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(54) INDOOR UNIT OF AIR CONDITIONER

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Description

Technical Field

[0001] The present invention relates to air conditioners, and more particularly, to an indoor unit which draws air through a front, and discharges air heat exchanged therein in a front direction through sides, having an optimized structure with increased suction and discharge rates and low noise.

Background Art

[0002] In general, the air conditioner repeats a refrigerating cycle in which refrigerant is compressed, condensed, expanded, and vaporized.

[0003] That is, gaseous refrigerant at a low temperature and low pressure before introduction to a compressor is compressed into a high temperature high pressure gaseous refrigerant at the compressor, turned into high pressure liquid refrigerant as the gaseous refrigerant discharges heat at a condenser, and turned into low temperature low pressure liquid refrigerant as the high pressure liquid refrigerant passes through an expansion valve. The refrigerant passed through the expansion valve is turned into low temperature low pressure refrigerant at an evaporator as the refrigerant absorbs heat as the refrigerant passes through an evaporator, and introduced into the compressor again. The air conditioner cools or heats required places in a performing such a series of cycles.

[0004] In the meantime, in the air conditioners, there are a package type air conditioner having an indoor unit and an outdoor unit built in one body and mostly installed at a window, and a separate type air conditioner having the indoor unit and the outdoor unit separated from each other. In the indoor unit, there is a wall type for mounting on a wall as a kind of interior decoration.

[0005] A related art indoor unit disclosed in Korea laid open patent No. 10-2005-0089203 has a structure in which air is drawn through a rear side of the indoor unit, and discharges through a front of the indoor unit, of which detailed description will be omitted, expecting to refer to above document if necessary.

[0006] In the meantime, the related art indoor unit disclosed in above Korea laid open patent has the following drawbacks in view of structures.

[0007] If the indoor unit is mounted close to a wall excessively, air flow rate to the rear of the indoor unit is reduced, with an increased noise.

[0008] The motor mounted on a front panel for driving a turbofan to draw air through the rear of the indoor unit makes the front panel, having much of the consumer's vision taken into amount in design, to vibrate when the motor is in operation.

[0009] The rear side air drawing structure with a filter therefor mounted on the rear side requires pulling out of the filter downward from the rear side for cleaning, and

placing in the filter to the rear side after cleaning, which is inconvenient to the user.

[0010] EP 1 526 339 discloses an indoor unit of an air conditioner having an improved airflow structure. Room air is drawn in through holes in a rear cover, passes a heat exchanger, and is discharged through one or more discharge holes at front lateral sides of the indoor unit.

Disclosure of Invention

Technical Problem

[0011] The object of the present invention for solving the foregoing various problems lies on providing an indoor unit which draws air through a front, and discharges air heat exchanged therein in a front direction through sides, having an optimized structure with increased suction and discharge rates and low noise.

[0012] That is, the present invention relates to an indoor unit which discharges air drawn through a front and heat exchanged therein in a front direction through sides, having a new structure in which suction and discharge flow structures and various components are optimized for increasing an air flow rate while maintaining good low noise characteristics.

Technical Solution

[0013] The invention provides an indoor unit for an air conditioner as set out in claim 1.

Advantageous Effects

[0014] The indoor unit for an air conditioner has the following advantages.

[0015] At first, an indoor unit, drawing air from a front and discharging heat exchanged air through sides, permits to optimize a structure to increase suction and discharge flow rates while reducing noise.

[0016] That is, the present invention permits to provide an indoor unit of new structure having optimized suction/discharge structures and various components such that low noise characteristics can be maintained while an air flow rate can be increased.

[0017] In detail, in comparison to the related art, even if the indoor unit of the present invention is mounted close to a wall, a suction air flow rate can be secured.

[0018] Moreover, different from the related art indoor unit of which turbo fan driving motor is mounted on a front frame, the front panel designed taking a consumer visual sense into account does not vibrate, to reduce the noise at the time the motor is driven.

[0019] The mounting of the filter on a front side permits to provide convenience to the user as the mounting/dismounting of the filter for cleaning is easy.

Brief Description of the Drawings

[0020]

FIG. 1 illustrates an exterior perspective view of an indoor unit in accordance with a preferred embodiment of the present invention;
 FIG. 2 illustrates an exploded perspective view of FIG. 1;
 FIG. 3 illustrates a section of the indoor unit across a line I-I in FIG. 1;
 FIG. 4 illustrates a plan view of "A" part in FIG. 2 for showing an edge structure of a front panel of the indoor unit of the present invention;
 FIG. 5 illustrates a perspective view of a front frame of the indoor unit of the present invention;
 FIG. 6 illustrates a perspective view of a guide frame of the indoor unit of the present invention;
 FIG. 7 illustrates a front view of FIG. 6,
 FIG. 8 illustrates a section across the line II-II in FIG. 6;
 FIG. 9 illustrates a graph showing a ratio of an orifice radius to a fan diameter versus noise;
 FIG. 10 illustrates a perspective view showing a variation of a turbofan of an indoor unit of the present invention;
 FIG. 11 illustrates a perspective view showing another variation of a turbofan of an indoor unit of the present invention;
 FIG. 12 illustrates a graph showing a comparison noise characteristics of a turbofan having the present invention applied thereto and a related art fan;
 FIG. 13 illustrates a plan view of FIG. 10;
 FIG. 14 illustrates a perspective view of a motor mount base of an indoor unit of the present invention;
 FIG. 15 illustrates a back side perspective view of FIG. 14;
 FIG. 16 illustrates a plan view for explaining a mounting position of an electric dust collector to an indoor unit of the present invention;
 FIG. 17 illustrates a side view of FIG. 16;
 FIG. 18 illustrates a reference drawing having a flow pattern at a discharge portion of the related art indoor unit made visible;
 FIGS. 19 to 21 front views of indoor units in accordance with another preferred embodiments of the present invention respectively, of cases having two turbofans respectively applied to the indoor units, together with a scroll structure in each of the cases;
 FIG. 22 illustrates a perspective view of an indoor unit in accordance with another preferred embodiment of the present invention, having a cross flow fan applied thereto; and
 FIGS. 23 to 26 respectively illustrate cross sections of variations of an indoor unit in accordance with a preferred embodiment of the present invention, having two cross flow fans applied thereto.

Best Mode for Carrying Out the Invention

[0021] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.
 [0022] An indoor unit in accordance with a first preferred embodiment of the present invention will be described with reference to FIGS. 1 to 17.
 [0023] FIG. 1 illustrates an exterior perspective view of an indoor unit in accordance with a preferred embodiment of the present invention, FIG. 2 illustrates an exploded perspective view of FIG. 1, and FIG. 3 illustrates a section of the indoor unit across a line I-I in FIG. 1.
 [0024] FIG. 4 illustrates a plan view of "A" part in FIG. 2 for showing an edge structure of a front panel of the indoor unit of the present invention, and FIG. 5 illustrates a perspective view of a front frame of the indoor unit of the present invention.
 [0025] FIG. 6 illustrates a perspective view of a guide frame of the indoor unit of the present invention, FIG. 7 illustrates a front view of FIG. 6, FIG. 8 illustrates a section across the line II-II in FIG. 6, and FIG. 9 illustrates a graph showing a ratio of an orifice radius to a fan diameter versus noise.
 [0026] FIG. 10 illustrates a perspective view showing a variation of a turbofan of an indoor unit of the present invention, FIG. 11 illustrates a perspective view showing another variation of a turbofan of an indoor unit of the present invention, FIG. 12 illustrates a graph showing a comparison noise characteristics of a turbofan having the present invention applied thereto and a related art fan, and FIG. 13 illustrates a plan view of FIG. 10.
 [0027] FIG. 14 illustrates a perspective view of a motor mount base of an indoor unit of the present invention, and FIG. 15 illustrates a back side perspective view of FIG. 14.
 [0028] FIG. 16 illustrates a plan view for explaining a mounting position of an electric dust collector to an indoor unit of the present invention, and FIG. 17 illustrates a side view of FIG. 16.
 [0029] Referring to FIGS. 1 to 3, the indoor unit 1 of an air conditioner of the present invention includes a front frame 200 made to enable air suction through a front thereof, a base frame 400 for joining with the front frame 200, having outlets in sides and a bottom, and a seating portion 410 at a front center for seating a fan driving motor, a guide frame 300 between the front frame 200 and the base frame 400 for guiding an air flow, a heat exchanger 500 between the front frame 200 and the guide frame 300, a turbofan 600 for discharging air having heat exchanged as the air passes through the heat exchanger 500 to an outside of the indoor unit, and a front panel 100 mounted in front of the front frame 200 spaced therefrom.
 [0030] Referring to FIG. 4, the front panel 100 has a predetermined thickness except an edge portion which has a thickness that becomes the thinner as it goes outward from a predetermined position the more for reducing an air suction resistance. That is, the edge portion of the

front panel 100 has a predetermined slope angle β .

[0031] If required, a circumference of the front panel 100 may be chamfered 110.

[0032] Referring to FIG. 5, the front frame has a grating type of air inlet 210 at a center of a front for drawing air, and bosses 220 at outer sides of the air inlet 210 for securing the front panel.

[0033] On the air inlet 210 of the front frame 200, there is a filter 800 for filtering foreign matters. In general, the filter has a mesh form.

[0034] A top side inlet portion 'B' of the front frame 200 has curved for minimizing a flow resistance.

[0035] Referring to FIGS. 6 to 8, the guide frame 300 includes an orifice 310 for guiding an air flow drawn by the turbofan 600, and upper/lower scrolls 320a, and 320b for guiding an air flow discharged from the turbofan 600 and fixing a direction of discharge.

[0036] Of the upper/lower scrolls 320a, and 320b, the upper scroll 320a has a combined surface of two curved surfaces which surrounds the turbo fan 699, with a cut-off point at a first quadrant (an upper left side surface) of the guide frame 300 with coordinates of $0.17 < x/\varphi < 0.48$, $0.54 < y/\varphi < 0.68$ where φ denotes a diameter of the turbo fan 600, and x , and y denote coordinates with an origin at a center of the turbo fan 600.

[0037] In the meantime, referring to FIGS. 2 and 3, the guide frame 300 further includes a heat exchanger supporting portion 330 on an opposite surface of the scrolls for maintaining a gap between the orifice 310 and the heat exchanger 500.

[0038] Noise is minimum and a performance of the turbo fan is maximum when a gap 'G' between a bottom of the orifice 310 to a bottom of the heat exchanger 500 is 9.5 ~ 10.5% of a diameter of the turbo fan.

[0039] For an example, if the diameter of the turbo fan 600 is 300mm, it is the most preferable that the gap 'G' is 28.5 ~ 31.5mm.

[0040] In the meantime, referring to FIGS. 8 and 9, it is preferable that a ratio R/φ of a radius 'R' of the orifice 310 to the diameter φ of the turbo fan 600 is 0.05 ~ 0.07 for determining an optimal orifice 310 shape that minimizes a flow resistance, at which range both noise characteristics and a turbo fan performance is optimized. Particularly, both the noise characteristics and the turbo fan performance is the best at the ratio R/φ of 0.06, of the radius 'R' of the orifice 310 to the diameter φ of the turbo fan 600.

[0041] Referring to FIGS. 2 and 3, the guide frame 300 has edge planes 340, which are surfaces for guiding discharge of air, bent toward a front side of the indoor unit.

