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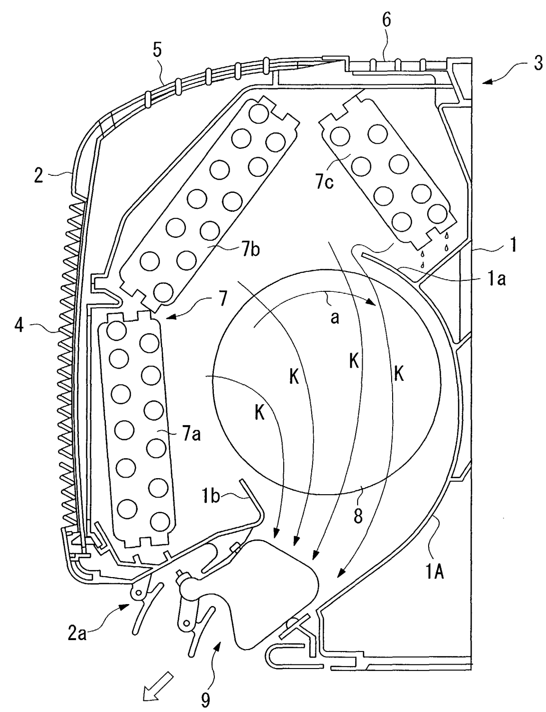
(54) **Interior unit for air conditioner, and air conditioner comprising the same**

(57) An interior unit for air conditioners, and an air conditioner itself, for preventing the ventilation performance from being degraded and for reducing noise caused by the interference between the air flow and the fan are disclosed. The interior unit comprises a fan (8) having vanes (8a) which are circularly arranged to have a cylinder shape, wherein intermediate plates (8b) for reinforcing the cylinder are inserted at cross sections along the axis of the cylinder; an interior heat exchanger (7) which surrounds the fan except for an outlet area through which the air is drawn out from the fan; and a stabilizer (30), placed between the interior heat exchanger and the fan, for receiving draining liquid produced by the interior heat exchanger. The air which passes through the interior heat exchanger is then drawn into the fan according to the rotation of the fan, and the drawn air is discharged through the outlet area outside the interior unit. The end of the stabilizer, which is closest to the fan, has a peak-valley form consisting of peak portions and valley portions which are alternatingly arranged. The pitch of the peak portions is substantially equal to the pitch of the intermediate plates, and the pitch of the vanes is substantially equal to the pitch between each peak portion and each valley portion.

FIG. 5



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to interior units for air conditioners for realizing comfortable room environments by heating or cooling the room, in particular, to those for reducing noise without degrading ventilation performance.

Description of the Related Art

[0002] Fig. 5 is a longitudinal-sectional view showing an example of an interior unit for conventional air conditioners. The interior unit shown in Fig. 5 has a box-shaped body (called "casing 3", hereinbelow) formed by attaching a front panel 2 to a base 1. An air inlet 4 is provided in the front face of the front panel 2, and air inlets 5 and 6 are also provided in the top face of the front panel 2.

[0003] In the casing 3, an interior heat exchanger 7 and a tangential fan 8 are provided, where the interior heat exchanger 7 is of a plate-fin-tube type, and the tangential fan 8 is a cross flow fan. In the interior heat exchanger 7, a plurality of plate fns are arranged in parallel, and these parallel-arranged plate fins are placed between side plates. In addition, tubes through which refrigerant flows are provided between the side plates and the plate fins. The tangential fan 8 is placed in an air guide case 1A which is provided in the casing 3.

[0004] The interior heat exchanger 7 is arranged in a manner such that the interior heat exchanger 7 surrounds the air-intake area of the tangential fan 8 when the tangential fan 8 rotates in the direction indicated by the arrow "a". The interior heat exchanger 7 consists of three portions: a first portion 7a, a second portion 7b, and a third portion 7c.

[0005] An air direction controller 9 for adjusting the direction of cold or warm air is provided at an air outlet 2a.

[0006] At the air-intake side of the tangential fan 8, (i) an air-intake nose 1a which is an extension of the air guide case 1A and (ii) a stabilizer 1b attached to the base 1 are provided, which are integrated with the base 1. The stabilizer 1b also functions as a drain guide which receives draining liquid (here, condensate) generated in the interior heat exchanger 7, and the stabilizer 1b has generally a plate shape which is parallel to the outer-peripheral face of the tangential fan 8, where a specific spacing is provided between the stabilizer 1b and the outer-peripheral face which faces the stabilizer 1b.

[0007] When the tangential fan 8 rotates in the direction indicated by arrow "a", the air around the tangential fan 8 is drawn via the air inlet 4 (provided at the front face of the front panel 2) and the air inlets 5 and 6 (provided at the top face of the front panel 2) into the first to third portions 7a to 7c of the interior heat exchanger 7.

