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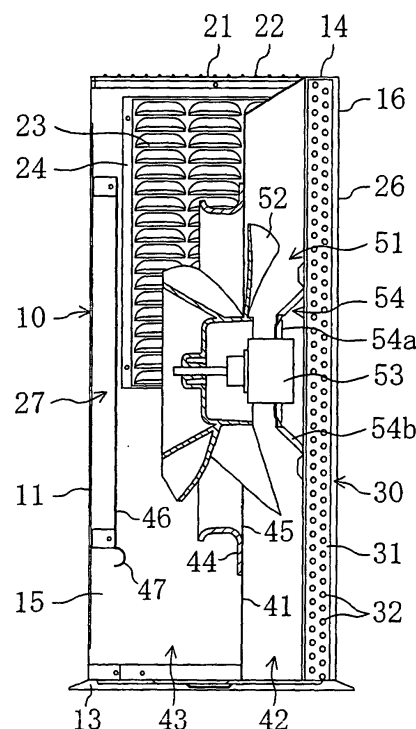
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(54) **OUTDOOR UNIT OF AIR CONDITIONER**

(57) A casing (10) includes a front-side part (16) in which is formed a suction inlet (26), a topside part (14) in which is formed a topside emission outlet (21), and a back plate (11). The casing (10) contains a heat exchanger (30) mounted in the suction inlet (26) and a mixed flow fan (51) made up of a fan motor (53) mounted on the side of a back surface of the heat exchanger (30) and a fan rotor (52) which is activated by the fan motor (53). The mixed flow fan (51) is mounted in such a way that the fan motor (53) is located on the front side of the fan rotor (52). Formed on the side of a back surface of the mixed flow fan (51) is an emission flow path (27) along which a part of air blown out of the mixed flow fan (51) flows between the mixed flow fan (51) and the back plate (11) of the casing (10) toward the topside emission outlet (21).

FIG. 2



Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner outdoor unit and more specifically to measures to deal with the flow of air emitted from a fan of such an air conditioner outdoor unit.

BACKGROUND ART

[0002] There is an air conditioner outdoor unit known in the prior art which includes a box-shaped casing, and the casing has an air suction inlet at the front and an air emission outlet at the top. One such air conditioner outdoor unit is disclosed in Japanese Patent Application *Kokai* Publication No. (2000)18649. This type of air conditioner outdoor unit includes an air conditioner outdoor unit that contains, in its casing, a heat exchanger at the front thereof and a fan disposed on the rear surface side of the heat exchanger, wherein air drawn in from the front of the casing is blown up to the top of the casing.

[0003] In the above-described outdoor unit, the heat exchanger is located interior to the air suction inlet formed at the front of the casing, and the fan is at the back of the heat exchanger. The fan comprises a fan rotor and a drive motor disposed on the rear surface side of the fan, wherein the fan rotor is supported on a motor shaft of the drive motor. The drive motor is secured, via a motor stand, to a back plate of the casing. Formed between the fan and the back plate of the casing is an air flow path along which air emitted from the fan flows from bottom to top.

PROBLEMS TO BE SOLVED

[0004] In the above-described outdoor unit, air emitted from the fan flows along the air flow path from bottom to top and is discharged to the outside through the air emission outlet formed in the top. Since the drive motor lies in the air flow path, this causes air emitted to below the drive motor to pass through the periphery of the drive motor and through the periphery of the motor stand. Consequently, the drive motor and the motor stand contribute to the turbulence of the flow of air. In the air flow path, the drive motor and the motor stand become obstacles to a current of air emitted from the fan. This gives rise to problems, such as an increase in noise and a decrease in air supplying volume.

[0005] In the light of these problems with the prior art techniques, the present invention was made. Accordingly, an object of the present invention is to reduce resistance to the flow of air emitted from the fan and moving along an air flow path.

DISCLOSURE OF INVENTION

[0006] The present invention employs an arrangement in which a drive motor (53) is disposed on the front side of a fan rotor (52).

[0007] More specifically, a first problem solving means is directed to an air conditioner outdoor unit that comprises a casing (10) including a front-side part (16) in which is formed an air suction inlet (26) and a top-side part (14) in which is formed an air emission outlet (21), a heat exchanger (30) mounted in the air suction inlet (26) of the casing (10), and a fan (51) mounted on the side of a rear surface of the heat exchanger (30) and including a drive motor (53) and a fan rotor (52) which is activated by the drive motor (53), and an emission flow path (27) is formed along which a part of air emitted from the fan (51) flows between the fan (51) and a back plate (11) of the casing (10) toward the air emission outlet (21) on the side of a rear surface of the fan (51). The fan (51) is mounted in such a way that the drive motor (53) is located nearer to the front-side part (16) than the fan rotor (52).

[0008] Further, in a second problem solving means according to the first problem solving means, a tube plate (35) for the securing of a heat transfer tube (32) of the heat exchanger (30) is provided and the drive motor (53) is secured, via a motor stand (54), to the tube plate (35).

[0009] Further, in a third problem solving means according to the first problem solving means the fan (51) is a mixed flow fan.

[0010] Further, in a fourth problem solving means according to the third problem solving means, a guide plate (46), for guiding air emitted downward from the fan (51) in such a way that the emitted air flows upward along the back plate (11), is mounted in parallel with the back plate (11) in the emission flow path (27).

[0011] Finally, in a fifth problem solving means according to the third problem solving means, the fan (51) serves as a first fan and a second fan (55) is disposed above the first fan (51), and a guide plate (46), for guiding air emitted downward from the first fan (51) so that the emitted air flows upward along the back plate (11), is mounted in parallel with the back plate (11) in the emission flow path (27) between the first fan (51) and the back plate (11) of the casing (10), and a flow path separating plate (48), for the separation of a first flow path (27a) for air emitted from the first fan (51) and flowing upward and a second flow path (27b) for air emitted from the second fan (55), is disposed on the side of a rear surface of the second fan (55).

[0012] In the first problem solving means, air is drawn into the casing (10) through the air suction inlet (26) formed in the front-side part (16) of the casing (10), when the fan rotor (52) is activated by the drive motor (53). The air drawn into the casing (10) passes through the heat exchanger (30) and then passes through the periphery of the drive motor (53). Thereafter, the air is

emitted from the fan (51) and becomes a blowoff. A part of the air flows upward along the emission flow path (27) between the fan (51) and the back plate (11) of the casing (10) and is discharged to the outside through the air emission outlet (21) formed in the topside part (14) of the casing (10).