[0042] Referring to FIGS. 2 and 3, particularly, FIGS. 10 to 13, the turbo fan 600, or 600a includes a shroud 610 having a central suction opening, a hub 630 having a main plate 620 opposite to, and spaced a predetermined distance from, the shroud 610, for connecting a rotation shaft of the motor at a center, and a plurality of blades 640, or 640a each having a predetermined curvature connected in a circumferential direction of the hub

630 between the main plate 620 of the hub 630 and the shroud 610.

[0043] Tip pitches of the blades 640, or 640a of the turbo fan 600, or 600a are variable or equal, wherein, in general, the variable pitch is favorable for the fan performance (static pressure characteristics with respect to the same air flow rate) and noise, while the equal pitch is favorable for fan balancing. Therefore, the fan is designed in the variable pitch or the equal pitch, taking a fan diameter, a width of the blade, and a number of the blades into account. For an example, the fan with the equal pitch has the best noise characteristics in a condition that the fan diameter φ is 300mm, the width (L see FIG. 10) of the blade is 50mm, and the number of the blades is 13.

[0044] Irrespective of the equal pitch or the variable pitch, the width of the blades can be always the same regardless of a distance from the center of the turbo fan to the tip (see FIG. 10), or varied with the distance from the center of the turbo fan to the tip (see FIG. 11).

[0045] That is, the width of the blade may always have the same dimension regardless of a radial distance from the center of the turbo fan as shown in FIG. 10, or becomes the smaller as it goes the more after the blade passes the main plate as shown in FIG. 11.

[0046] The turbo fan 600 in FIG. 10, having the same width of the blade 640 regardless of the distance of the blade from a fan center with a larger area of the blades, is favorable in view of securing greater flow rate, and the turbo fan 600a in FIG. 11, having a width of the blade 640a which becomes the smaller as it goes the more after the blade passes the main plate in a shape a main plate 620 side of the blades is cut away, is favorable in view of suppression of vortex caused by flow interference between the main plate 620 connected to the hub 630 and the blades.

[0047] In the meantime, if an air discharge area of the indoor unit 1 is fixed, the fan is the most favorable in view of flow rate, high static pressure, and low noise characteristics if a ratio φ/L of the diameter φ of the turbo fan to the width of the blade is at 6.5 ~ 7.5.

[0048] It is preferable that the tip of the blade 640, or 640a is positioned the same with an edge of the shroud 610.

[0049] In the meantime, referring to FIGS. 14 and 15, the motor seat portion 410 at a center of the base frame 400 for a fan driving motor is an annular bead portion 410a for enabling to secure a stable and adequate width of the blade.

[0050] Referring to FIG. 15, in the vicinity of the motor seat portion 410 on a back side of the base frame 400, there are ribs 420 for reinforcing strength and being out of a natural frequency of the motor.

[0051] In the meantime, thickness of the base frame 400 may be changed for being out of the natural frequency of the motor. The base frame 400 of the present invention has 4 ~ 8mm range of the thickness 't' of the base frame 400 for being out of the natural frequency of the

motor.

[0052] Referring to FIG. 3, though the guide frame 300 has the edge plane 340, the base frame 400 has a guide surface 440 of a predetermined curvature on an inside of a lower side of an outlet 430 in an edge of the base frame 400 for guiding air to be discharged toward a front side of the indoor unit.

[0053] According to this, the indoor unit 1 of the present invention can discharge air toward the front side of the indoor unit even if there is no air direction control device additionally.

[0054] Of course, the outlet 430 of the indoor unit 1 of the present invention may be provided with a louver (not shown) to be opened/closed in a sliding type by a step motor.

[0055] In this instance, an opening angle of the louver is determined such that the louver does not act as a resistance to the air discharged in a front direction guided by the discharge air guide surface 440 of the inside surface of the base frame 400.

[0056] Of course, though the louver also serve to guide the air to be discharged toward the front of the indoor unit, because the indoor unit 1 of the present invention can discharge the air toward the front of the indoor unit even if the indoor unit 1 is not provided with an additional flow direction control device, the indoor unit 1 may not be provided with the louver.

[0057] However, it is preferable that the indoor unit 1 is provided with the louver because the louver covers the outlet of the indoor unit to maintain an exterior of the indoor unit clean, and prevent dusts or foreign matters from entering through the outlet when the indoor unit 1 is not in operation.

[0058] In the meantime, referring to FIGS. 2 and 3, and 16 and 17, the indoor unit 1 of the present invention is provided with an electric dust collector 700 on an air suction plane of the heat exchanger 500.

[0059] In this instance, it is preferable that the electric dust collector 700 is mounted a distance away from a center of the turbo fan 600.

[0060] In more detail, referring to FIGS. 16 and 17, it is preferable that the electric dust collector 700 is mounted at a position where a ratio l/h is 5 - 6 where 'l' denotes a distance from the center of the turbo fan 600, and 'h' denotes a height from an upper surface of the turbo fan 600 to a center of the electric dust collector 700, at which position the electric dust collector 700 has minimum noise while keeping a performance the same.

[0061] In general, the electric dust collector 700 is secured to fins of the heat exchanger 500. That is, fastening pieces (not shown) of the electric dust collector 700 are pressed in between fins of the heat exchanger 500, to secure the electric dust collector 700 to the heat exchanger 500.

[0062] In the meantime, though it is preferable that a photocatalytic plasma electric dust collector is provided for applying a high voltage to remove fine dust from air and deodorizing air, a general electric dust collector may be provided if the fine dust only is removed.

[0063] That is, though the general electric dust collector can capture dust, the general electric dust collector can not solve the problem of the odor, an activated carbon filter may be provided, additionally.

[0064] In the meantime, the photocatalytic plasma electric dust collector includes an ionizing unit for ionizing dust in the air and emitting photo energy, a capturing unit for capturing dust ionized at the ionizing unit, a photocatalytic filter for decomposing odor particle captured by the photo energy emitted from the ionizing unit, and a high voltage generating unit for applying a high voltage to the dust collecting filter.

[0065] The operation and effect of the indoor unit 1 of the present invention will be described.

[0066] At first, upon putting the indoor unit 1 into operation, the turbo fan 600 rotates to draw room air through a space between the front panel 100 and the front frame 200.

[0067] That is, the room air is introduced to the air inlet 210 in a front of the front frame 200 through four directions of up/down and left/right sides of the front panel 100.

[0068] Then, as the air passes through the filter 800 at the air inlet 210 of the front frame 200, the air has foreign matters filtered therefrom. Then, the air is heated at the heat exchanger 500, and drawn into the turbo fan 600 guided by the orifice 310 at the guide frame 300.

[0069] In this process, a portion of the room air passes through the electric dust collector 700, during which, if the dust collector is the photocatalytic plasma electric dust collector, fine dust is captured and filtered, and the air is deodorized.

[0070] In the meantime, air drawn into the turbo fan 600 through the electric dust collector 700 is discharged in a radial direction of the fan, with an air flow thereof divided in left/right and lower directions by guidance of the upper and lower scrolls 320a, and 320b.

[0071] Then, the air is discharged toward a front side of the indoor unit by guidance of the guide surface 440 of the base frame 400 and the edge planes of the guide frame 300.

[0072] Functions and effects of various parts of the indoor unit 1 of the present invention operative thus are as follows.

[0073] The front panel 100, attached to a front of the indoor unit 1 of the present invention, shades the air inlet 210 having the filter mounted thereto to make the indoor unit 1 to look better.

[0074] Of course, in order to make the indoor unit 1 to look better further, decorative material or designs may be attached.

[0075] On one side of the front panel 100, there may be a display unit (not shown) provided separately or as one unit with the front panel 100 for displaying operation, and/or operation states, or function handling states of the indoor unit 1 to the user.

[0076] Referring to FIG. 4, the edge portion of the front panel 100, having a cut away inside surface to make thickness thereof the thinner as it goes to an edge the

more, enlarges an air suction area between the front panel 100 and the front frame 200.

[0077] That is, by enlarging a suction area of air introduced to the front/rear and upper/lower sides of the front panel 100, an air flow rate can be increased.

[0078] Next, the top side inlet portion of the front frame 200 is formed to have a predetermined curve for minimizing a flow resistance of air, because the top side inlet portion of the front frame 200 is high such that it is invisible to the user if the indoor unit 1 is mounted on a wall.

[0079] That is, basically, if a gap between the front panel 100 and the front frame 200 is great excessively, though it is favorable in view of air section, but it has a drawback in that an inside of the indoor unit 1 is made visible through the gap. However, the top side inlet portion of the front frame 200 has no such a trouble, relatively.

[0080] In the meantime, of course, if it is required to take a flow resistance of the suction air into account more, or if mounting of the indoor unit 1 at a lower side of the wall does not matters, not only the top side inlet, but also the bottom side inlet of the front frame 200 may be curved.

[0081] Next, the filter 800 on the air inlet 210 of the front frame 200, being a mesh type filter, filters large sized dust and foreign matters from air.

[0082] Next, the orifice 310 in the guide frame 300 guides the air drawn into the turbo fan 600 effectively, to contribute to reduction of noise of the indoor unit 1, and serves to enhance a performance of the turbo fan 600 to the maximum.

[0083] Alike the orifice 310, the scrolls of guide frame 300, serving to fix a discharge direction of air discharged from the turbo fan 600 as well as make an air flow distribution of the discharged air uniform to the maximum, contributes to reduction of noise of the indoor unit 1, and serves to enhance a performance of the turbo fan to the maximum by guiding the discharge air, effectively.

[0084] Moreover, the heat exchanger supporting portion 330 on an opposite surface of the scrolls projected therefrom at a predetermined height maintains a gap between the orifice 310 and the heat exchanger 500, for securing a required heat exchange area between the drawn air and the heat exchanger 500.

[0085] That is, if the heat exchanger 500 and the orifice 310 abut without the heat exchanger supporting portion 330, with a significant reduction of air suction area, the securing of the required heat exchange area fails. However, since a front/rear direction dimension (a depth of the indoor unit) of the indoor unit becomes greater as much as the projected height of the heat exchanger supporting portion 330, it is required to design a height of the indoor unit appropriately taking this into account.

[0086] Along with this, the ratio R/ϕ of the radius 'R' of the orifice 310 of the guide frame 300 and the diameter ϕ of the turbo fan is designed so that noise characteristics is optimized.

[0087] The edge planes 340 of the guide frame 300 bent toward the front side of the indoor unit 1 improve a

flow resistance of the air discharged, to reduce noise, and prevent the air from returning, so as to be drawn through the gap between the front panel 100 and the front frame 200 again.

[0088] That is, referring to FIG. 3, the planar surface of the edge portion 340 of the guide frame 300 reduces a flow resistance and the returning of air compared to a curved edge portion of the guide frame 300.

[0089] Next, since it tends that pressure and flow rate characteristics of the blade of the turbo fan 600 concentrates on a tip of the fan, a tip area of the blade is increased to improve the static pressure characteristics and the noise characteristics.

[0090] That is, in general, if the turbo fan has a great width, to make an area of the blade larger, a pressure component increases, implying that the fan is required to overcome a flow resistance in providing a required flow rate.

[0091] The turbo fan 600a in FIG. 11, employing blades each having a width which becomes the smaller on a side of the main plate 620 as it goes toward a blade tip the more, has a poor static pressure characteristics compared to the turbo fan 600 in FIG. 11, employing blades each having the same blade width up to an end of the tip, to require faster fan, that results in an increased noise because the rotation speed of the turbo fan is a major source of noise.

[0092] According to this, if the turbo fan 600 having wide and long blades as shown in FIG. 10 is employed, to secure an adequate air flow rate even if the rotation speed is low, the noise caused by the rotation speed can be reduced.