[0008] The drawn air is then heat-exchanged in the first to third portions 7a to 7c, so that cold or warm air K is obtained. The driven tangential fan 8 makes the cold or warm air K flow from the above-explained air-intake side towards the direction indicated by long arrows in Fig. 5 across the tangential fan 8. This air is then blown out from the air outlet 2a. In addition, the blowing direction of the cold or warm air K can be controlled using the air direction controller 9.

[0009] The plate-shape stabilizer 1b is positioned in a space between the first portion 7a of the interior heat exchanger 7 and the tangential fan 8 in order to receive the above-explained draining liquid. Therefore, the stabilizer 1b partially obstructs the cold or warm air K blown from the first portion 7a; thus, it is necessary to make the cold or warm air K, which is to be drawn into the tangential fan 8, bypass the stabilizer 1b. Accordingly, the flow velocity of the relevant portion of the cold or warm air K is increased.

[0010] Consequently, in the tangential fan 8, the flow velocity of the cold or warm air K drawn as explained above is not uniform. In the area having a high flow velocity, the flow of the cold or warm air K interferes with vanes of the tangential fan 8, thereby generating narrow-band noise called "NZ sounds". The NZ sounds are noise whose frequency f is defined by NZ/60 Hz, where N denotes the rotational speed (rpm) of the tangential fan 8 and Z indicates the number of vanes of the tangential fan 8.

[0011] In a conventional method for solving this problem, the vanes of the tangential fan 8 are arranged in a manner such that the pitch of the vanes is not uniform. However, in this case, the ventilation performance is degraded in the portion having a large pitch, and also in the portion having a small pitch, the performance of ventilation is degraded because under the same flow velocity of the cold or warm air K, such a portion having a small pitch has larger loss in the air flow in comparison with the portion having a large pitch.

SUMMARY OF THE INVENTION

[0012] In consideration of the above circumstances, an object of the present invention is to provide an interior unit for air conditioners, and an air conditioner itself, for preventing the ventilation performance from being degraded and for reducing noise caused by the interference between the air flow and the fan.

[0013] Therefore, the present invention provides an interior unit for an air conditioner, comprising:

a fan (8) having a plurality of vanes (8a) which are circularly arranged to have a cylinder shape, wherein intermediate plates (8b) for reinforcing the cylinder are inserted at cross sections along the axis of the cylinder;

an interior heat exchanger (7) which surrounds the fan except for an outlet area through which the air

is drawn out from the fan; and
a stabilizer (30), placed between the interior heat exchanger and the fan, for receiving draining liquid produced by the interior heat exchanger, wherein:

the air which passes through the interior heat exchanger is then drawn into the fan according to the rotation of the fan, and the drawn air is discharged through the outlet area outside the interior unit, and
the interior unit is characterized in that:

the end of the stabilizer, which is closest to the fan, has a peak-valley form consisting of peak portions and valley portions which are alternatingly arranged;
the pitch of the peak portions is substantially equal to the pitch of the intermediate plates; and
the pitch of the vanes is substantially equal to the pitch between each peak portion and each valley portion.

[0014] According to this structure, the peak-valley form of the stabilizer can generate phase differences between the air flow passing along the peak portions to the fan and the air flow passing along the valley portions to the fan, thereby preventing the flow velocity of the air drawn into the fan from partially increasing. Therefore, it is possible to reduce noise caused by interference between the air flow including a portion of a larger flow velocity and the fan.

[0015] In addition, the pitch of the peak portions is substantially equal to the pitch of the intermediate plates. Therefore, in comparison with another form in which the pitch of the peak portions is smaller than that of the intermediate plates, the number of the peak portions which interrupt the air flow directed to the fan can be reduced to an optimum number. Therefore, the resistance imposed on the air flow to the fan can be low, thereby preventing the ventilation performance from being degraded.

[0016] In addition, the pitch of the vanes is substantially equal to the pitch between each peak portion and each valley portion. Therefore, the stabilizer can have a peak-valley shape most suitable to the employed fan. Accordingly, it is possible to simultaneously and reliably realize the sufficient amount of blown air and the reduction of noise.

[0017] Preferably, the peak portions respectively face the intermediate plates in a manner such that along the axial direction of the cylinder, the peak position of each peak portion substantially agrees with the position where the corresponding intermediate plate is inserted, and each valley portion faces an area between two adjacent intermediate plates. When the air flow drawn from the fan is viewed along the axis of the fan, the amount of air is reduced in the vicinity of each intermediate plate in comparison with the other portions away from the intermediate plates. However, in the above structure, each peak portion faces each intermediate plate; thus, each area between the intermediate plates, which has higher ventilation efficiency and performance, faces each valley portion, thereby increasing the amount of passing air. That is, in comparison with another form in which each peak portion faces the area between the adjacent intermediate plates, the ventilation performance can be improved.

[0018] Preferably, given pitch t1 of the vanes and pitch t2 between each peak portion and each valley portion, these pitches satisfy the condition "$0.9 \leq t2/t1 \leq 1.1$". According to this condition, the above-explained functions and effects can be reliably obtained.