[0013] In the second problem solving means according to the first problem solving means, air drawn into the casing (10) through the air suction inlet (26) passes through the heat exchanger (30). After having passed through the heat exchanger (30), the air passes through the periphery of the motor stand (54) and through the periphery of the drive motor (53) and is emitted by the fan (51).

[0014] In the third problem solving means according to the first problem solving means, the air, after having passed through the heat exchanger (30), passes through the periphery of the drive motor (53). Thereafter, the direction of flow of the air is changed by the mixed flow fan (51) and, as a result, is so emitted as to expand in a radial pattern. Air emitted downward from the mixed flow fan (51) flows upward along the emission flow path (27) between the mixed flow fan (51) and the back plate (11) of the casing (10) and is discharged to the outside through the air emission outlet (21).

[0015] In the fourth problem solving means, air emitted upward from the fan (51) is discharged to the outside through the air emission outlet (21) without flowing between the back plate (11) and the guide plate (46). On the other hand, air emitted downward from the fan (51) is so guided by the guide plate (46) as to flow upward through the emission flow path (27) along the back plate (11) and is discharged to the outside through the air emission outlet (21).

[0016] In the fifth problem solving means according to the third solving means, air is drawn into the casing (10) through the air suction inlet (26) when both the fans (51, 55) are activated by the drive motors (53), then passes through the heat exchanger (30), and thereafter passes through the periphery of the drive motor (53). Air emitted downward from the first fan (51) is guided by the guide plate (46) and flows upward in the emission flow path (27) along the back plate (11). And, the air flows along the first flow path (27a) between the flow path separating plate (48) and the back plate (11) and is discharged to the outside through the air emission outlet (21). On the other hand, air emitted upward from the first fan (51) flows upward on the rear surface side of the second fan (55). And, the air flows along the first flow path (27a) between the flow path separating plate (48) and the back plate (11) and is discharged to the outside through the air emission outlet (21).

[0017] On the other hand, air emitted from the second fan (55) flows along the second flow path (27b) and is discharged to the outside through the air emission outlet (21). In other words, air emitted from the second fan (55) and air emitted from the first fan (55) and flowing upward flow separately, whereby these two air flows will ad-

vance smoothly without interference.

EFFECTS OF INVENTION

[0018] In accordance with the above-described problem solving means, the drive motor (53) is located nearer to the front-side part (16) than the fan rotor (52), so that there is no obstacle to a current of air emitted from the fan (51) in the emission flow path (27). This accordingly allows the air emitted from the fan (51) to smoothly flow along the emission flow path (27) between the fan (51) and the back plate (11) because the drive motor (53) is not an obstacle. As the result of this, it becomes possible to eliminate noise generated by the drive motor (53) becoming resistance and the volume of air emission from the fan (51) is increased. Additionally, since air is discharged from the topside of the casing (10), this prevents the occurrence of short circuiting causing once-discharged air to be redrawn into the casing (10), when the outdoor unit (10) is installed with its backside fitted closely to a house wall or the like.

[0019] In accordance with the second problem solving means, the drive motor (53) is fixed by the tube plate (35), thereby ensuring that the drive motor (53) is fixed firmly even when the heat exchanger (30) is disposed at the front.

[0020] In accordance with the third problem solving means, the fan (51) is implemented by a mixed flow fan, so that the width of the emission flow path (27) between the back plate (11) and the mixed flow fan (51) can be made narrower in comparison with the case where the fan (51) is implemented by an axial flow fan. This makes it possible to provide an outdoor unit of smaller depth. Furthermore, it is possible to increase the volume of air drawn into the casing (10) in comparison with the case where the fan (51) is implemented by a centrifugal fan.

[0021] In accordance with the fourth problem solving means, it is arranged such that the guide plate (46) for the guiding of air emitted downward from the fan (51) is provided. As a result of such arrangement, the emitted air is allowed to smoothly flow into between the guide plate (46) and the back plate (11) of the casing (10) as well as to smoothly flow upward. As the result of this, the volume of air emission from the fan (51) is increased.

[0022] In accordance with the fifth problem solving means, it is arranged such that the two fans (51, 55) are disposed one above the other. As the result of such arrangement, it becomes possible to increase the volume of air emission without having to increase the area required for installing an air conditioner outdoor unit. Additionally, the provision of the guide plate (46) makes it possible to allow air emitted downward from the first fan (51) to smoothly flow into between the guide plate (46) and the back plate (11) of the casing (10) and to smoothly flow upward. As the result of this, the volume of air emission from the first fan (51) is increased. Furthermore, it is arranged such that the first flow path (27a) along which air emitted from the first fan (51) flows up-

ward and the second flow path (27b) along which air emitted from the second fan (55) flows are separated from each other. As the result of such arrangement, these flows of air emitted respectively from the fans (51, 55) will not interfere with each other and therefore advance smoothly. Accordingly, the volume of air emission from each fan (51, 55) is increased.

BRIEF DESCRIPTION OF DRAWINGS

[0023]

Figure 1 is a perspective illustration of an air conditioner outdoor unit according to a first embodiment of the present invention;

Figure 2 is a cross sectional view of the air conditioner outdoor unit taken along line A-A of Figure 1; Figure 3 is a partial perspective illustration depicting a heat exchanger, a motor stand and a partitioning plate in the first embodiment;

Figure 4 is a perspective illustration of an air conditioner outdoor unit according to a second embodiment of the present invention; and

Figure 5 is a cross sectional view of the air conditioner outdoor unit taken along line C-C of Figure 4.

BEST MODE FOR CARRYING OUT INVENTION

[0024] Hereinafter, embodiments of the present invention will be described in detail with reference to the drawing figures.

EMBODIMENT 1

[0025] As shown in Figure 1, an air conditioner outdoor unit according to a first embodiment of the present invention is shaped like a box. Figure 1 is a perspective illustration of the outdoor unit when viewed from the backside thereof.

[0026] The outdoor unit comprises a casing (10) which is a rectangular parallelepiped box. A large number of vertical grooves (12) for the purpose of reinforcement are formed in a back plate (11) of the casing (10). Additionally, a pair of installation legs (13) are mounted at the bottom of the casing (10).

[0027] Formed in a topside part (14) of the casing (10) is a topside emission outlet (21) of square shape serving as an air emission outlet. The topside emission outlet (21) is formed into a rectangular shape the length of whose long sides is slightly shorter than the lateral width of the casing (10) and the length of whose short sides is somewhat shorter than the depth of the casing (10). Additionally, a lattice emission grill (22) is mounted all over the topside emission outlet (21), in other word the topside emission outlet (21) is covered with the grill (22).