[0093] On the other hand, if the turbo fan 600a having blades with shapes as shown in FIG. 11 is employed, to reduce a flow resistance between the main plate 620 formed as one body with the hub 630 and the blades, resulting in reduction of vortex at the tip of the blade, turbo fan noise caused by the vortex is reduced.

[0094] That is, though the turbo fan in FIG. 11 is favorable in view of noise caused by vortex, if the rotation speed is increased to overcome the drawback of the low flow rate, it has a drawback in that motor noise increases following the increase of the rotation speed. Though the turbo fan in FIG. 10 is not favorable in view of noise caused by the vortex relative to the turbo fan in FIG. 11, it is favorable in view of an air flow rate, to expect an effect of reduction of noise coming from the rotation speed reduction. As shown in the graph in FIG. 12, as a result of test, the noise reduction effect of the turbo fan in FIG. 10 is better. Though the turbo fan in FIG. 10 is a better noise reduction effect than the turbo fan in FIG. 11, since the turbo fan in FIG. 11 has good noise characteristics, the turbo fan 1 can be applicable to the indoor unit 1 of the present invention.

[0095] Next, on the annular bead portion 410a of the motor seat portion 410 at the center of the base frame 400, which is projected to the front side of the indoor unit, the motor 'M' is mounted.

[0096] The ribs in the vicinity of the motor seat portion 410 on a back side of the base frame 400 reinforce strength of the base frame 400, and make frequency characteristics of the base frame 400 to fall on an outside of a natural frequency of the motor, so that the base frame 400 and the motor do not resonate.

[0097] Moreover, as described before, while the annular bead portion 410a at the base frame 400 serves to reinforce and avoid resonance at the time of operation of the motor, the annular bead portion 410a also serves to keep the width of the blade of the turbo fan constant.

[0098] That is, referring to FIG. 3, the design of the main plate 620 of the turbo fan to surround the bead portion 410a of the base frame 400 at a position lower than the highest projected point of the bead portion 410a on the drawing enables the width of the blade secured, adequately.

[0099] In the meantime, the change of thickness 't' of the base frame 400, leading to change mass at the end enables the vibration characteristics of the base frame to fall outside of the natural frequency of the motor, thereby preventing resonance between the base frame 400 and the motor.

[0100] Next, the electric dust collector 700 on the air suction surface of the heat exchanger removes fine dust from air before the air passes through the heat exchanger 500.

[0101] Moreover, the electric dust collector 700 positioned a predetermined distance away from the center of the turbo fan can provide an adequate dust collecting performance while the electric dust collector 700 does not act as a resistance to the air.

[0102] In the meantime, though the front panel 100 may be a fixed type, in view of reduction of defective front panel 100, it may also be preferable that a suction area variable type of the front panel 100 is employed, in which the panel 100 is tilted in a fashion that an upper side or a lower side of the front panel 100 moves apart from the front frame, or the like in operation of the indoor unit while the front panel 100 is closed when the indoor unit is not in operation, or the entire front panel 100 moves forward to increase the suction area.

[0103] A case in which two turbo fans 600 are applied to the indoor unit will be described.

[0104] Basically, though the embodiment is identical to the foregoing embodiment in that room air is drawn through the front and discharged to the front side of the indoor unit through the heat exchanger 500 and the turbo fan 600, the embodiment is different from the foregoing embodiment in that the embodiment is provided with two turbo fans 600, together with consequential partial changes of structure.

[0105] In general, it can be known that a discharge air flow pattern of an indoor unit having one turbo fan applied thereto is not distributed uniformly in left/right and lower directions in view of nature of the fan that rotates only in one direction. (see FIG. 18).

[0106] Accordingly, it is intended to provide an indoor

unit in which two fans are applied in the embodiment described below, to make the discharge air flow pattern more uniform, and moreover, flow rates of air discharged in left and right, or left and right and lower side of the indoor unit can be varied by controlling rotation speeds of the two fans differently.

[0107] An indoor unit having two turbo fans 600 applied thereto will be described with reference to FIGS. 19 to 21.

[0108] Before starting description of the embodiment, the same names and reference symbols will be given to parts identical to the foregoing embodiment, and may not be shown.

[0109] The indoor unit of the embodiment includes a front frame 200 (see FIG. 2) made to enable air suction through a front thereof, a base frame 400 (see FIG. 2) joined with the front frame 200 having air outlets in sides and a bottom, and two motor seats 410 (see FIG. 14) on an inner side of a front for driving turbo fans, a guide frame 300 (see FIGS. 2 and 6) between the front frame 200 and the base frame 400 for guiding an air flow, a heat exchanger 500 between the front frame 200 and the guide frame 300, and a front panel 100 (see FIG. 2) mounted in front of the front frame 200 with a space therefrom.

[0110] Referring to FIG. 19, the embodiment is characterized in that two turbo fans 600 are mounted on an upper side and a lower side respectively, a middle scroll 320c is mounted between the two turbo fans for isolating the two turbo fans and guiding discharge air flows, an upper scroll 320a over the upper turbo fan, and lower scrolls 320b under the lower turbo fan for guiding air discharge to the lower side.

[0111] The guide frame 300 has orifices 310 formed in correspondence to the turbo fans for guiding air flows toward the turbo fans, respectively.

[0112] The turbo fans are mounted to rotate in different directions.

[0113] In a case of this configuration, basically though the air discharge directions are in left and right sides, because the middle scroll separates the upper side and the lower side of the air conditioner, and the air is discharged, not only in the left and right sides, but also in a lower side, the indoor unit has five air discharge directions, at the end.

[0114] In this case, the air discharge flow distribution is much more uniform compared to a case only one turbo fan is provided.

[0115] If the lower scrolls 320b under the lower turbo fan, which guides the air flow discharge to the lower side, are not provided, though the air discharge directions are divided in left and right directions, because the middle scroll separates the upper space and the lower space, all discharge directions are four at the end.

[0116] Referring to FIG. 20 where a middle scroll 320d of another structure is illustrated, in this case too, the air discharge flow distribution is more uniform than the case only one fan is used.

[0117] FIG. 21 illustrates a middle scroll 320e tilted op-

posite to FIG. 19.

[0118] In the meantime, it does not make any difference even if the turbo fans respectively mounted on the upper side and the lower side are rotated in the same direction.

[0119] As can be known from FIGS. 19 to 21, of course it does not make any difference even if rotation centers of the turbo fans at the upper side and the lower side are not positioned in the same vertical line.

[0120] Particularly, if the indoor unit having two turbo fans is mounted to one end of a wall, the air flow can be improved effectively by controlling left/right side air discharge flow rates of the indoor unit.

[0121] That is, if the indoor unit is not at a center of the wall, but on one side of the wall, an air flow toward an adjacent wall is deflected at the wall, which makes feeling of the air flow poor in a position of the user. However, in the case of the embodiment having two fans applied thereto, air flow rates in the left/right sides are changed by controlling a rotation speed of one fan, to obtain a desired feeling of the air flow.

[0122] If an additional remark is made, as the air discharge flow rate is fixed according to a scroll shape or the rotation direction of the turbo fan, by controlling one of the fans taking a mounted position of the indoor unit, the left, or right side discharge rate can be changed to obtain a desired feeling of the air flow.

[0123] An indoor unit having two cross flow fans 900 applied thereto will be described with reference to FIGS. 23 to 26.

[0124] Alike the foregoing case in which two turbo fans are used, the indoor unit of the embodiment is the same with the foregoing embodiment in that the air discharge flow rate can be distributed uniformly in left/right sides, and the left/right side air discharge flow rates can be varied, taking the mounting position of the indoor unit into account, to obtain a desired feeling of air flow.

[0125] FIG. 22 illustrates a perspective view of an indoor unit having the two cross flow fans 900 applied thereto, including a front frame 200 made to enable air suction through a front, a base frame 400 joined with the front frame 200, having outlets in sides, and motor seats on an inner side of upper and lower sides for mounting motor for driving the cross flow fans, a heat exchanger 500 in rear of the front frame 200, cross flow fans 900 on left and right sides in rear of the heat exchanger 500, and a front panel 100 in front of the front frame 200 with a space therefrom for shading an air suction face of the front frame 200.

[0126] Basically, the front panel 100 is mounted such that upper/lower and left/right sides thereof have the same air suction gap from the air suction face of the front frame 200.

[0127] In the meantime, FIGS. 23 to 26 illustrate cross sections of variations of the indoor unit of the present invention having two cross flow fans 900 applied thereto, having basic structures identical to a structure shown in FIG. 11, except that front panel mounting structures, di-

ameters of the fans, and shapes of the heat exchangers 500 are different.

[0128] That is, the indoor unit in FIG. 23 has the front panel 100 spaced apart from the air suction face of the front frame 200 such that the front frame 200 is tilted from the air suction face by an angle ' θ ' wherein the front panel 100 is in close contact with the air suction face of the front frame 200 to close the air inlet until a separate driving unit (not shown) is driven to open the front panel with a predetermined tilting angle.

[0129] The indoor unit FIG. 24 has the front panel 100 mounted to one side of the front frame 200 like a cantilever, wherein the front panel 100 is in close contact with the air suction face of the front frame 200 until a separate driving unit (not shown) is driven to make the front panel spaced apart from the air suction face by the same distance entirely, to open the air suction face.

[0130] The indoor units in FIGS. 23 and 24 have straight lined sections of the heat exchangers.

[0131] The indoor unit in FIG. 25 has the front panel 100 in close contact with the air suction face of the front frame 200 until a separate driving unit (not shown) is driven to make the front panel 100 spaced from the air suction face. The heat exchanger 500 has a straight line section with thickness at opposite edges facing the cross flow fans 900 formed thinner than a middle portion. That is, the middle portion of the heat exchanger 500 has two rows of refrigerant pipes while the opposite edges have a single row of refrigerant pipe.

[0132] The indoor unit in FIG. 26 has the front panel 100 spaced a distance apart from the air suction face of the front frame 200 until a separate driving unit (not shown) is driven to make the front panel 100 spaced from the air suction face farther.

[0133] The heat exchanger 500 has a 'V' section on the whole.

[0134] In the meantime, referring to FIGS. 25 and 26, opposite edges of the heat exchanger 500 facing the cross flow fans 900 may have thickness thinner than a middle portion.

[0135] It is preferable that the indoor units according to embodiments of the present invention are mounted on the wall vertically. Of course, the indoor units according to embodiments of the present invention may be mounted horizontally. Or, the indoor units according to embodiments of the present invention may be mounted in any direction, such as mounting in a tilted position. However, it is preferable that the indoor units according to embodiments of the present invention are mounted vertically, taking positions of air outlets and air flow directions into account.

[0136] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims.

Claims

1. An indoor unit for an air conditioner comprising:

a front frame (200) made to enable air suction through a front thereof;
 a base frame (400) joined with the front frame, having outlets in sides and a bottom, and a motor seat for mounting a fan driving motor thereon;
 a guide frame (300) between the front frame and the base frame including an orifice (310) for guiding air flow being drawn into the fan (600), and upper and lower scrolls (320a, 320b) for guiding an air flow discharged from the fan and fixing a discharge direction of the air;
 a heat exchanger (500) between the front frame and the guide frame;
 a fan (600) for discharging heat exchanged air to an outside of the indoor unit;
characterized in that it further comprises a front panel (100) mounted in front of the front frame with a space thereto,
 wherein the front panel includes edge portions each having thickness thinner than other portions of the front panel, with a slope on an inside surface of the panel for reducing a flow resistance at the time of drawing air therethrough, and the indoor unit being arranged such that room air is introduced between the front panel and the front frame,
 the front frame (200) having a top side inlet formed to have a curved shape for minimising a flow resistance to air, and
 wherein the guide frame (300) includes edge planes (340) bent toward a front side of the indoor unit for guiding air discharge.