[0019] The present invention also provides an air conditioner which comprises an interior unit as explained above, wherein the air conditioner also comprises an exterior unit which includes an exterior heat exchanger, a compressor for transferring high-temperature and high-pressure gaseous refrigerant to the interior heat exchanger of the interior unit, and various electrical circuit elements.

[0020] Therefore, it is possible to prevent the ventilation performance from being degraded and to reduce noise caused by interference between the air flow and the fan.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig. 1 is a perspective view showing the interior unit and the air conditioner using the same in an embodiment according to the present invention.
Fig. 2 shows the relative positional relationship between the tangential fan and the stabilizer in the interior unit of the embodiment, viewed with a visual line which is perpendicular to the axis of the tangential fan.
Fig. 3 is a cross-sectional view in a section perpendicular to the axis of the tangential fan, which shows the general structure of a distinctive portion of the tangential fan.
Fig. 4 is a graph showing the changes in the noise level and the ventilation performance with respect to the relationships between the peak-valley shape of the fan and the pitch of the vanes of the fan, where the horizontal axis indicates the pitch ratio t2/t1, and the vertical axis at the right side of the graph indicates the noise level while the vertical axis at the left side indicates the amount of air.
Fig. 5 is a longitudinal-sectional view showing an example of an interior unit for conventional air conditioners.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Hereinafter, the interior unit and the air conditioner using the same as an embodiment according to the present invention will be explained in detail with reference to the drawings. However, the present invention is not limited to this embodiment, and various variations and modifications are possible within the scope and spirit of the present invention.

[0023] First, with reference to Fig. 1, the general structure of the air conditioner will be explained below. Fig. 1 is a perspective view showing the interior unit and the air conditioner using the same in the present embodiment.

[0024] The air conditioner shown in Fig. 1 consists of an interior unit 10 and an exterior unit 20, which are connected to each other via two refrigerant passages 21 through which refrigerant flows, electrical wiring (not shown), and the like. The refrigerant flows from the interior unit 10 to the exterior unit 20 through one of the refrigerant passages 21, and conversely, the refrigerant flows from the exterior unit 20 to the interior unit 10 through the other of the refrigerant passages 21.

[0025] The basic structure of the interior unit 10 is the same as that of the above-explained conventional interior unit (see Fig. 5). The distinctive features of the interior unit 10 will be explained below, but other structural elements of the interior unit 10 are the same as those of the conventional interior unit and explanations thereof are omitted here.

[0026] In a body 20a of the exterior unit 20, an exterior heat exchanger 20b, a propeller fan 20c, a compressor 20f, an exterior unit controller 20g, and the like are provided. The exterior heat exchanger 20b includes refrigerant passages around which a plurality of plate fins are arranged. This exterior heat exchanger 20b is provided for performing the heat exchange between the refrigerant and the outside air. An air flow passing from the back face to the front face in the body 20a is generated using the propeller fan 20c, so that fresh air can be continuously drawn into the body 20a and the efficiency of the heat exchange in the exterior heat exchanger 20b can be improved.

[0027] The compressor 20f converts gaseous refrigerant having a low temperature and a low pressure into gaseous refrigerant having a high temperature and a high pressure and discharges the high-temperature and high-pressure gaseous refrigerant. Therefore, the compressor 20f is one of the most important constituents of the refrigerant circuit which is provided for circulating the refrigerant between the interior unit 10 and the exterior unit 20. In addition to the compressor 20f, the refrigerant circuit includes the interior heat exchanger 7, the exterior heat exchanger 20b, the refrigerant passages 21, an expansion valve (not shown), a four-way valve (not shown) for directing the flow of the refrigerant, and the like.

[0028] The exterior unit controller 20g includes various electrical circuit elements and controls the operations of the propeller fan 20c, the compressor 20f, and other devices provided in the exterior unit 20.

[0029] Below, the operation of the air conditioner having the above structure will be explained for each operation mode of heating and cooling.

[0030] In the heating operation mode, high-temperature and high-pressure refrigerant output from the compressor 20f is transferred through the refrigerant passage 21 to the interior heat exchanger 7 of the interior unit 10. In the interior unit 10, the air drawn through the front panel 2 by using the tangential fan 8 receives heat from the high-temperature and high-pressure refrigerant which passes through the interior heat exchanger 7. Accordingly, warm air is blown out from the air outlet 2a. Simultaneously, the high-temperature and high-pressure refrigerant is condensed in the interior heat exchanger 7 so that high-temperature and high-pressure liquid refrigerant is produced.