[0028] Formed in an upper portion of one of side parts (15) of the casing (10) is a side emission outlet (23) of square shape. The side emission outlet (23) is opened

in a side part (15) positioned on the left-hand side when viewed from the backside of the casing (10). The side emission outlet (23) is formed into a rectangular shape the length of whose long sides is about half of the height of the casing (10) and the length of whose short sides is slightly shorter than the depth of the casing (10). Additionally, an emission louver (24) is mounted all over the side emission outlet (23), in other words the side emission outlet (23) is covered with the louver (24).

[0029] A suction inlet (26) of square shape serving as an air suction inlet is formed in a front-side part (16) of the casing (10) (see Figures 1 and 2). The suction inlet (26) is formed into a square or rectangular shape slightly smaller than the front-side part (16) of the casing (10).

[0030] A partitioning plate (41) is mounted in the casing (10). The partitioning plate (41) divides the interior space of the casing (10) into an upstream chamber (42) and a downstream chamber (43). The upstream chamber (42) is defined on the side of the front-side part (16) of the casing (10). The upstream chamber (42) is brought into communication with outside the casing (10) by the suction inlet (26). On the other hand, the downstream chamber (43) is defined on the side of the back plate (11) of the casing (10). The downstream chamber (43) is brought into communication with outside the casing (10) by the topside emission outlet (21) and by the side emission outlet (23).

[0031] As shown in Figure 2, a heat exchanger (30) is mounted in the suction inlet (26) opened in the front-side part (16). The heat exchanger (30) is mounted all over the suction inlet (26). The heat exchanger (30), made up of a large number of fins (31) arrayed at predetermined pitches and a heat transfer tube (32) penetrating through the fins (31), constitutes a so-called cross fin type fin and tube heat exchanger. Additionally, the entire heat exchanger (30) is shaped like a flat plate.

[0032] A bell-mouth (44) is mounted centrally in the partitioning plate (41). The bell-mouth (44) forms a circular opening part (45), and the upstream chamber (42) and the downstream chamber (43) are brought into communication with each other via the opening part (45).

[0033] Mounted, coaxially with the bell-mouth (44), in the inside of the casing (10) is a fan (51). The fan (51), made up of a fan rotor (52) and a fan motor (53) which is a drive motor, constitutes a mixed flow fan. The fan (51) is disposed in such a way that the fan motor (53) is located nearer to the front-side part (16) of the casing (10) than the fan rotor (52).

[0034] The fan motor (53) of the fan (51) is secured firmly to a motor stand (54). The motor stand (54) is made up of a main body part (54a) of rectangular shape and four leg parts (54b) extending respectively from four corners of the main body part (54a).

[0035] An emission flow path (27) is formed along which a part of air emitted from the fan (51) flows between the fan (51) and the back plate (11) of the casing (10) toward the emission outlets (21, 23) in the down-

stream chamber (43) of the casing (10). In the emission flow path (27), the air emitted downward from the fan (51) flows upward.

[0036] The emission flow path (27) is provided with a separator plate (46) which acts as a guide plate. The separator plate (46) is a square thin plate slightly larger than the fan rotor (52). The separator plate (46) is mounted in parallel with the back plate (11) at a distance from the back plate (11) of the casing (10). The separator plate (46) is secured firmly to the back plate (11).

[0037] The separator plate (46) guides a current of air emitted downward from the fan (51) so that the air flows upward along the back plate (11) of the casing (10). The separator plate (46) is mounted such that its lower end is located at a predetermined position. The position of the lower end of the separator plate (46) is adjusted such that air emitted downward from the fan (51) smoothly flows into between the separator plate (46) and the back plate (11). Stated another way, if the lower end position of the separator plate (46) is situated too low, then the separator plate (46) becomes resistance against air flowing into between the separator plate (46) and the back plate (11). On the other hand, if the lower end position of the separator plate (46) is situated too high, then the separator plate (46) fails to guide air to flow between itself and the back plate (11). Accordingly, the separator plate (46) is mounted such that its lower end is situated at a predetermined position.

[0038] A semi circular arc part (47) projecting in a semi circular arc pattern toward the partitioning plate (41) is formed at the lower end of the separator plate (46) over the full width of the separator plate (46).

[0039] As shown in Figure 3, end tube plates (34) and central tube plates (35) are mounted on the heat exchanger (30), wherein the end tube plates (34) mounted on right and left ends of the heat exchanger (30) and the central tube plates (35) mounted substantially centrally in the heat exchanger (30) extend from the bottom to the top of the heat exchanger (30). At the both ends of the heat exchanger (30), the heat transfer tube (32) passes through the end tube plates (34) and is fixed thereby.

[0040] The number of the central tube plates (35) mounted on the heat exchanger (30) is two. Each of the central tube plates (35) comprises two ends (36) and a central part (37) by which the ends (36) are connected together and has a cross section shaped like a Japanese phonetic letter *ko*. A plurality of through holes are formed in the central part (37) of each of the central tube plates (35) and the heat transfer tube (32) of the heat exchanger (30) passes through the through holes. In other words, the central tube plates (35) are constructed such that the heat transfer tube (32) of the heat exchanger (30) is fixed.

[0041] In Figure 3, diagrammatic representation of the fan rotor (52), the fins (31), and the heat transfer tube (32) is omitted for the sake of simplicity.

[0042] Each of the leg parts (54b) of the motor stand

(54) is fixed, at its forward end, to one of the ends (36) of the central tube plate (35) situated on the side of the back plate (11). The fan motor (53) is mounted centrally in the main body part (54a) of the motor stand (54).

[0043] Although not diagrammatically shown, devices such as a compressor and a receiver, a substrate for electric components including a power circuit and a control microcomputer, and piping for refrigerant are all housed in the downstream chamber (43) of the casing (10). These devices and other components are disposed along the other side part (15) situated on the right-hand side when viewed from the backside of the casing (10).

15 OPERATION AND ACTION

[0044] The operation and action of the above-mentioned outdoor unit will now be described. When the fan rotor (52) is activated by the fan motor (53), outdoor air flows, through the suction inlet (26), into the upstream chamber (42) of the casing (10). Then, the air passes through between each fin (31) of the heat exchanger (30), during which the air exchanges heat with refrigerant in the heat transfer tube (32). The heat exchanger (30) acts as a condenser during the cooling mode of operation, and as an evaporator during the heating mode of operation.