2. The indoor unit as claimed in claim 1, wherein the front frame (200) has a bottom side inlet formed to have curved shapes for minimizing a flow resistance in drawing air.

3. The indoor unit as claimed in claim 1, wherein the upper scroll (320a) has a combined surface of two curved surfaces that surrounds the fan (600), with a cut-off point at a first quadrant of the guide frame (300) with coordinates of $0.17 < x/\varphi < 0.48$, $0.54 < y/\varphi < 0.68$ where φ denotes a diameter of the turbo fan (600), and x and y denote coordinates with an origin at a center of the turbo fan (600).

4. The indoor unit as claimed in claim 1, wherein the guide frame (300) further includes a heat exchanger supporting portion (330) on an opposite surface of the scroll for maintaining a gap to the heat exchanger (500).

5. The indoor unit as claimed in claim 1, wherein a gap

'G' between a bottom where the orifice (310) beings and a bottom of the heat exchanger (500) is 9.5 - 10.5% of a turbo fan diameter.

6. The indoor unit as claimed in claim 1, wherein a ratio R/φ is in a range of 0.05 - 0.07 where 'R' denotes a radius of the fan (600) and φ denotes a diameter of the fan.

7. The indoor unit as claimed in claim 1, wherein the fan (600), being a turbo fan, includes;
 a shroud (610) having a central suction opening, a hub (630) having a main plate (620) opposite to, and spaced a predetermined distance from, the shroud (610), for connecting a rotation shaft of the motor at a center, and
 a plurality of blades (640) each having a predetermined curvature connected in a circumferential direction of the hub (630) between the main plate of the hub and the shroud.

8. The indoor unit as claimed in claim 7, wherein tip pitches of the blades (640) of the turbo fan (600) are variable or equal, and a width of the blade (640) has the same dimension starting from a connection portion to the hub (630) to the tip, and the blade tip is positioned almost the same with an edge of the shroud (610).

9. The indoor unit as claimed in claim 7, wherein a ratio φ/L of the diameter φ of the fan (600) to the width 'L' of the blade is at 6.5 - 7.5 if a discharge area is fixed.

10. The indoor unit as claimed in claim 1, wherein the motor seat at a center of the base frame (400) is an annular bead portion projected to a front side of the indoor unit.

11. The indoor unit as claimed in claim 1, further comprising ribs (420) on a back side of the base frame (400) in the vicinity of the motor seat for reinforcing strength, and being out of a natural frequency of the motor.

12. The indoor unit as claimed in claim 1, wherein the base frame (400) has a thickness 't' enabling the base frame being out of the natural frequency of the motor.

13. The indoor unit as claimed in claim 1, further comprising an electric dust collector (700) mounted on an air suction face of the heat exchanger (500) so as to be positioned a predetermined distance away from the center of the fan (600),
 wherein the electric dust collector (700) is mounted at a position where a ratio l/h is 5 - 6 where 'l' denotes a distance from the center of the turbo fan (600), and 'h' denotes a height from an upper surface of the

turbo fan to a center of the electric dust collector.

14. The indoor unit as claimed in claim 1, wherein the base frame (400) has a guide surface of a predetermined curvature on an inside of a lower side of an outlet in an edge of the base frame (400) for guiding air to be discharged toward a front side of the indoor unit.

Patentansprüche

1. Innengerät für eine Klimaanlage, welches Folgendes aufweist:

einen Frontrahmen (200), welcher hergestellt ist, um eine Luftabsaugung durch seine Vorderseite zu ermöglichen;

einen mit dem Frontrahmen verbundenen Grundrahmen (400), welcher Auslässe bzw. Ventile an der Seite und an der Unterseite sowie eine Motor-Auflagefläche für die Befestigung eines Gebläse-Antriebmotors darauf aufweist;

einen Leitrahmen (300) zwischen dem Frontrahmen und dem Grundrahmen, welcher eine Öffnung (310) zur Leitung eines in das Gebläse (600) angesaugten Luftstroms einschließt, sowie obere und untere Luftleitelemente (320a, 320b) zur Leitung eines Luftstroms, welcher aus dem Gebläse ausgestoßen wird, und zur Festlegung einer Ausstoßrichtung der Luft;

einen Wärmetauscher (500) zwischen dem Frontrahmen und dem Leitrahmen;

ein Gebläse (600) zum Ausstoß von von dem Wärmetauscher getauschter Luft an eine Außenumgebung des Innengeräts;

dadurch gekennzeichnet, dass das Innengerät des Weiteren Folgendes aufweist:

eine Frontplatte (100), welche vor dem Frontrahmen mit Abstand zu diesem angebracht ist,

wobei die Frontplatte Rand- oder Kantenabschnitte einschließt, welche jeweils eine Dicke geringer als andere Abschnitte der Frontplatte aufweisen, mit einem Gefälle auf einer Innenfläche der Platte zur Verringerung eines Strömungswiderstands zum Zeitpunkt des Ansaugens von Luft durch diese; und

wobei das Innengerät derart angeordnet ist, dass Raumluft zwischen der Frontplatte und dem Frontrahmen eingeleitet wird, wobei der Frontrahmen (200) einen Oberseiten-Einlass aufweist, welcher so geformt ist, dass er eine gekrümmte Form zur Minimierung eines Strömungswiderstand gegenüber Luft aufweist; und

wobei der Leitrahmen (300) Kantenebenen oder -flächen (340) aufweist, welche in Richtung einer Vorderseite des Innengeräts zur Leitung des Luftaustritts gekrümmt sind.

2. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** der Frontrahmen (200) einen unteren Seiteneinlass aufweist, welcher so geformt ist, dass er eine gekrümmte Form zur Minimierung eines Strömungswiderstands bei der Ansaugung von Luft aufweist.

3. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** das obere Luftleitelement (320a) eine kombinierte Fläche aus zwei gekrümmten Flächen aufweist, welche das Gebläse (600) umgibt, mit einer Trennstelle an einem ersten Quadranten des Leitrahmens (300) mit den Koordinaten $0.17 < x/j < 0.48$, $0.54 < y/j < 0.68$, wobei j einen Durchmesser des Turbogebläses (600) bezeichnet, und x und y bezeichnen Koordinaten mit Ursprung an einem Mittelpunkt des Turbogebläses (600).

4. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** der Führungsrahmen (300) des Weiteren einen Wärmetauscher-Stützabschnitt (330) auf einer gegenüberliegenden Fläche des Luftleitelements einschließt, um einen Spalt zu dem Wärmetauscher (500) beizubehalten.

5. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Spalt "G" zwischen einem unteren Ende, an welchem die Öffnung (310) beginnt, und einem unteren Ende des Wärmetauschers (500) $9.5 \sim 10.5\%$ des Durchmessers eines Turbogebläses beträgt.

6. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Verhältnis R/j im Bereich von $0.05 \sim 0.07$ liegt, wobei "R" einen Radius des Gebläses (600) und j einen Durchmesser des Gebläses bezeichnet.

7. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gebläse (600), bei welchem es sich um ein Turbogebläse handelt, Folgendes einschließt:

eine Umhüllung (610) mit einer zentralen Ansaugöffnung;

eine Radnabe oder Drehscheibe (630) mit einer Hauptplatte (620) gegenüber und einer vorgegebenen Entfernung beabstandet von der Umhüllung (610), um eine Drehwelle des Motors an einer Mitte anzuschließen, und eine Vielzahl von Schaufelblättern (640), wobei jedes eine vorgegebene Krümmung aufweist und in Umfangsrichtung der Nabe (630) zwi-

schen der Hauptplatte der Nabe und der Umhüllung verbunden ist.

8. Innengerät nach Anspruch 7, **dadurch gekennzeichnet, dass** die Abstände der Spitzen der Schaufelblätter (640) des Turbogebläses variabel oder gleich sind, und dass eine Breite des Schaufelblatts (640) ausgehend von einem Verbindungsabschnitt mit der Nabe (630) zur Spitze dieselbe Abmessung aufweist, und dass die Schaufelblattspitze fast identisch zu einer Kante der Umhüllung (610) angeordnet ist. 5
9. Innengerät nach Anspruch 7, **dadurch gekennzeichnet, dass** ein Verhältnis j/L des Durchmessers j des Gebläses (600) zu der Breite "L" des Schaufelblatts bei 6.5 7.5 liegt, falls ein Ausstoßbereich festgelegt ist. 10
10. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** die Motoraufgabe an einer Mitte des Grundrahmens (400) ein ringförmiger Wulstabschnitt ist, welcher in Richtung einer Frontseite des Innengeräts vorsteht. 15
11. Innengerät nach Anspruch 1, welches des Weiteren Rippen (420) auf einer Rückseite des Grundrahmens (400) in der Nähe der Motoraufgabe zur Stärkung der Festigkeit aufweist, und wobei die Rippen außerhalb der Eigenfrequenz des Motors liegen. 20
12. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** der Grundrahmen (400) eine Dicke "t" aufweist, welche ermöglicht, dass der Grundrahmen außerhalb der Eigenfrequenz des Motors liegt. 25
13. Innengerät nach Anspruch 1, welches des Weiteren einen elektrischen Staubfänger (700) aufweist, welcher auf einer Luftansaugseite des Wärmetauschers (500) befestigt ist, so dass er in einer vorher festgelegten Entfernung weg von der Mitte des Gebläses (600) angeordnet ist, wobei der elektrische Staubfänger (700) an einer Position befestigt ist, an der ein Verhältnis l/h 5 -6 beträgt, wobei "l" eine Entfernung von der Mitte des Turbogebläses (600) bezeichnet, und "h" eine Höhe von einer oberen Fläche des Turbogebläses zu einer Mitte des elektrischen Staubfängers bezeichnet. 30
14. Innengerät nach Anspruch 1, **dadurch gekennzeichnet, dass** der Grundrahmen (400) eine Leitfläche mit einer vorher festgelegten Krümmung auf einer Innenseite einer unteren Seite eines Auslasses in einer Kante des Grundrahmens (400) aufweist, um auszublasende Luft in Richtung einer Frontseite des Innengeräts zu leiten. 35

Revendications

1. Unité intérieure pour un climatiseur comprenant:

un châssis avant (200) réalisé pour permettre l'aspiration de l'air par sa partie avant;
 un châssis de base (400) assemblé avec le châssis avant, ayant des sorties sur les côtés et un fond, et un siège de moteur pour monter un moteur d'entraînement de ventilateur sur ce dernier;
 un châssis de guidage (300) entre le châssis avant et le châssis de base comprenant un orifice (310) pour guider l'écoulement d'air qui a été aspiré dans le ventilateur (600), et des hélices supérieure et inférieure (320a, 320b) pour guider un écoulement d'air déchargé du ventilateur et fixant une direction de décharge de l'air;
 un échangeur de chaleur (500) entre le châssis avant et le châssis de guidage;
 un ventilateur (600) pour décharger l'air échangé thermiquement à l'extérieur de l'unité intérieure;
caractérisée en ce qu'elle comprend en outre:

- un panneau avant (100) monté en face du châssis avant avec un espace, dans laquelle le panneau avant comprend des parties de bord ayant chacune une épaisseur plus fine que les autres parties du panneau avant, avec une inclinaison sur une surface interne du panneau pour réduire la résistance à l'écoulement au moment de l'aspiration de l'air, et l'unité intérieure étant agencée de sorte que l'air ambiant est introduit entre le panneau avant et le châssis avant, le châssis avant (200) ayant une entrée latérale supérieure formée pour avoir une forme incurvée afin de minimiser une résistance à l'écoulement de l'air, et dans laquelle le châssis de guidage (300) comprend des plans de bord (340) pliés vers un côté avant de l'unité intérieure pour guider la décharge d'air. 40
2. Unité intérieure selon la revendication 1, dans laquelle le châssis avant (200) a une entrée latérale inférieure formée pour avoir des formes incurvées afin de minimiser une résistance à l'écoulement lors de l'aspiration de l'air. 45
3. Unité intérieure selon la revendication 1, dans laquelle l'hélice supérieure (320a) a une surface combinée de deux surfaces incurvées qui entoure le ventilateur (600), avec un point de coupure à un premier quadrant du châssis de guidage (300) avec des coordonnées de $0,17 < x/\varphi < 0,48$, $0,54 < y/\varphi < 0,68$, où 50

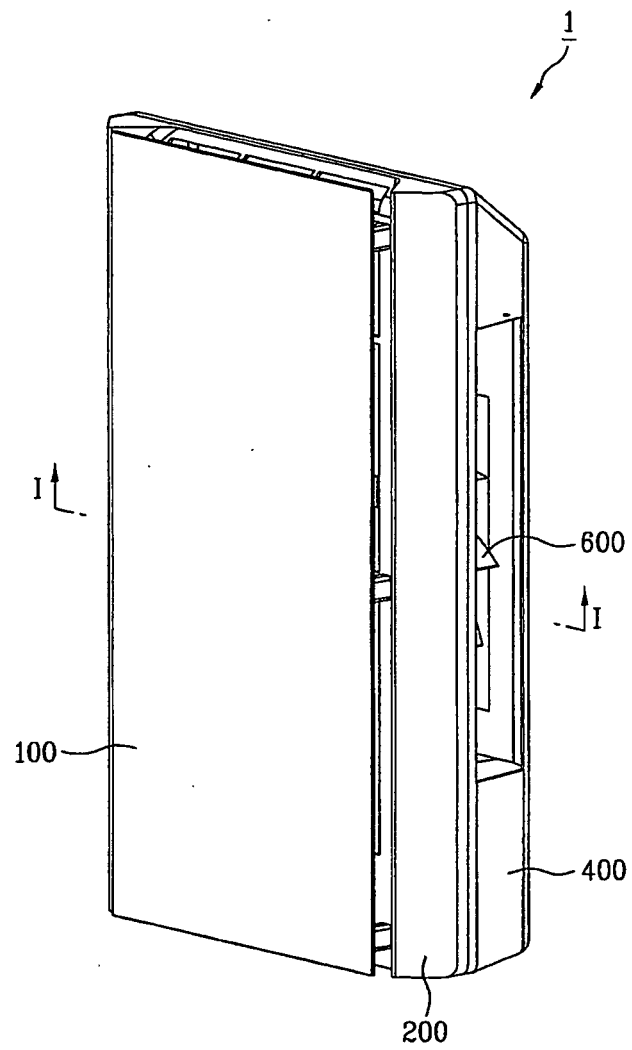
φ désigne un diamètre du réacteur à double flux (600), et x et y désignent des coordonnées avec une origine à un centre du réacteur à double flux (600).

4. Unité intérieure selon la revendication 1, dans laquelle le châssis de guidage (300) comprend en outre une partie de support d'échangeur de chaleur (330) sur une surface opposée de l'hélice pour maintenir un espace par rapport à l'échangeur de chaleur (500). 5
5. Unité intérieure selon la revendication 1, dans laquelle un espace "G" entre un fond où l'orifice (310) commence et un fond de l'échangeur de chaleur (500) représente 9,5 - 10,5% d'un diamètre de réacteur à double flux. 10
6. Unité intérieure selon la revendication 1, dans laquelle un rapport R/φ est dans une plage de 0,05 ~ 0,07, où "R" désigne un rayon du ventilateur (600) et φ désigne un diamètre du ventilateur. 15
7. Unité intérieure selon la revendication 1, dans laquelle le ventilateur (600) qui est un réacteur à double flux, comprend: 20
 - un flasque (610) ayant une ouverture d'aspiration centrale,
 - un moyeu (630) ayant une plaque principale (620) opposée à et espacée selon une distance prédéterminée du flasque (610) pour raccorder un arbre de rotation du moteur à un centre, et une pluralité de pales (640) ayant chacune une courbure prédéterminée, raccordées dans une direction circonférentielle du moyeu (630) entre la plaque principale du moyeu et le flasque. 25
8. Unité intérieure selon la revendication 7, dans laquelle les pas de pointe des pales (640) du réacteur à double flux (600) sont variables ou égaux, et une largeur de la pale (640) a la même dimension à partir d'une partie de raccordement au moyeu (630) jusqu'à la pointe, 30
 - et la pointe de pale est positionnée presque à la même position avec un bord du flasque (610). 35
9. Unité intérieure selon la revendication 7, dans laquelle un rapport φ/L du diamètre φ du ventilateur (600) sur la largeur "L" de la pale est de 6,5 ~ 7,5, si une zone de décharge est déterminée. 40
10. Unité intérieure selon la revendication 1, dans laquelle le siège de moteur au niveau d'un centre du châssis de base (400) est une partie de bourrelet annulaire faisant saillie vers un côté avant de l'unité intérieure. 45
11. Unité intérieure selon la revendication 1, compre-

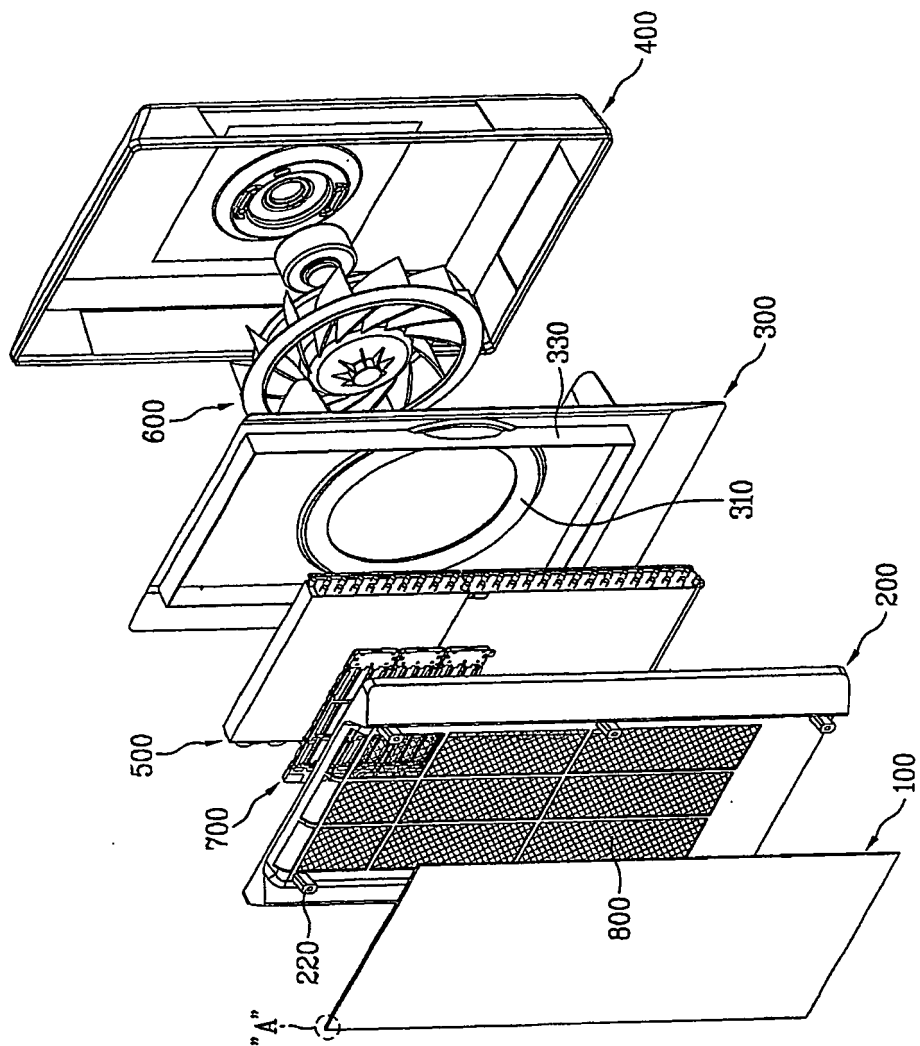
nant en outre des nervures (420) sur un côté arrière du châssis de base (400) à proximité du siège de moteur pour renforcer la résistance, et étant hors d'une fréquence naturelle du moteur.

12. Unité intérieure selon la revendication 1, dans laquelle le châssis de base (400) a une épaisseur "t" permettant au châssis de base d'être hors de la fréquence naturelle du moteur. 50
13. Unité intérieure selon la revendication 1, comprenant en outre un collecteur de poussière électrique (700) monté sur une face d'aspiration d'air de l'échangeur de chaleur (500) afin d'être positionné à une distance prédéterminée du centre du ventilateur (600), 55
 - dans laquelle le collecteur de poussière électrique (700) est monté dans une position dans laquelle un rapport l/h est de 5 - 6, où "l" désigne une distance par rapport au centre du réacteur à double flux (600) et "h" désigne une hauteur à partir d'une surface supérieure du réacteur à double flux jusqu'à un centre du collecteur de poussière électrique.
14. Unité intérieure selon la revendication 1, dans laquelle le châssis de base (400) a une surface de guidage d'une courbure prédéterminée sur un intérieur d'un côté inférieur d'une sortie dans un bord du châssis de base (400) pour guider l'air à décharger vers un côté avant de l'unité intérieure. 60

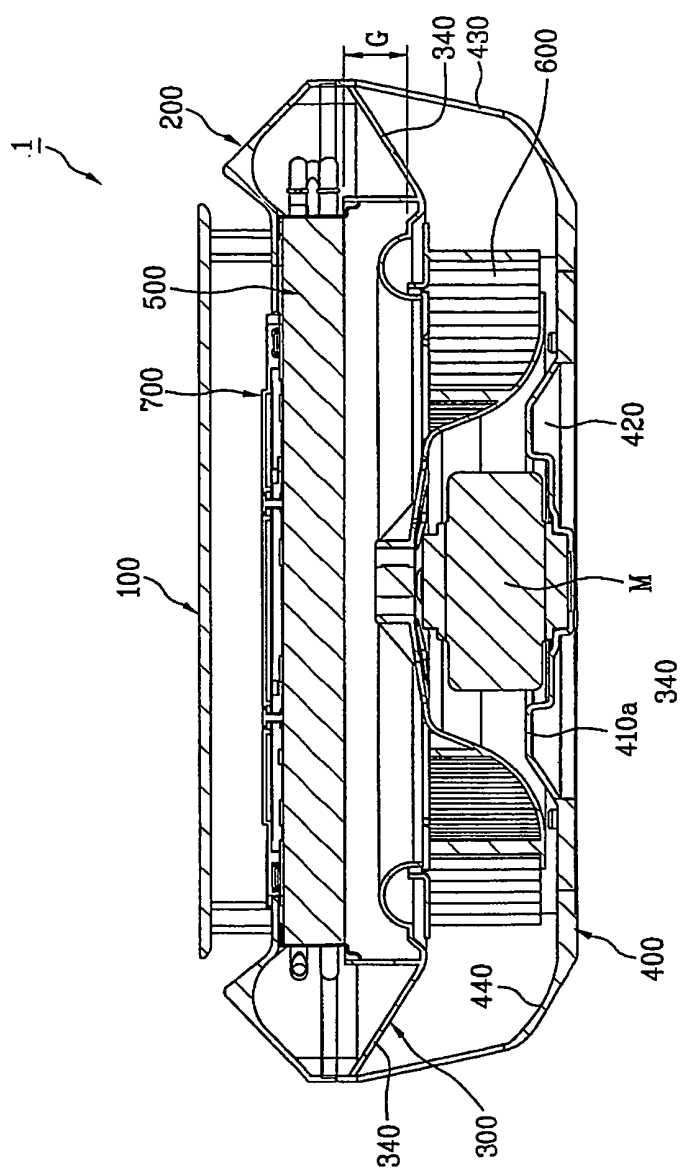
[Fig. 1]