[0031] This high-temperature and high-pressure liquid refrigerant is again transferred through the refrigerant passage 21 to the exterior heat exchanger 20b of the exterior unit 20. In the exterior unit 20, the high-temperature and high-pressure liquid refrigerant passes through the expansion valve (not shown) so that the pressure of the refrigerant is reduced and low-temperature and low-pressure liquid refrigerant is produced. Accordingly, the low-temperature and low-pressure liquid refrigerant which passes through the exterior heat exchanger 20b receives heat from fresh outside air drawn into the body 20a by the propeller fan 20c, and the low-temperature and low-pressure liquid refrigerant is thus vaporized and converted into low-temperature and low-pressure gaseous refrigerant. This low-temperature and low-pressure gaseous refrigerant is transferred to the compressor 20f again, and the above-explained operation is repeated.

[0032] In the cooling operation mode, the refrigerant also flows in the refrigerant circuit but in the reverse direction. That is, high-temperature and high-pressure gaseous refrigerant produced by the compressor 20f is transferred through the refrigerant passage 21 to the exterior heat exchanger 20b. The outside air receives heat from this high-temperature and high-pressure gaseous refrigerant, and this refrigerant is condensed and converted into high-temperature and high-pressure liquid refrigerant. This high-temperature and high-pressure liquid refrigerant passes through the expansion valve (not shown) and thus is converted into low-temperature and low-pressure refrigerant. This low-temperature and low-pressure refrigerant is again transferred through the refrigerant passage 21 to the interior heat exchanger 7. The transferred low-temperature and low-pressure liquid refrigerant receives heat from the inside air (i.e., room air) so that the inside air is cooled. Accordingly, the refrigerant itself is vaporized and converted into low-temperature and low-pressure gaseous refrigerant. This gaseous refrigerant is transferred to the compressor 20f again, and the above-explained operation is repeated.

[0033] These operations are controlled by an interior unit controller 15 in the interior unit 10 and the above-explained exterior unit controller 20g in the exterior unit 20, which operate in cooperation with each other.

[0034] Below, the stabilizer which functions as the drain guide and relevant portions will be explained with reference to Figs. 2 to 4. These portions are distinctive features of the present embodiment. In the following explanations, reference numeral 30 indicates the stabilizer 30 of the present embodiment, which is distinctively different from the above-explained conventional stabilizer 1b.

[0035] Fig. 2 shows the relative positional relationship between the tangential fan 8 and the stabilizer 30 in the interior unit 10 of the present embodiment, viewed with a visual line (or sight) which is perpendicular to the axis of the tangential fan 8. Fig. 3 is a cross-sectional view in a section perpendicular to the axis of the tangential fan 8, which shows the general structure of a distinctive portion of the tangential fan 8.

[0036] As shown in Figs. 2 and 3, the tangential fan 8 (corresponding to the fan of the present invention) has a cylindrical form in which a plurality of vanes (or blades) 8a are circularly arranged. A plurality of intermediate plates 8b are inserted into this "cylinder" at a plurality of sections perpendicular to the axis of the cylinder, where these intermediate plates are provided for reinforcing the cylinder which consists of the vanes 8a. The tangential fan 8 can rotate around its axis by a drive motor (not shown). The following points are similar to the above-explained conventional example: (i) the interior heat exchanger 7 is positioned around the tangential fan 8 except for an area through which the air is drawn out from the tangential fan 8, and (ii) the stabilizer 30 is placed between the first portion 7a of the interior heat exchanger 7 and the tangential fan 8 so that the stabilizer 30 receives the draining liquid generated by the first portion 7a.

[0037] The stabilizer 30 protrudes towards the opposite direction to the flow direction of the cold or warm air which is drawn into the tangential fan 8 (similar to the stabilizer 1b shown in Fig. 5). In the present embodiment, the head of the stabilizer 30 has a phase difference generating portion having a peak-valley form (which has a height t2 as shown in Fig. 2) for generating phase difference in the air drawn into the tangential fan 8. In order to effectively enlarge the passage area in the longitudinal direction of the tangential fan 8, the pitch of the peak portions of the peak-valley form is equal to the pitch P2 of the intermediate plates 8b of the tangential fan 8.

[0038] More specifically, as shown in Fig. 2, the phase difference generating portion has a peak-valley form which consists of peak portions 31 and valley portions 32 which are alternatingly arranged (that is, a saw-tooth form having sloped portions). In this peak-valley form, the pitch P1 of the peak portions is equal to the pitch P2 of the intermediate plates 8b (i.e., P1 = P2), and the peak position of each peak portion 31 agrees with the position where each intermediate plate 8b is placed, in the axial direction of the cylinder (see Fig. 2). Therefore, each valley portion 32 faces each area between adjacent intermediate plates 8b

[0039] In addition, the pitch t2 between each peak portion 31 and each valley portion 32 (i.e., vertical difference) is substantially equal to the pitch t1 of the vanes 8a of the tangential fan 8 (see Fig. 3). Specifically, the pitches t1 and t2 satisfy the condition "$0.9 \leq t2/t1 \leq 1.1$".