[0045] The air, which has undergone heat exchange in the heat exchanger (30), passed through the periphery of the motor stand (54) and through the periphery of the fan motor (53) and flows, through the bell-mouth (44), into the downstream chamber (43). During that period, the air is blown diagonally relative to the axial direction of the fan (51). In other words, a current of air emitted from the fan (51) flows in a radial pattern expanding toward the downstream side.

[0046] Air emitted from the fan (51) to the left or upward relative to Figure 1 is discharged to outside the casing (10) through the side emission outlet (23) or through the topside emission outlet (21). On the other hand, air emitted downward from the fan (51) reverses its course and flows upward, is guided by the separator plate (46), and flows upward along the emission flow path (27). In other words, air emitted downward from the fan (51) flows into a space between the back plate (11) of the casing (10) and the separator plate (46) and flows upward in the space. At this time, since there is no obstacle in the emission flow path (27) that contributes to the generation of noise, noise will not be produced by the presence of an obstacle such as the fan motors (53). Additionally, since air flows smoothly because of the absence of an obstacle, this increases the volume of air emission. The air merges with air flowing directly toward the topside emission outlet (21) and toward the side emission outlet (23) from the fan (51) and is discharged to outside the casing (10).

EFFECTS OF EMBODIMENT 1

[0047] In the first embodiment, the fan motor (53) is located nearer to the front-side part (16) than the fan rotor (52), which means that there exists no obstacle in the emission flow path (27). Such arrangement allows a flow of air emitted from the fan (51) to flow smoothly through the emission flow path (27) between the fan (51) and the back plate (11) because the fan motor (53) is not an obstacle to such a flow of air. This both eliminates noise caused by the fan motor (53) becoming resistance and increases the volume of air emission from the fan (51). Additionally, it is arranged such that air is discharged from the topside of the casing (10). This prevents the occurrence of short circuiting causing once-discharged air to be redrawn into the casing (10), when the outdoor unit is installed with its backside fitted closely to a house wall or the like.

[0048] Furthermore, the fan motor (53) is mounted fixedly by the tube plates (35), which ensures that the fan motor (53) is mounted fixedly even when the heat exchanger (30) is disposed at the front.

[0049] Further, the fan (51) is implemented by a mixed flow fan, so that the width of the emission flow path (27) between the back plate (11) and the mixed flow fan can be made narrower in comparison with the case where the fan (51) is implemented by an axial flow fan. This makes it possible to provide an outdoor unit of smaller depth. Furthermore, it is possible to increase the volume of air suction into the casing, in comparison with the case where the fan (51) is implemented by a centrifugal fan.

[0050] Furthermore, it is arranged such that the separator plate (46) for the guiding of air emitted downward from the fan (51) is provided. As a result of such arrangement, air emitted downward from the fan (51) is allowed to smoothly flow into between the separator plate (46) and the back plate (11) of the casing (10) and to smoothly flow upward. As the result of this, the volume of air emission is increased.

EMBODIMENT 2

[0051] A second embodiment of the present invention is greater in air conditioning power than the outdoor unit according to the first embodiment. Here, differences between the outdoor unit of the second embodiment and the outdoor unit of the first embodiment will be described.

[0052] As shown in Figures 4 and 5, a casing (10) of the outdoor unit of the second embodiment is vertically longer than the casing (10) of the first embodiment. Stated another way, the casing (10) of the second embodiment is so shaped as to be identical in lateral width and depth with the casing (10) of the first embodiment; however, the former extends higher than the latter.

[0053] The casing (10) of the second embodiment includes two side parts (15), wherein a first side emission

outlet (23) is formed in an upper portion of one of the side parts (15) and a second side emission outlet (25) is formed in an upper portion of the other side part (15). Like the first embodiment, a topside emission outlet (21) is formed in a topside part (14) of the casing (10).

[0054] More specifically, the first side emission outlet (23) is opened in the one side part (15) situated on the left-hand side when viewed from the backside of the casing (10). The first side emission outlet (23) of the second embodiment is equivalent to the side emission outlet (23) of the first embodiment, in other words the first side emission outlet (23) of the second embodiment is identical in long and short side lengths with the side emission outlet (23) of the first embodiment. Besides, like the side emission outlet (23) of the first embodiment the first side emission outlet (23) is provided with an emission louver (24).

[0055] On the other hand, the second side emission outlet (25) is formed in the other side part (15) situated on the right-hand side when viewed from the backside of the casing (10). The second side surface emission outlet (25) is shaped like a rectangle the length of whose short sides is equal to the length of the short sides of the first side emission outlet (23) and the length of whose long sides is slightly shorter than the length of the long sides of the first side emission outlet (23). Besides, like the first side emission outlet (23) the second emission outlet (25) is also provided with an emission louver (24).

[0056] The suction inlet (26) is formed slightly smaller than the front-side part (16) of the vertically elongated casing (10). And, the heat exchanger (30) shaped like a flat plate is laid out such that it provides a covering all over the suction inlet (26). In other words, the heat exchanger (30) is vertically oblong and the area of heat transfer of the heat exchanger (30) is greatened by extending the height of the heat exchanger (30).

[0057] In the outdoor unit according to the second embodiment, a fan (55) is mounted above a fan (51) of the type described in the first embodiment. The provision of the two fans (51, 55) makes it possible to effectively use the entire surface of the vertically elongated heat exchanger (30). The first fan (51) disposed on the down-side and the second fan (55) disposed on the upside are each provided with a fan rotor (52) and a fan motor (53) and each fan constitutes a mixed flow fan.

[0058] Mounted on the rear surface side of the first fan (51) is a separator plate (46) serving as a guide plate. The structure of the separator plate (46) is the same as the structure of the separator plate (46) described in the first embodiment. In other words, the first fan (51) of the present embodiment is equivalent to the first fan (51) of the first embodiment with the separator plate (46) disposed on the rear surface side thereof.

[0059] The first fan (51) is disposed nearer to the back plate (11) of the casing (10) than the second fan (55). Accordingly, a partitioning plate (41) of the second embodiment is shaped such that its lower portion projects

toward the backside of the casing (10) more than the upper portion. A bell-mouth (44) for the first fan (51) is mounted at a lower portion of the partitioning plate (41) and a bell-mouth (44) for the second fan (55) is mounted at an upper portion of the partitioning plate (41).

[0060] In the outdoor unit according to the second embodiment, a flow path separating plate (48) is disposed in the downstream chamber (43) of the casing (10). The flow path separating plate (48) is for separation of a first flow path (27a) along which air emitted from the first fan (51) flows upward and a second flow path (27b) along which air emitted from the second fan (55) flows. In other words, the flow path separating plate (48) separates the flow path (27a) along which air emitted from the fan (51) flows and the flow path (27b) along which air emitted from the fan (55) flows, whereby the air emitted from the fan (51) and the air emitted from the fan (55) do not interfere with each other and are smoothly directed to the emission outlets (21, 23, 25).

