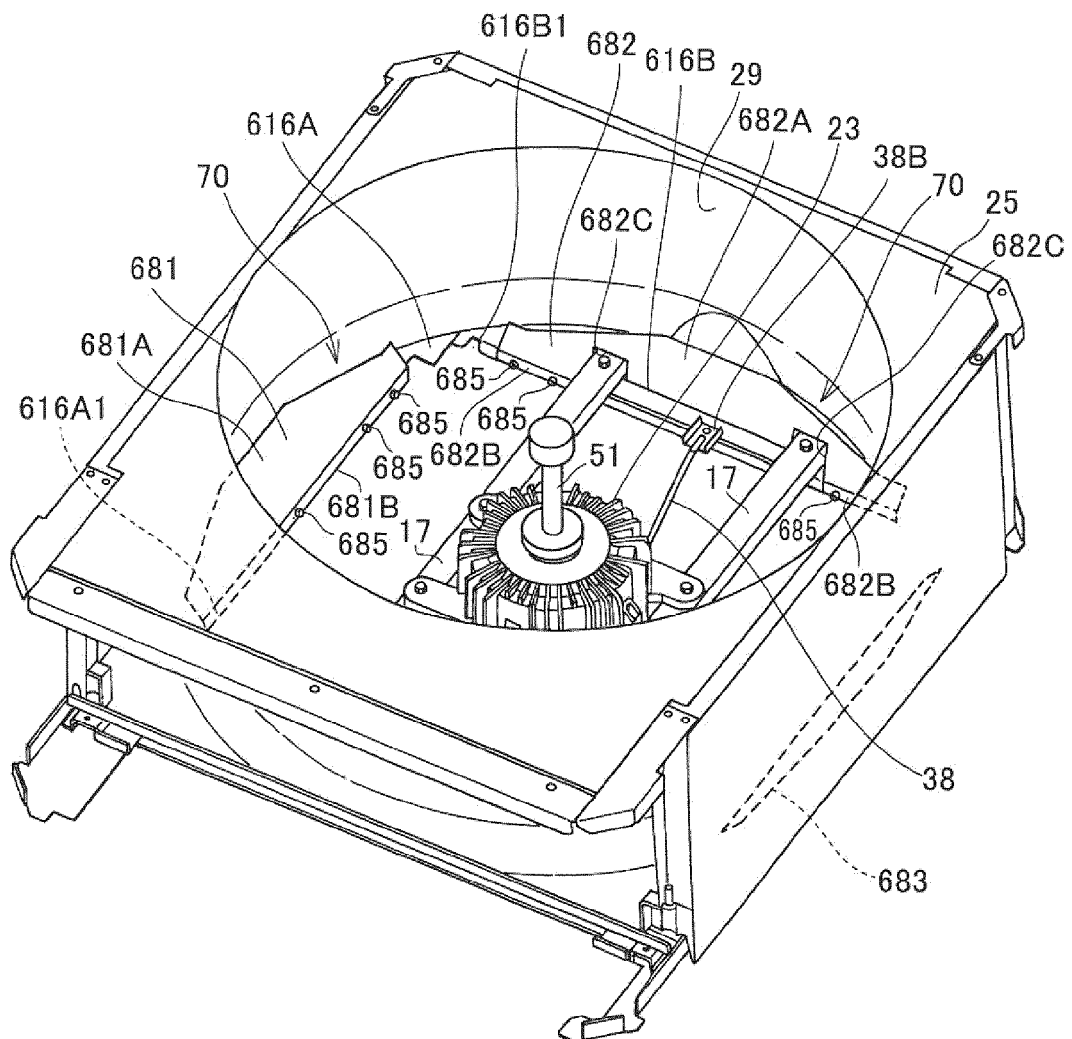
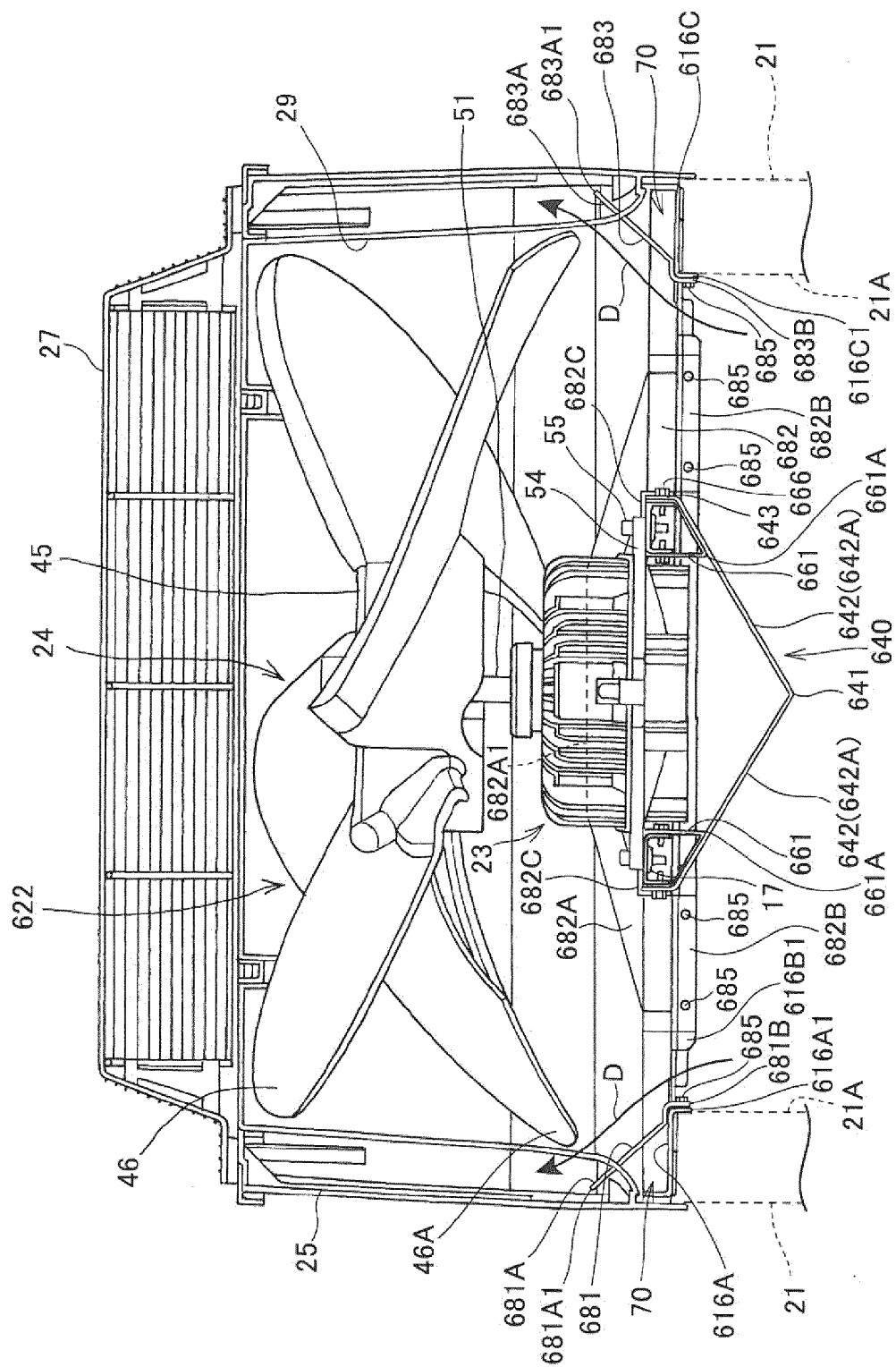


FIG. 21



REFERENCES CITED IN THE DESCRIPTION

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