[0040] This pitch ratio of t2/t1 will be explained in detail with reference to Fig. 4. Fig. 4 is a graph showing the changes in the noise level and the ventilation performance with respect to the relationships between the peak-valley shape of the tangential fan 8 and the pitch of the vanes of the tangential fan 8, where the horizontal axis indicates the pitch ratio t2/t1, and the vertical axis at the right side of the graph indicates the noise level while the vertical axis at the left side indicates the amount of (blown) air.

[0041] As shown in Fig. 4, the noise level gradually decreases as the pitch ratio t2/t1 graduall increases to 1.0. After the pitch ratio t2/t1 exceeds 1.0, the noise level does not substantially change (i.e., the noise level is lowest). On the assumption that the allowable noise increase with respect to the lowest noise level is 3 dB, the pitch ratio t2/t1 is preferably equal to or more than approximately 0.9 (i.e., $0.9 \leq t2/t1$).

[0042] Conversely, regarding the amount of (blown) air which relates to the characteristics of the fan, as shown in Fig. 4, the amount of air is almost constant until the increasing pitch ratio t2/t1 is close to 1.0. After the pitch ratio t2/t1 exceeds approximately 1.0, the amount of air generally decreases. On the assumption that the constant amount of air up to the pitch ratio of 1.0 is 100% and the allowable decrease of the amount of air from 100% is 3%, the pitch ratio t2/t1 is preferably equal to or less than approximately 1.1 (i.e., $t2/t1 \leq 1.1$).

[0043] Accordingly, in order to obtain the necessary amount of air and simultaneously reduce the noise level, the pitch ratio t2/t1 preferably satisfies the condition "$0.9 \leq t2/t1 \leq 1.1$".

[0044] As explained above, the interior unit 10 of the present embodiment has the stabilizer 30 whose end has a peak-valley shape in which peak portions 31 and valley portions 32 are alternatingly formed. The pitch P1 of the peak portions 31 is substantially equal to the pitch P2 of the intermediate plates 8b, and the pitch t1 of the vanes 8a of the tangential fan 8 is substantially equal to the pitch t2 between each peak portion 31 and each valley portion 32.

[0045] According to this structure, the peak-valley form (having a height t2) of the stabilizer 30 can generate phase differences (0 to 360 degrees corresponding to height 0 to t2) in air flow passing along each sloped portion to the tangential fan 8. Therefore, the strength of pressure waves generated by collision between the air flow and the vanes 8a of the tangential fan 8 can be suppressed, thereby reducing noise.

[0046] Also according to the above structure, the pitch P1 of the peak portions of the stabilizer 30 is substantially equal to the pitch P2 of the intermediate plates 8b of the tangential fan 8 (i.e., P1 = P2). Therefore, the air flow, which passes along the peak portions which function as large-resistance obstacles to the air flow, is drawn towards the intermediate plates 8b which are not affected by the motion of the vanes 8a of the tangential fan 8. Conversely, the air flow, which passes along the valley portions which function as low-resistance obstacles to the air flow, is drawn into each area between the adjacent intermediate plates 8b, that is, towards a center portion of each vane 8a. According to these functions, the ventilation performance can be improved.

[0047] Also according to this structure, in comparison with another form in which the pitch of the peak portions 31 is smaller than that of the intermediate plates 8b, the number of the peak portions 31 which interrupt the air flow directed to the tangential fan 8 can be reduced to an optimum number. Therefore, the resistance imposed on the air flow to the tangential fan 8 can be low, thereby preventing the ventilation performance from being degraded.

[0048] In addition, the pitch t1 of the vanes 8a is substantially equal to the pitch t2 between each peak portion 31 and each valley portion 32. Therefore, the stabilizer 30 can have a peak-valley shape most suitable to the employed tangential fan 8. Accordingly, it is possible to simultaneously realize the sufficient amount of blown air and the reduction of noise.

[0049] As explained above, according to the interior unit 10 of the present embodiment, it is possible to prevent the ventilation performance from being degraded and to reduce noise caused by the interference between the air flow and the tangential fan 8.

[0050] In addition, in the interior unit 10 of the present embodiment, the positions of the peak portions 31 relatively agree with the positions of the intermediate plates 8b (i.e., the peak portions respectively face the intermediate plates), and thus each valley portion 32 faces the area between the alternative intermediate plates. Also in the interior unit 10, given pitch t1 of the vanes 8a of the tangential fan 8 and given pitch t2 between each peak portion 31 and each valley portion 32, the condition "$0.9 \leq t2/t1 \leq 1.1$" is satisfied.

[0051] When the air flow drawn from the tangential fan 8 is viewed along the axis of the tangential fan 8, the amount of air is reduced in the vicinity of each intermediate plate 8b in comparison with the other portions away from the intermediate plates. However, in the above structure, each peak portion 31 faces each intermediate plate 8b; thus, each area between the intermediate plates, which has higher ventilation efficiency and performance, faces each valley portion 32, thereby increasing the amount of passing air. That is, in comparison with another form in which each peak portion 31 faces the area between the adjacent intermediate plates, the ventilation performance can be improved.