[0061] The flow path separating plate (48) comprises a guide plate (49) and a dividing plate (50). The guide plate (49), made by bending a flat plate, is shaped along the fan rotor (52) of the second fan (55) and is mounted along the lower portion of the second fan (55). One end of the guide plate (49) extends to the first side emission outlet (23). The dividing plate (50) is a flat plate extending upward from the guide plate (49) and is so located as to cover the backside of the second fan (55). Additionally, the dividing plate (50) is so located as to run parallel with the back plate (11) of the casing (10).

[0062] The motor stand (54) of each fan (51, 55) is made up of a main body part (54a) of rectangular shape and two leg parts (54b) horizontally extending from one end to the other of the heat exchanger (30). The cross section of the leg parts (54b) of the motor stands (54) is rectangular. The leg parts (54b) of each motor stand (54) are firmly secured, at their middle portions, to an upper or lower end of the main body part (54a). Additionally, the leg parts (54b) of each motor stand (54) are firmly secured, at their both ends, to end tube plates (34) of the heat exchanger (30).

OPERATION AND ACTION

[0063] The operation and action of the above-mentioned outdoor unit will now be described. When the fan rotors (52) are activated by the fan motors (53), outdoor air flows, through the suction inlet (26), into the upstream chamber (42) of the casing (10). The air passes through between each fin (31) of the heat exchanger (30), during which the air exchanges heat with refrigerant in the heat transfer tube (32).

[0064] After having passed through the heat exchanger (30), the air passes through the periphery of the motor stands (54) and through the periphery of the fan motors (53), is drawn by the fans (51, 55), and is blown into the downstream chamber (43).

[0065] Air emitted upward from the first fan (51) flows

along the first flow path (27a) defined between the back plate (11) of the casing (10) and the flow path separating plate (48) and is discharged, through the emission outlets (21, 23, 25) to outside the casing (10). On the other hand, air emitted downward from the first fan (51) reverses its course and flows upward, is guided by the separator plate (46), and flows along the emission flow path (27). The air flows upward between the back plate (11) of the casing (10) and the separator plate (46), flows along the first flow path (27a) together with the air emitted upward from the first fan (51), and is discharged to outside the casing (10) through the emission outlets (21, 23, 25). Since there is no obstacle in the emission flow path (27) that contributes to the generation of noise, noise will not be produced by the presence of an obstacle such as the fan motors (53). Besides, since air flows smoothly because of the absence of an obstacle in the emission flow path (27), this increases the volume of air emission.

[0066] Meanwhile, air, which has passed through the upper portion of the heat exchanger (30), is drawn to the second fan (55) and is blown into the downstream chamber (43). Air emitted upward from the second fan (55) flows along the second flow path (27b) defined between the flow path separating plate (48) and the partitioning plate (41) and is discharged, through the emission outlets (21, 23, 25), to outside the casing (10). Air emitted downward from the second fan (55) is guided by the guide plate (49), flows along the second flow path (27b) defined between the flow path separating plate (48) and the partitioning plate (41), and is discharged, through the emission outlets (21, 23, 25), to outside the casing (10). Stated another way, air blown out of the first fan (51) and air blown out of the second fan (55) flow along different flow paths (i.e., the flow paths (27a, 27b)) without interfering with each other and are exhausted to outside the casing (10).

EFFECTS OF EMBODIMENT 2

[0067] In the second embodiment, the two fans (51, 55) are disposed vertically one above the other, thereby making it possible to increase the volume of emission of air without expanding the area required for installing an air conditioner outdoor unit. Besides, the provision of the separator plate (46) allows air emitted downward from the first fan (51) to smoothly flow between the separator plate (46) and the back plate (11) of the casing (10) and to smoothly flow upward. This increases the volume of emission of air from the first fan (51). Besides, it is arranged such that the first flow path (27a) along which air blown out of the first fan (51) flows upward and the second flow path (27b) along which air blown out of the second fan (55) flows are separated by the flow path separating plate (48), whereby the air blown out of the first fan (51) and the air blown out of the second fan (55) flow smoothly without interfering with each other. This increases the volume of air that is emitted from each fan

(51, 55).

[0068] Other constructions, working, effects of the second embodiment are the same as the first embodiment.

OTHER EMBODIMENTS

[0069] In the first embodiment, the provision of the side emission outlet (23) of the side part (15) may be omitted.

[0070] Additionally, in the second embodiment the provision of the first and second side emission outlets (23, 25) of the side parts (15) may be omitted.

[0071] Furthermore, in each of the foregoing embodiments the fan motor (53) is not necessarily required to be secured, via the motor stand (54), to the tube plates (34, 35) of the heat exchanger (30). For example, it may be arranged such that a supporting column is standingly provided on a bottom plate on the rear surface side of the heat exchanger (30) and the fan motor (53) is secured to the supporting column.

[0072] Additionally, in each of the foregoing embodiments the fan (51) is implemented by a mixed flow fan. Alternatively, the fan (51) may be implemented by for example an axial fan. In this case, the provision of the separator plate (46) may be omitted.

INDUSTRIAL APPLICABILITY

[0073] As has been described above, the present invention provides air conditioner outdoor units useful for so-called separate type air conditioners, particularly suitable for the case where the volume of emission of air from an outdoor unit is increased.

Claims

1. An air conditioner outdoor unit comprising: a casing (10) including a front-side part (16) in which is formed an air suction inlet (26), and a topside part (14) in which is formed an air emission outlet (21); a heat exchanger (30) mounted in said air suction inlet (26) of said casing (10); and a fan (51) disposed on the side of a rear surface of said heat exchanger (30) and including a drive motor (53) and a fan rotor (52) which is activated by said drive motor (53), wherein an emission flow path (27), along which a part of air emitted from said fan (51) flows between said fan (51) and a back plate (11) of said casing (10) toward said air emission outlet (21), is formed on the side of a rear surface of said fan (51), said fan (51) being mounted in such a way that said drive motor (53) is located nearer to said front-side part (16) than said fan rotor (52).
2. The air conditioner outdoor unit of claim 1 further comprising a tube plate (35) for the securing of a

heat transfer tube (32) of said heat exchanger (30), wherein said drive motor (53) is secured, via a motor stand (54), to said tube plate (35).