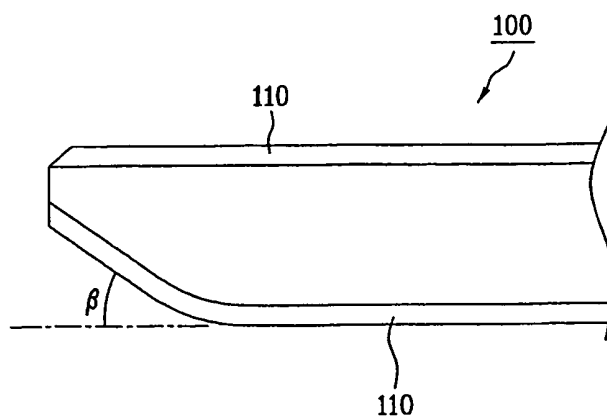
[Fig. 2]



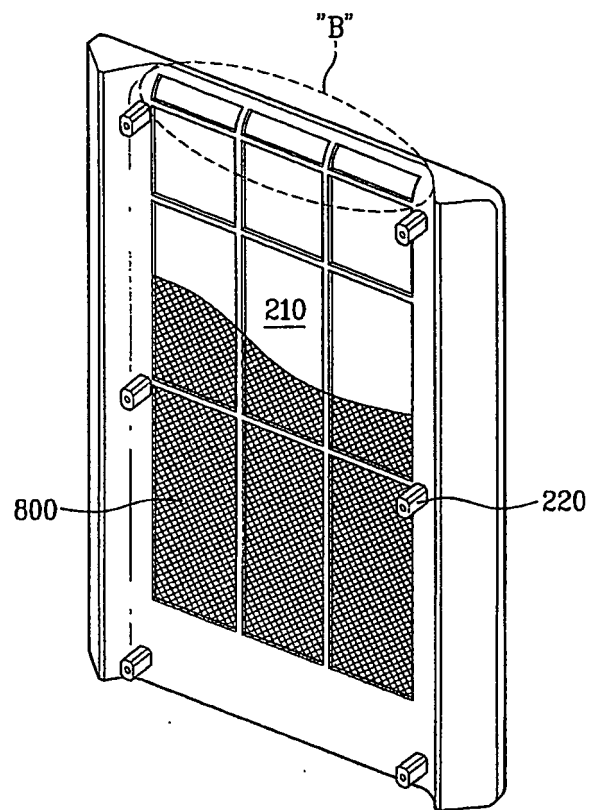
[Fig. 3]



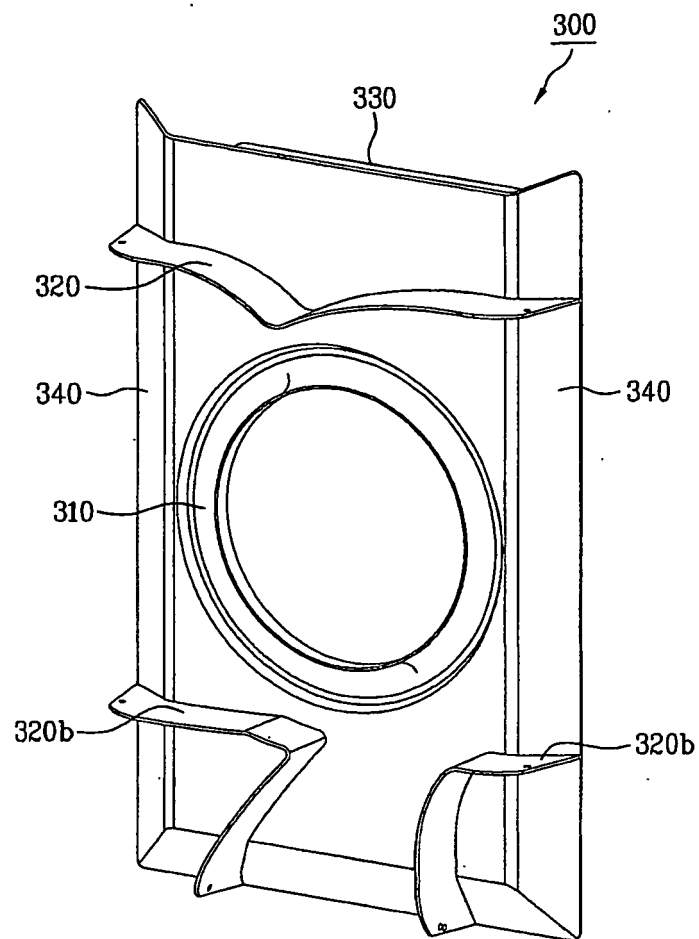
[Fig. 4]



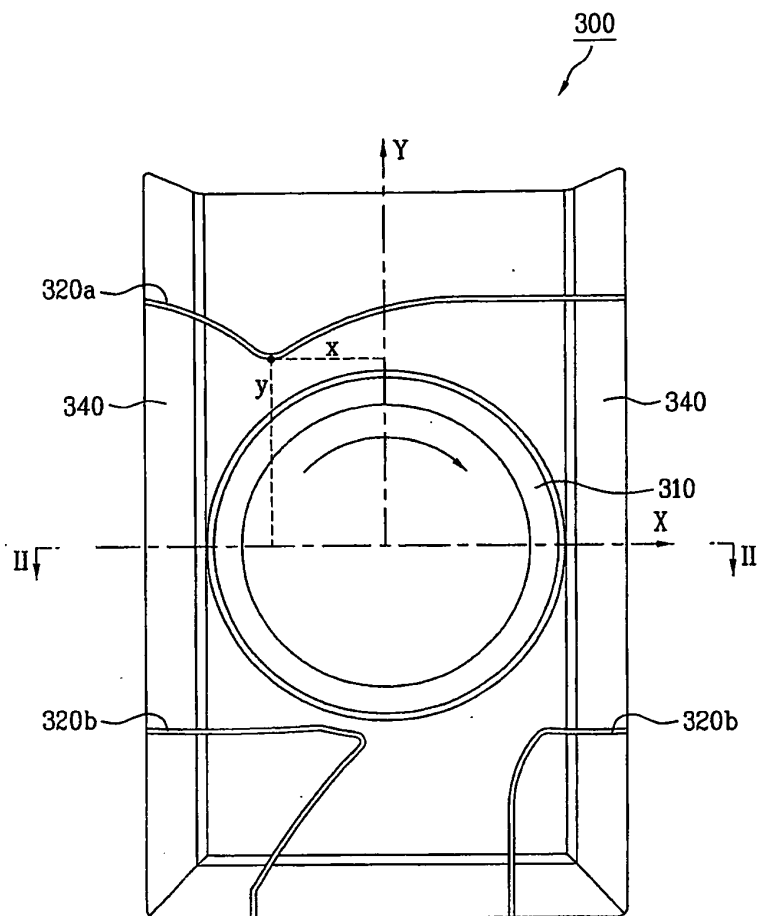
[Fig. 5]



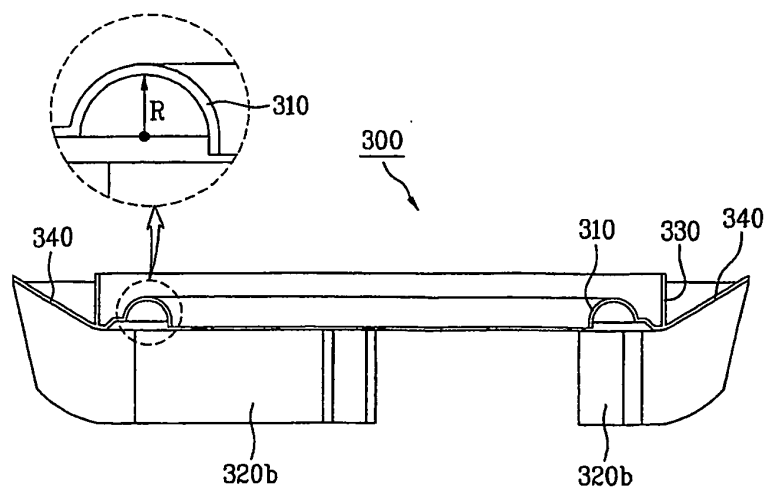
[Fig. 6]



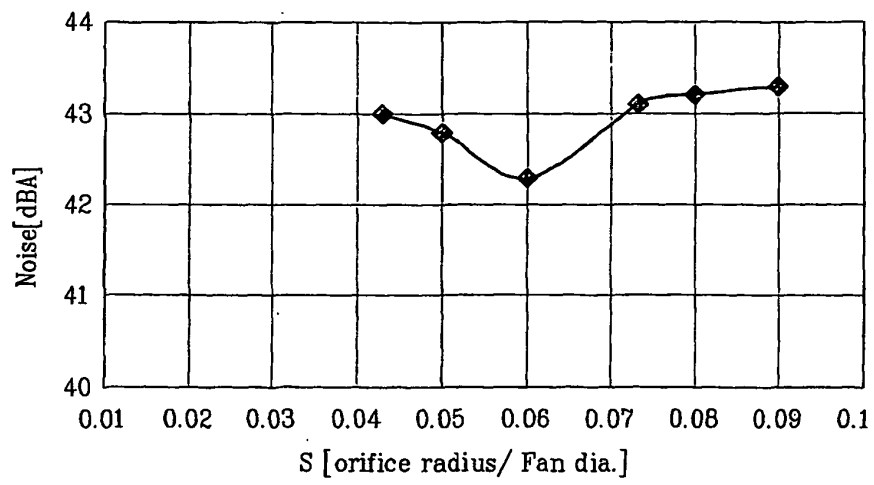
[Fig. 7]



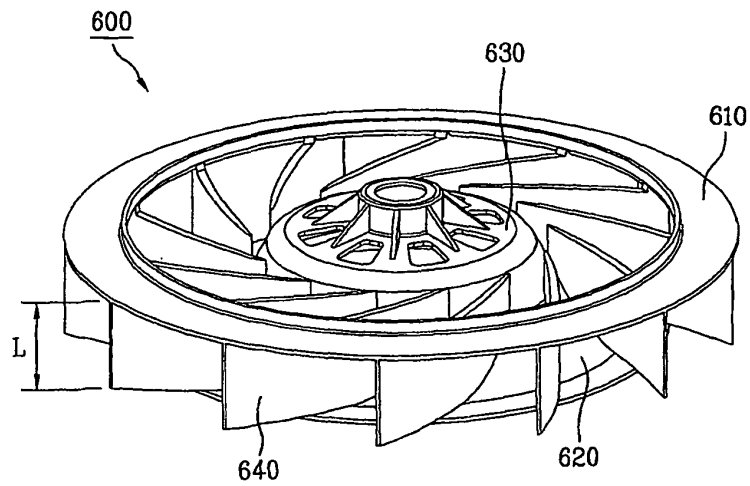
[Fig. 8]