Claims

1. An interior unit for an air conditioner, comprising:

a fan (8) having a plurality of vanes (8a) which are circularly arranged to have a cylinder shape, wherein intermediate plates (8b) for reinforcing the cylinder are inserted at cross sections along the axis of the cylinder;
an interior heat exchanger (7) which surrounds the fan except for an outlet area through which the air is drawn out from the fan; and
a stabilizer (30), placed between the interior heat exchanger and the fan, for receiving draining liquid produced by the interior heat exchanger, wherein:

the air which passes through the interior heat exchanger is then drawn into the fan according to the rotation of the fan, and the drawn air is discharged through the outlet area outside the interior unit, and
the interior unit is **characterized in that**:

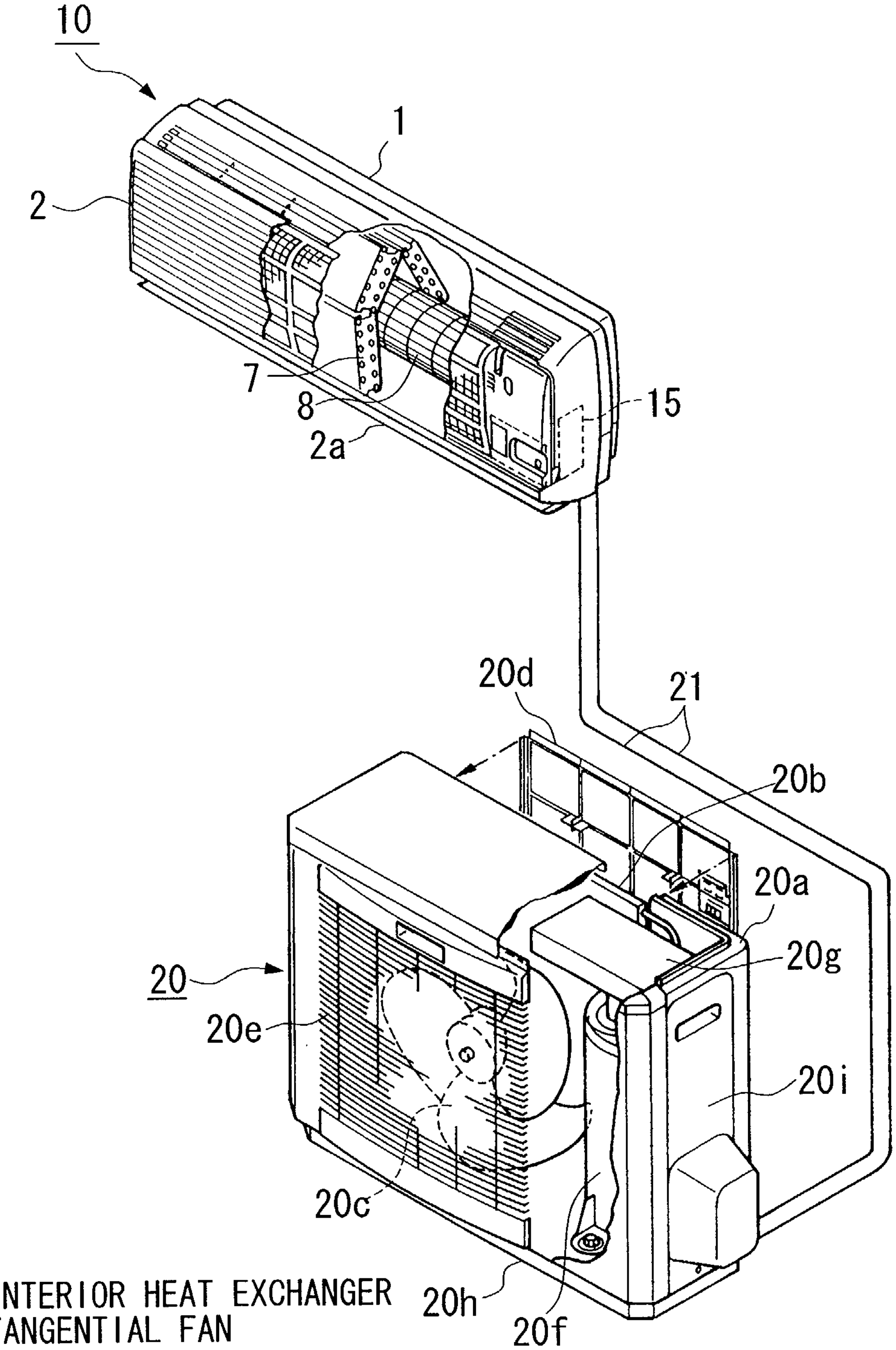
the end of the stabilizer, which is closest to the fan, has a peak-valley form consisting of peak portions and valley portions which are alternatingly arranged;
the pitch of the peak portions is substantially equal to the pitch of the intermediate plates; and
the pitch of the vanes is substantially equal to the pitch between each peak portion and each valley portion.