3. The air conditioner outdoor unit of claim 1, wherein said fan (51) is a mixed flow fan.
4. The air conditioner outdoor unit of claim 3, wherein a guide plate (46), for guiding air emitted downward from said fan (51) in such a way that said emitted air flows upward along said back plate (11), is mounted in parallel with said back plate (11) in said emission flow path (27).
5. The air conditioner outdoor unit of claim 3, wherein:

said fan (51) serves as a first fan and a second fan (55) is disposed above said first fan (51), a guide plate (46), for guiding air emitted downward from said first fan (51) in such a way that said emitted air flows upward along said back plate (11), is mounted in parallel with said back plate (11) in said emission flow path (27) between said first fan (51) and said back plate (11) of said casing (10), and a flow path separating plate (48), for the separation of a first flow path (27a) for air emitted from said first fan (51) and flowing upward and a second flow path (27b) for air emitted from said second fan (55), is disposed on the side of a rear surface of said second fan (55).

FIG. 1

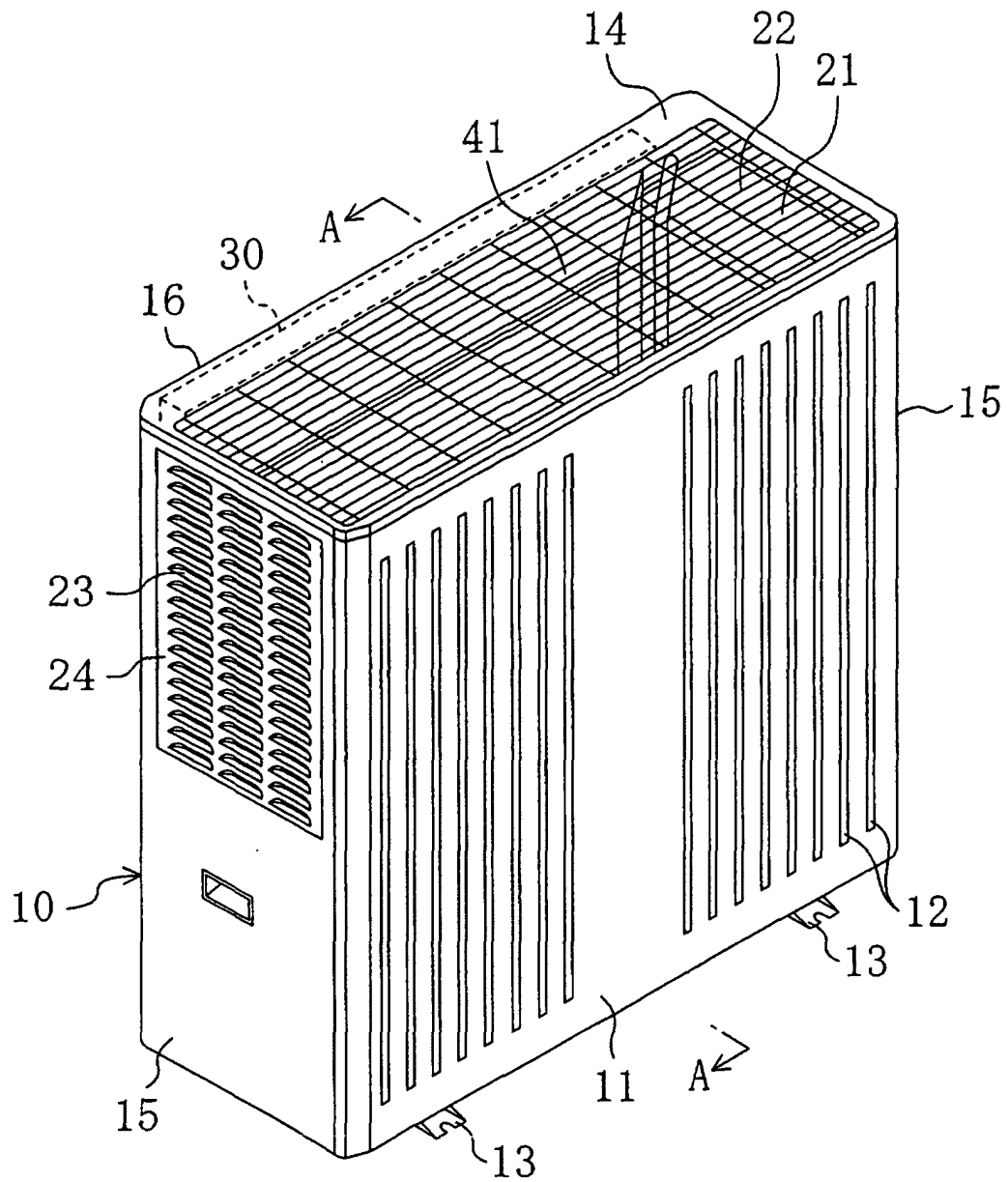


FIG. 2

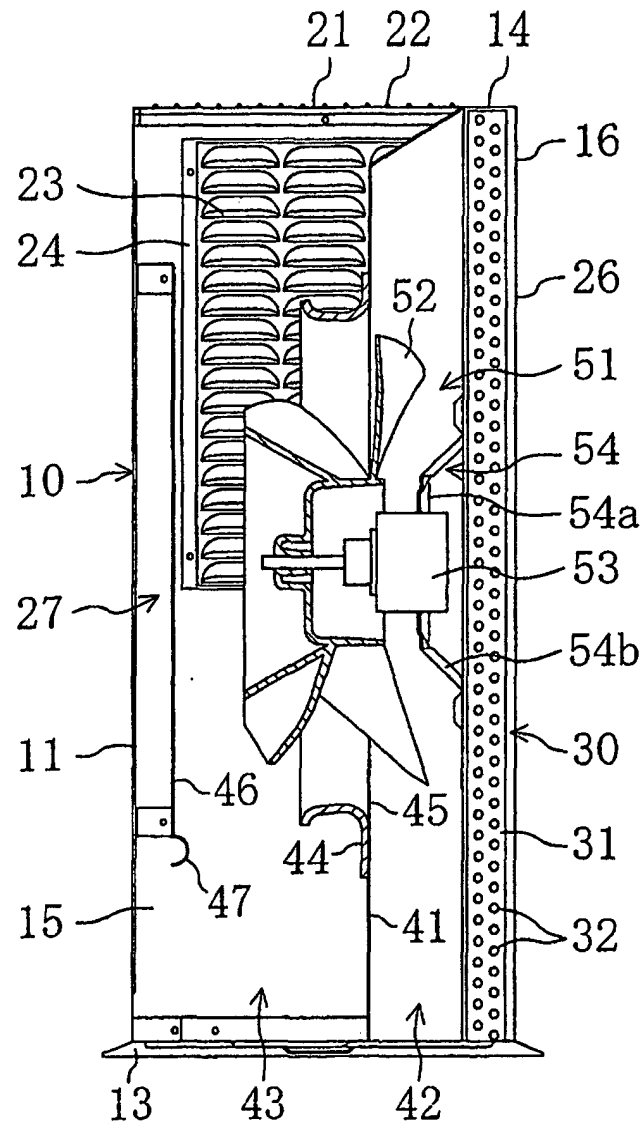


FIG. 3