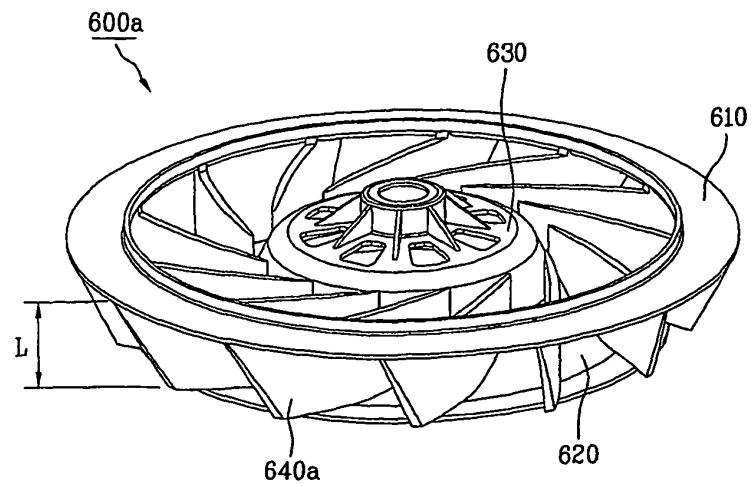
[Fig. 9]



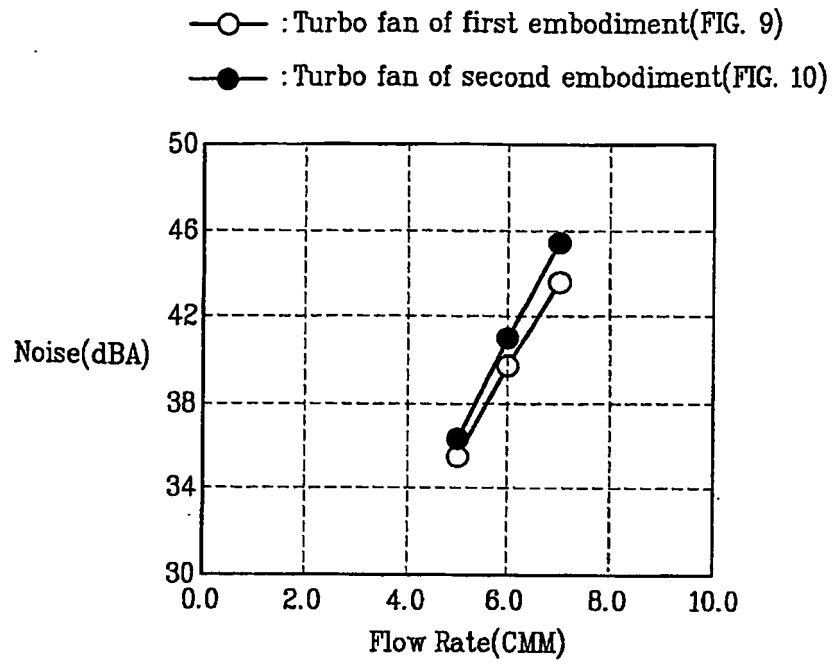
[Fig. 10]



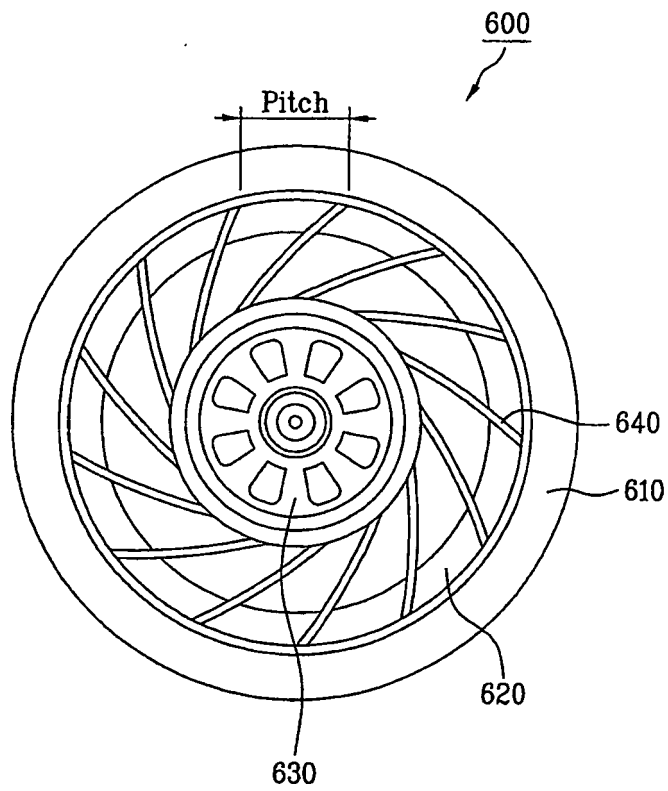
[Fig. 11]



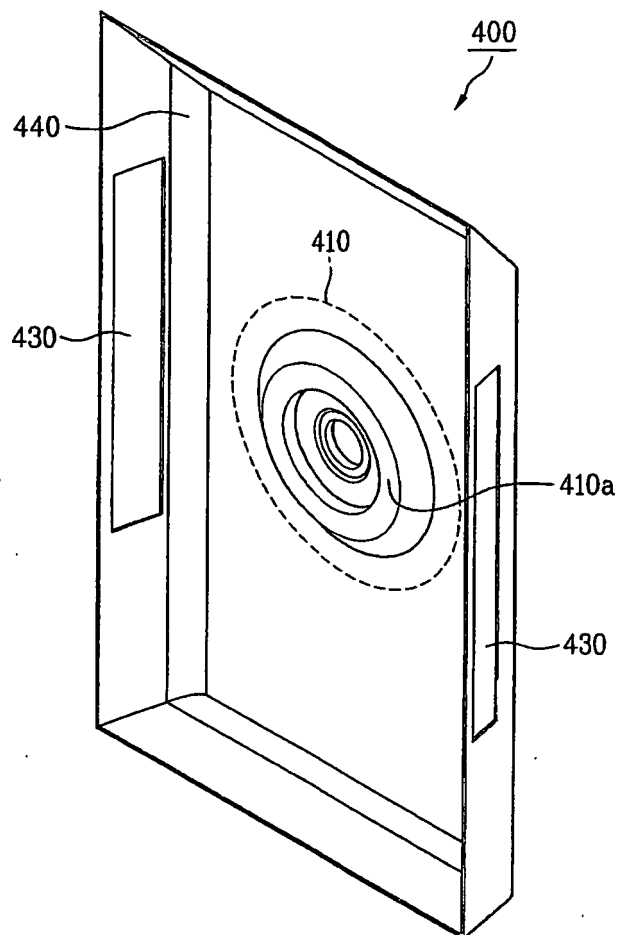
[Fig. 12]



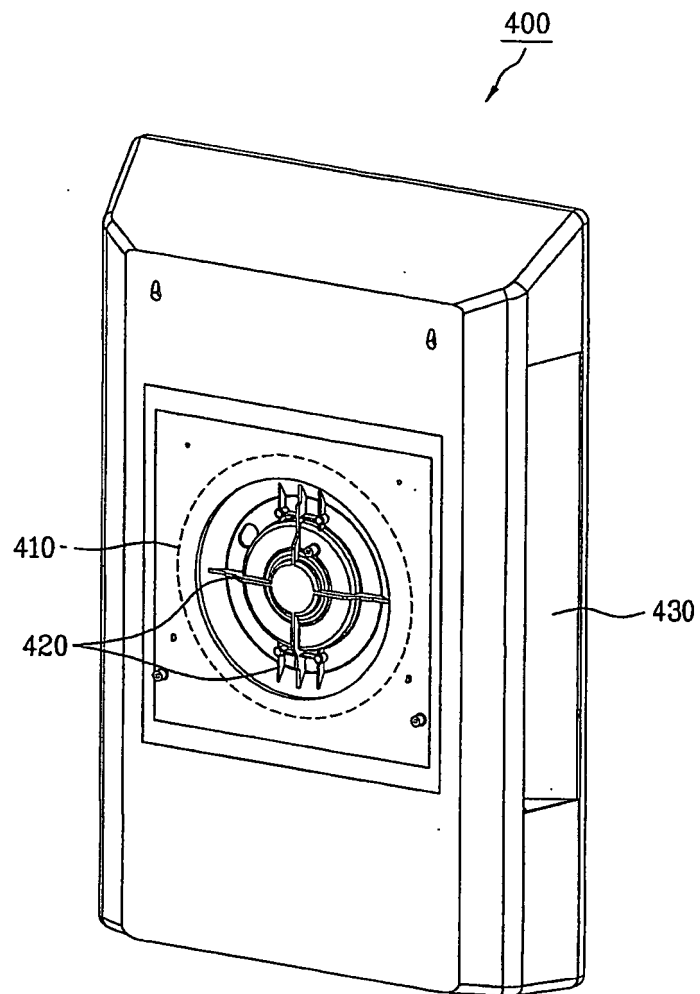
[Fig. 13]



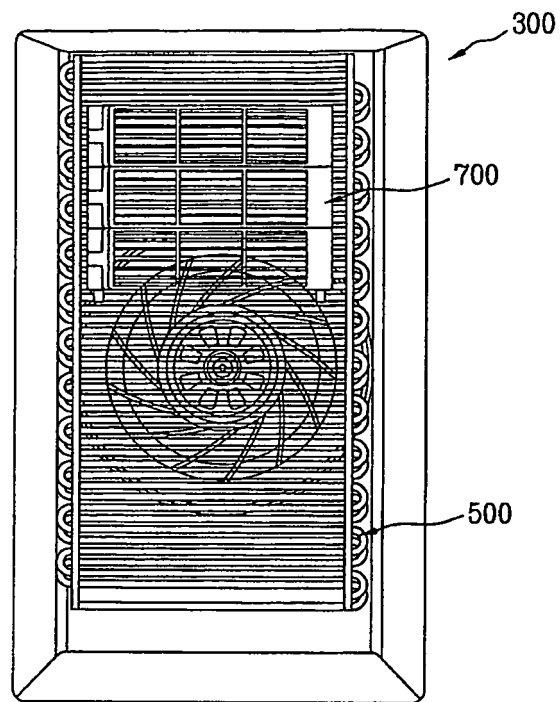
[Fig. 14]



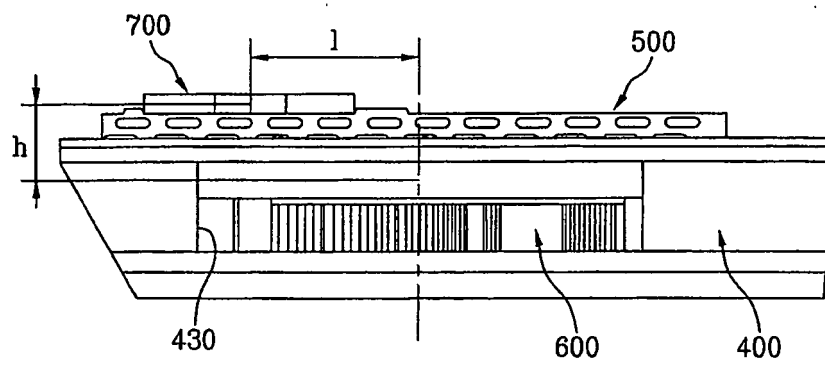
[Fig. 15]