2. An interior unit as claimed in claim 1, **characterized in that** the peak portions respectively face the intermediate plates in a manner such that along the axial direction of the cylinder, the peak position of each peak portion substantially agrees with the position where the corresponding intermediate plate is inserted, and each valley portion faces an area between two adjacent intermediate plates.

3. An interior unit as claimed in claim 1 or 2, **characterized in that** given pitch t1 of the vanes and pitch t2 between each peak portion and each valley portion, these pitches satisfy the condition "$0.9 \leq t2/t1 \leq 1.1$".

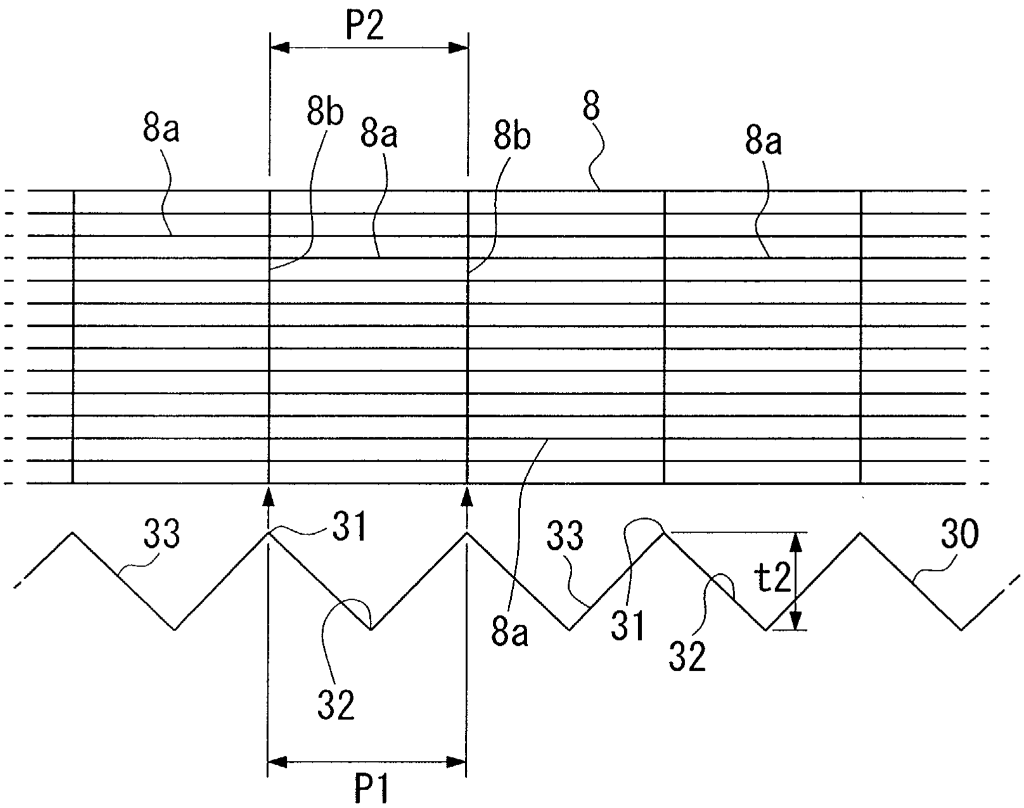
4. An air conditioner **characterized by** comprising an interior unit as claimed in any one of claims 1 to 3, wherein the air conditioner also comprises an exterior unit which includes an exterior heat exchanger, a compressor for transferring high-temperature and high-pressure gaseous refrigerant to the interior heat exchanger of the interior unit, and various electrical circuit elements.

FIG. 1



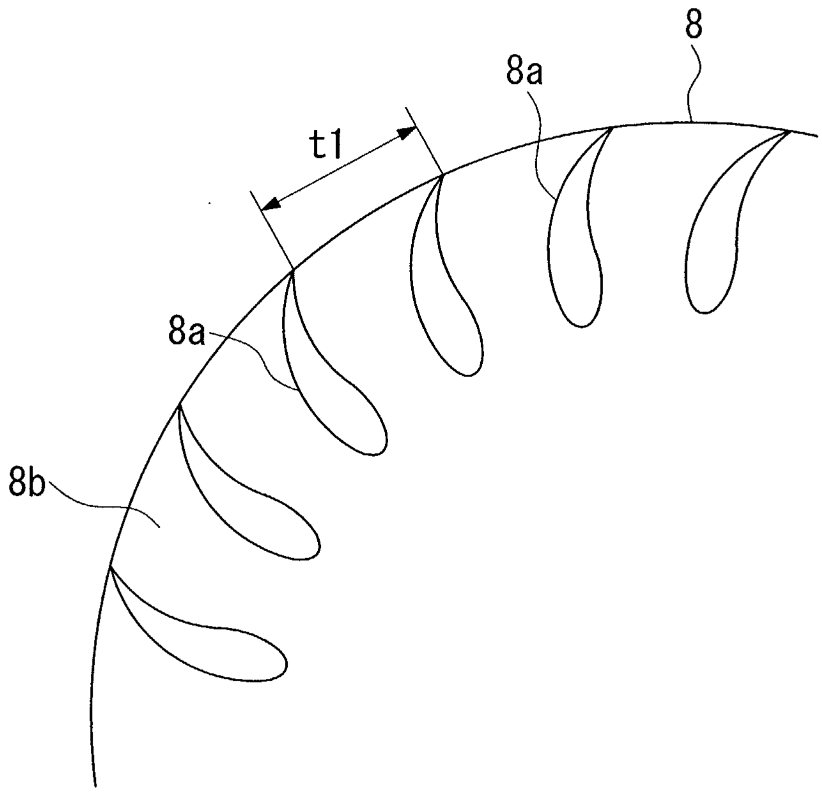
7;INTERIOR HEAT EXCHANGER
8;TANGENTIAL FAN
10;INTERIOR UNIT
20;EXTERIOR UNIT
20b;EXTERIOR HEAT EXCHANGER
20f;COMPRESSOR
20g;EXTERIOR UNIT CONTROLLER