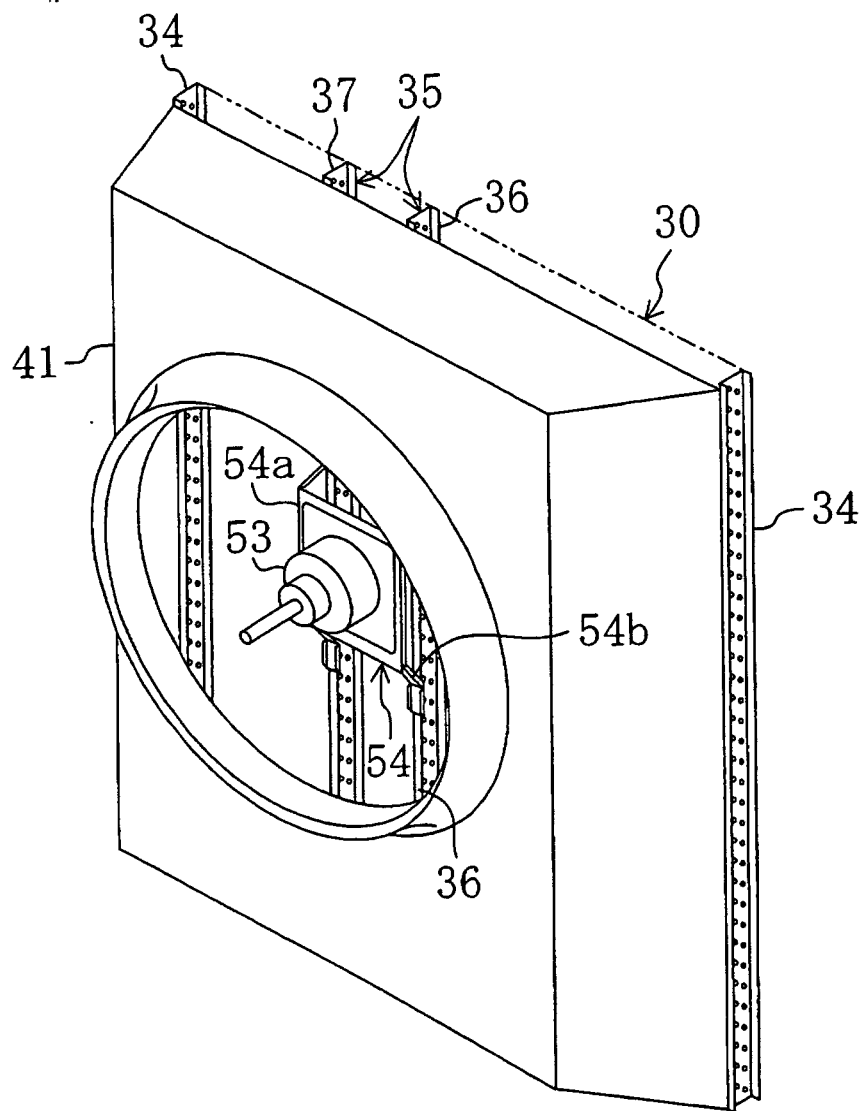


FIG. 4

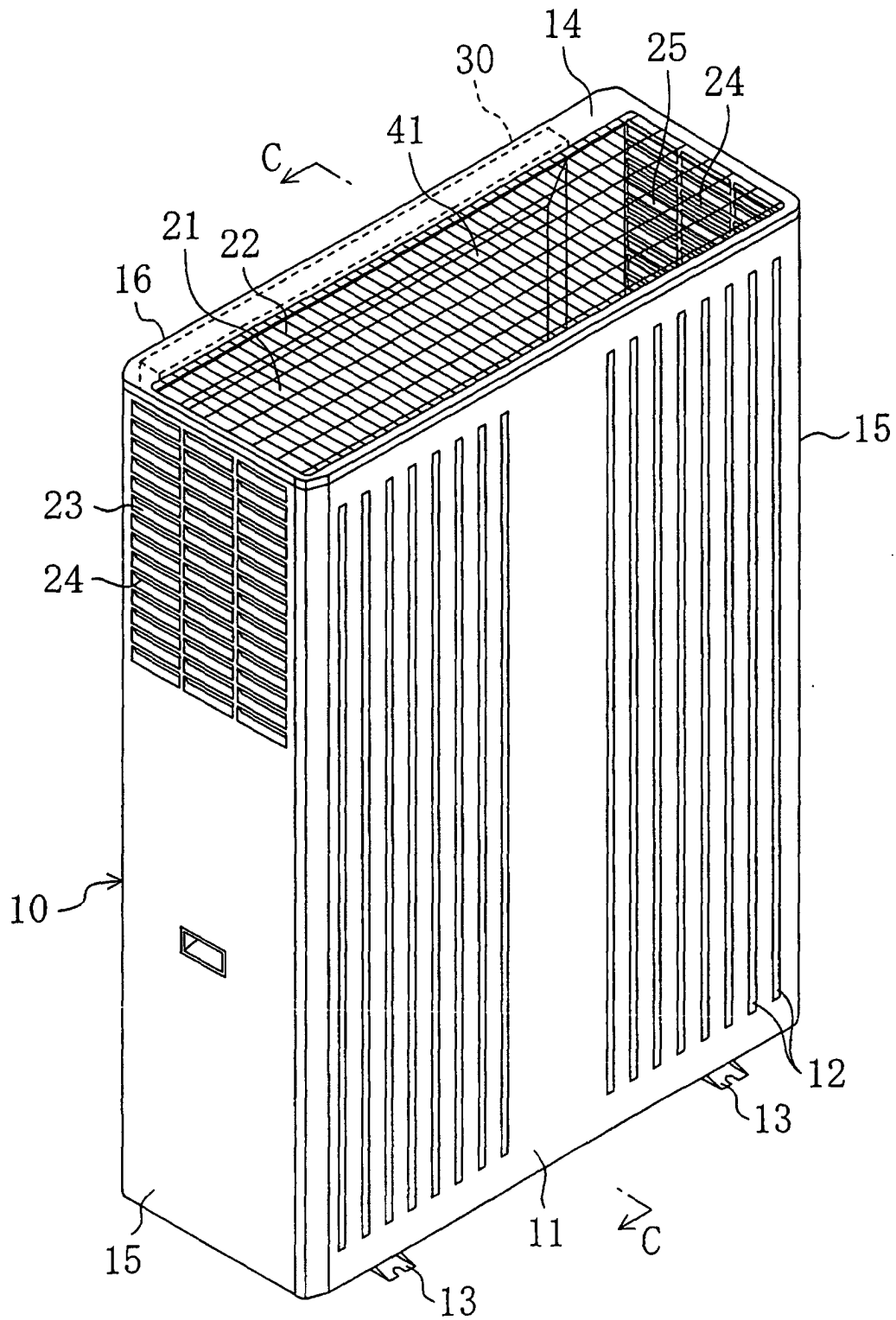
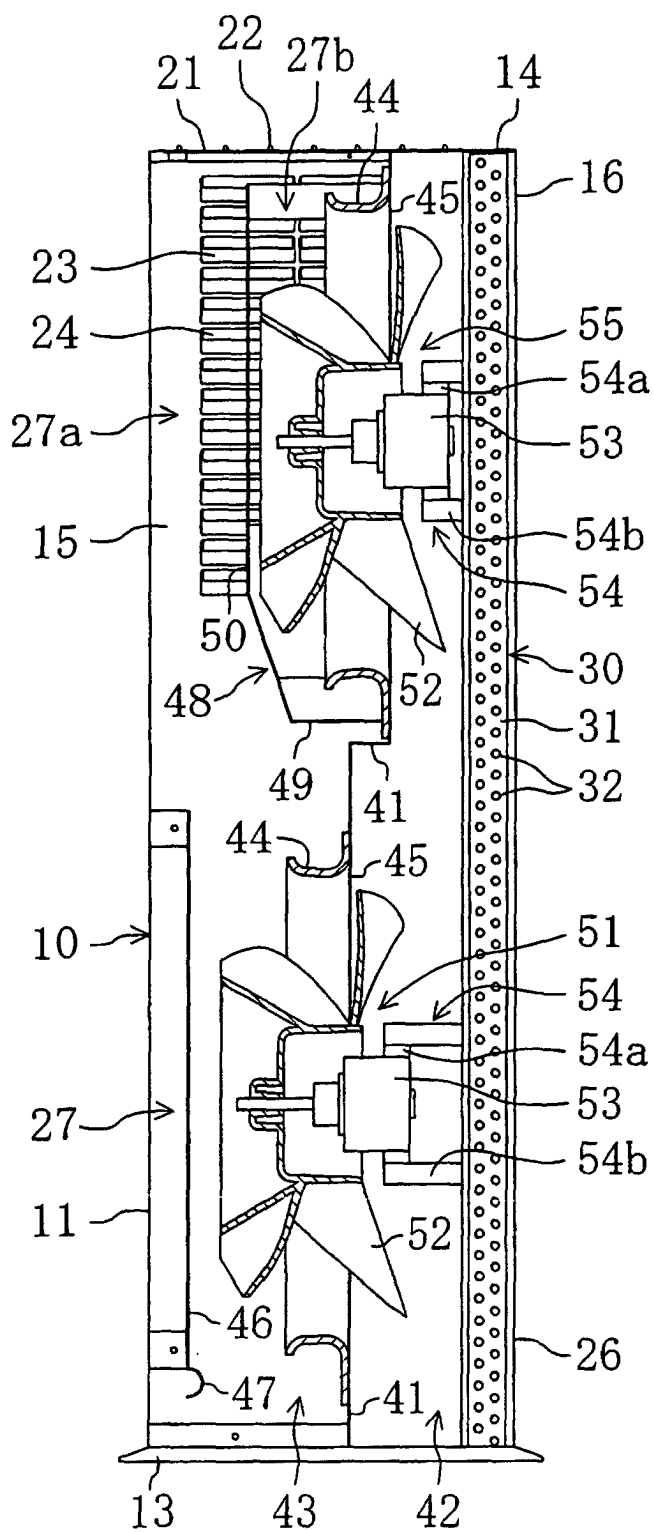


FIG. 5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/05338

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁷ F24F5/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁷ F24F5/00

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

Jitsuyo Shinan Koho	1926-1996	Toroku Jitsuyo Shinan Koho	1994-2002
Kokai Jitsuyo Shinan Koho	1971-2002	Jitsuyo Shinan Toroku Koho	1996-2002

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2-178542 A (Matsushita Refrigeration Co.), 11 July, 1990 (11.07.90), Page 2, upper right column, line 8 to lower left column, line 19 (Family: none)	1 2-5
X Y	JP 11-237083 A (Sanyo Electric Co., Ltd.), 31 August, 1999 (31.08.99), Page 3, lines 8 to 50 (Family: none)	1,2 3-5
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 065213/1989 (Laid-open No. 6237/1991) (Matsushita Refrigeration Co.), 22 January, 1991 (22.01.91), Page 5, lines 1 to 18 (Family: none)	1 2-5

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

* Special categories of cited documents:

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document of particular relevance; the claimed invention cannot be
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step when the document is taken alone

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document of particular relevance; the claimed invention cannot be
considered to involve an inventive step when the document is
combined with one or more other such documents, such
combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

26 June, 2002 (26.06.02)

Date of mailing of the international search report

09 July, 2002 (09.07.02)

Name and mailing address of the ISA/

Japanese Patent Office

Authorized officer

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP02/05338

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-274740 A (Sanyo Electric Co., Ltd.), 06 October, 2000 (06.10.00), Page 2, lines 19 to 30 (Family: none)	1-5
Y	JP 6-257595 A (Hitachi, Ltd.), 13 September, 1994 (13.09.94), Page 4, line 31 to page 5, line 23 (Family: none)	3
Y	JP 9-21398 A (Toshiba Corp.), 21 January, 1997 (21.01.97), Page 3, left column, line 44 to right column, line 47 (Family: none)	3
Y	EP 1041351 A1 (Daikin Industries, Ltd.), 04 October, 2000 (04.10.00), Page 4, right column, lines 26 to 35 (Family: none)	3

Form PCT/ISA/210 (continuation of second sheet) (July 1998)