[Fig. 16]

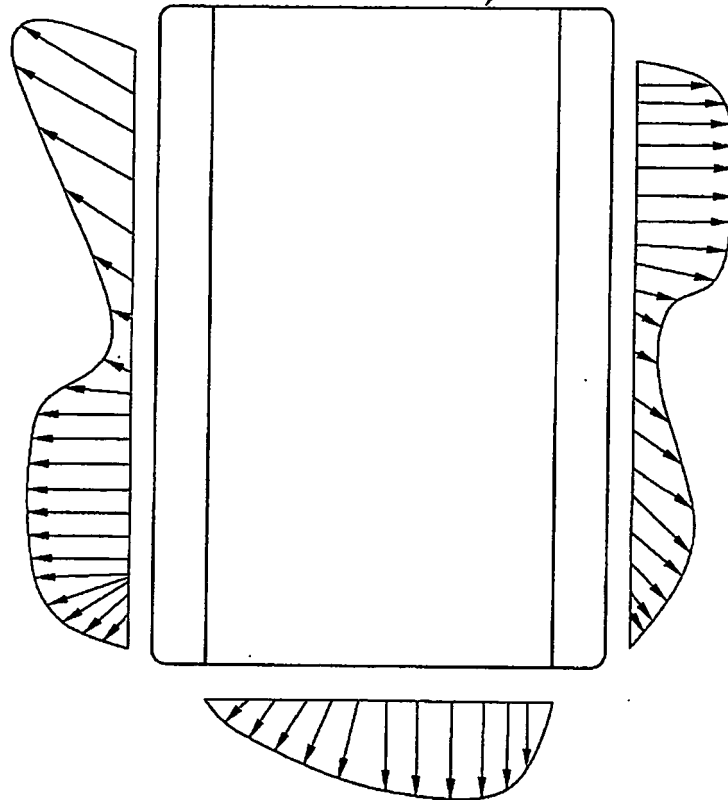


[Fig. 17]

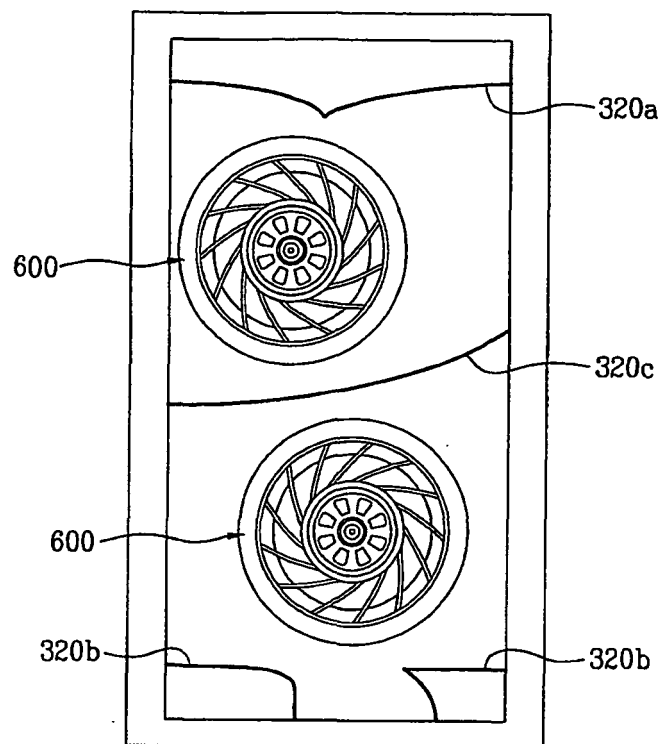


[Fig. 18]

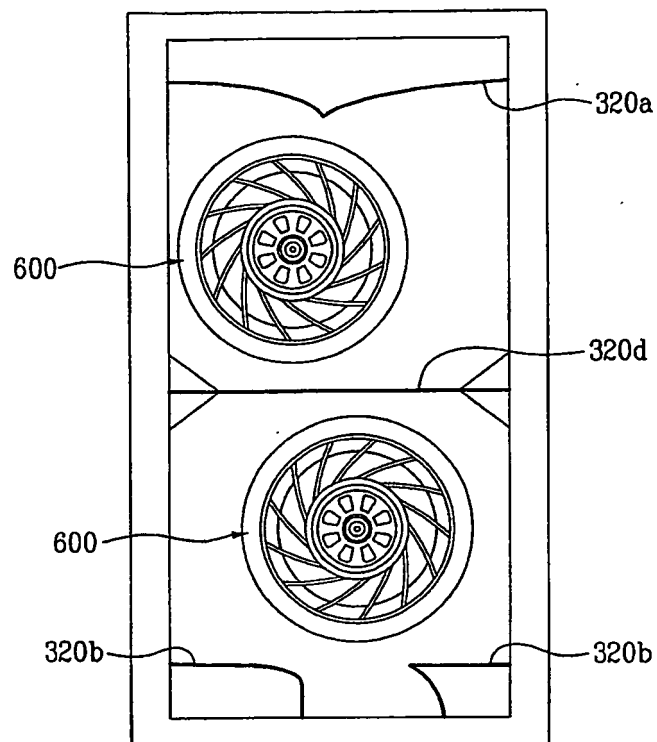
Related art
indoor unit



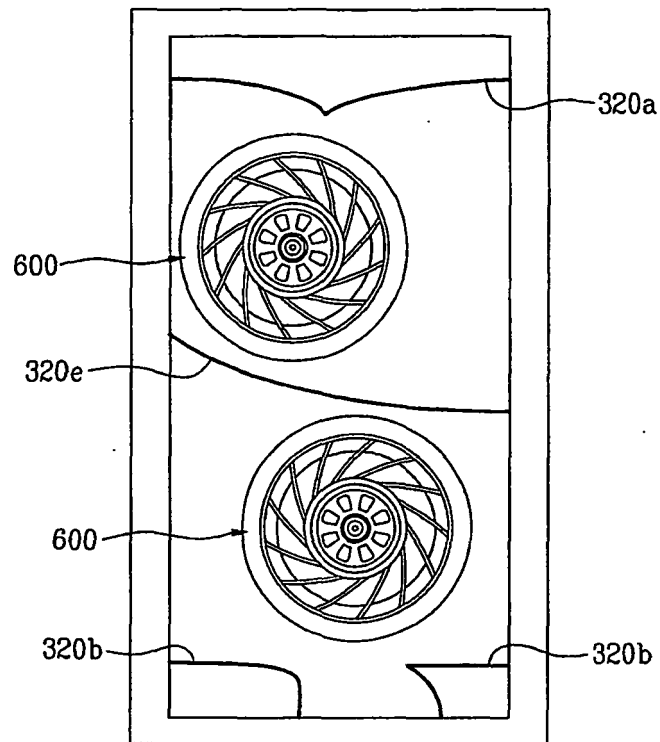
[Fig. 19]



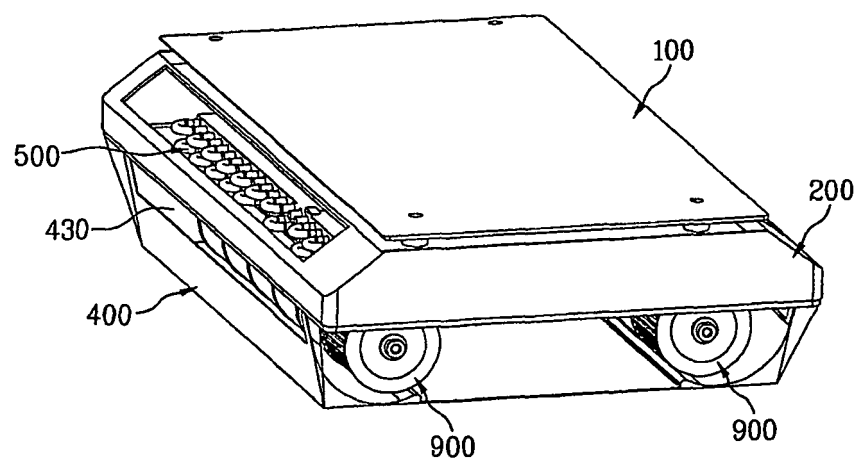
[Fig. 20]



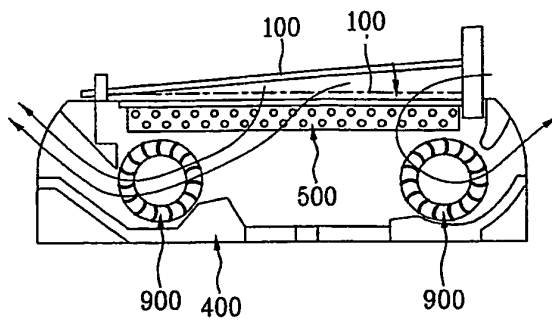
[Fig. 21]



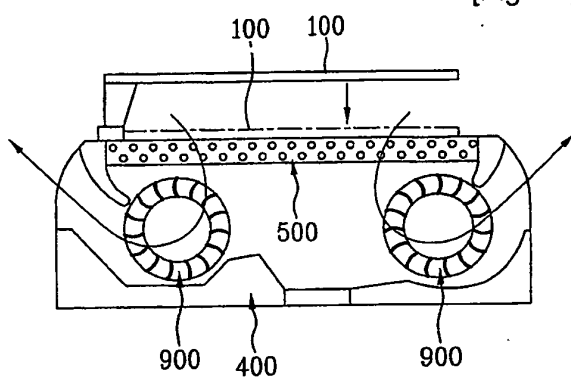
[Fig. 22]



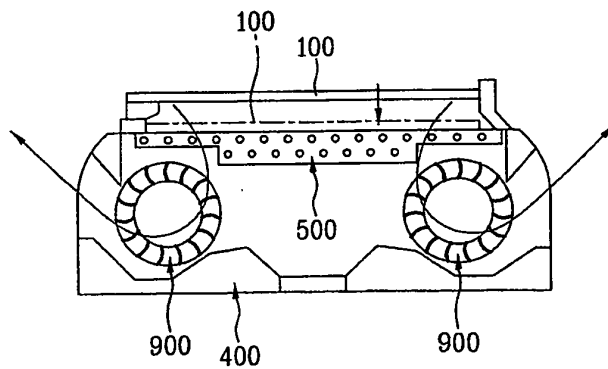
[Fig. 23]



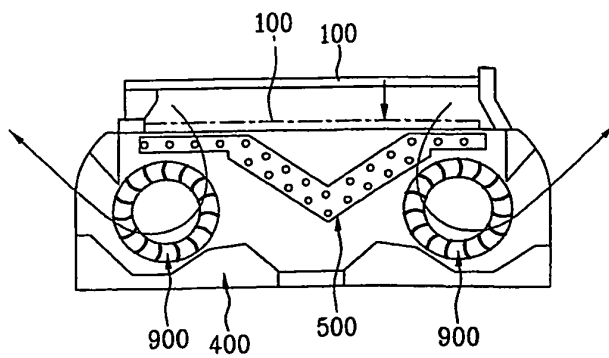
[Fig. 24]



[Fig. 25]



[Fig. 26]



REFERENCES CITED IN THE DESCRIPTION

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