FIG. 2



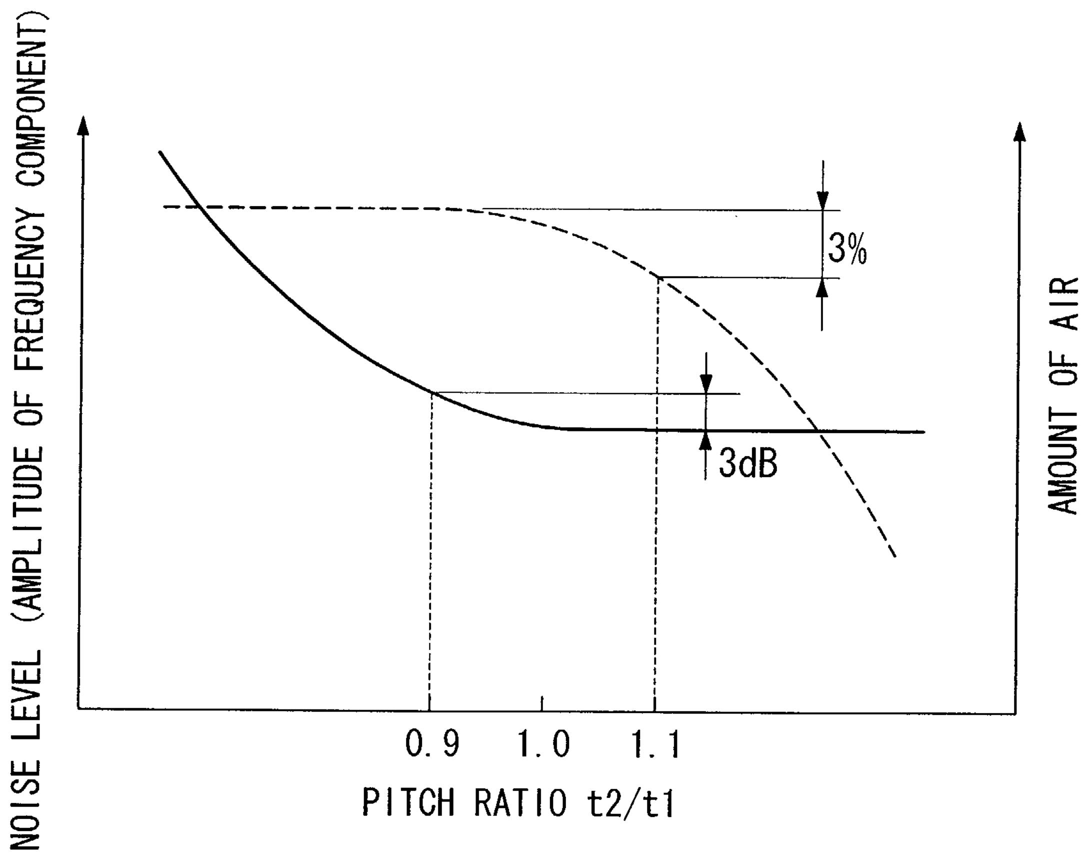
8;TANGENTIAL FAN
8a;VANE
8b;INTERMEDIATE PLATE
30;AIR-INTAKE NOSE (DRAIN GUIDE)
31;PEAK PORTION
32;VALLEY PORTION
P1;PITCH OF PEAK PORTIONS
P2;PITCH OF VALLEY PORTIONS
t2;PITCH BETWEEN PEAK PORTION AND VALLEY PORTION

FIG. 3



8;TANGENTIAL FAN
8a;VANE
8b;INTERMEDIATE PLATE
t2;PITCH OF VANES

FIG. 4



t1: PITCH OF VANES
t2: PITCH BETWEEN PEAK PORTION AND VALLEY PORTION

FIG. 5