

SPECIFICATION

OUTDOOR UNIT FOR AIR CONDITIONER

TECHNICAL FIELD

The present invention relates to an outdoor unit
5 for air conditioners which has an air outlet grille of a
special vane structure.

BACKGROUND ART

Conventionally, in most outdoor units for air
conditioners, for example as shown in Figs. 6 and 7, an air
10 outlet grille 2 on the front side is structured into a grid
shape consisting of grille vanes 2a, 2a, ... for
enhancement of the appearance (beauty) of an outdoor unit.
1. Then, the grille vanes 2a, 2a, ... of the air outlet
grille 2 each have a cross section of a generally
15 elliptical wing shape, for example, as shown in Figs. 8 and
9 (see, for example, Japanese Patent Laid-Open Publication
HEI 5-93531).

Such a wing-shaped cross section of the grille
vane 2a, 2a, ... makes it possible to prevent the breakaway
20 of air flow at a front edge portion 3a of the grille vane
while suppressing low both interferential noise due to
interference with the flow of air blown off from an

impeller 42 via a fan guide 41 and breakaway noise due to the breakaway.

However, blown-off air that is actually blown off from the impeller 42 via the fan guide 41 has strong
5 turning components so that the blown-off air impinges on the grille vane 2a at a specified angle θ as shown in Fig. 9, almost all over the grille surface of the air outlet grille 2 shown in Fig. 6. As a result, there would arise a large breakaway of air flow as shown in Fig. 9 on the rear
10 side of the air that impinge on the grille vane 2a at the specified angle θ , i.e., on the negative-pressure surface side, causing a large breakaway noise as a disadvantage.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to
15 provide an outdoor unit for air conditioners which includes an air outlet grille having grille vanes that allow the noise due to breakaway of blown-off air to be reduced by suppressing the breakaway on the negative-pressure surface side of blown-off air that impinges obliquely.

20 In order to achieve the above object, the outdoor unit for air conditioners according to the present invention is characterized in that a front edge of wing-shaped grille vanes provided in an air outlet grille of an outdoor unit casing is formed into a sawtoothed structure.

Thus, by forming the front edge of the grille vanes into a sawtoothed structure, there arise numerous small-scaled longitudinal eddies from troughs of the sawtoothed portion so that an air flow of high flow rate at places away from the negative-pressure surface of the grille vanes can be drawn near the negative-pressure surface of the grille vanes. As a result, the flow on the negative-pressure surface side of the grille vanes is unlikely to break away so that the breakaway noise can be reduced further than it could conventionally.

Also, rounding the tip of each crest of the sawtoothed portion makes it less likely that the flow in the front edge of the grille vanes breaks away, and also makes the handling during assembly safer. Furthermore, it has been confirmed that forming the height of each crest of the sawtoothed portion to a dimensional value of 0.05 to 0.25 times the length of vanes (chord length) or forming the crest-to-crest pitch of the sawtoothed portion to a dimensional value of 0.5 to 1.5 times the height of the crest itself improves the aforementioned functions particularly effectively.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an enlarged plan view showing the structure of the grille vane of an outdoor unit for air

conditioners according to an embodiment of the present invention;

Fig. 2 is a sectional view taken along the line II - II of Fig. 1;

5 Fig. 3 is a graph showing the relationship between the ratio of crest height of the sawtoothed portion to grille vane length (H/L) in the grille vanes and the noise level;

10 Fig. 4 is a graph showing the relationship between the ratio of crest-to-crest pitch to crest height of the sawtoothed portion in the grille vanes and the noise level;

15 Fig. 5 is a graph showing the relationship between noise level and air flow rate of the grille vanes according to the embodiment of the present invention, in contrast to a prior art;

Fig. 6 is a front view showing the structure of an outdoor unit for air conditioners and its air outlet grille according to the prior art;

20 Fig. 7 is a sectional view taken along the line VII - VII of Fig. 6;

Fig. 8 is a plan view of the grille vane in the air outlet grille of the prior-art outdoor unit; and

25 Fig. 9 is a sectional view taken along the line IX - IX of Fig. 8.

BEST MODE FOR CARRYING OUT THE INVENTION

Figs. 1 and 2 show the vane structure of an air outlet grille of an outdoor unit for air conditioners according to an embodiment of the present invention.

5 Referring to Figs. 1 and 2, reference numeral 2a denotes grille vanes constituting a grid-shaped air outlet grille 2 of the outdoor unit 1 for air conditioners with an appearance configuration similar to that of Figs. 6 and 7 as described before. This grille vane 2a, as shown in Fig.
10 2, has a cross section of a generally elliptical wing-shaped structure generally similar to that of the conventional one shown in Fig. 9 as a whole. However, its front edge portion 3a is formed into a sawtoothed portion 5 as shown in Fig. 1 over its entire lateral width.

15 Then, the sawtoothed portion 5 as shown in Fig. 2 has crests 5a, 5a, ... each formed at the tip into a rounded portion having a specified curvature across the front and rear faces. Moreover, the crest height H from the bottom of troughs 5b, 5b, ... to the tip of the crests
20 5a, 5a, ... is 0.05 to 0.25 times the length (chord length) L of grille vane 2a, and the lateral array pitch S of the crests 5a, 5a, ... with the troughs 5b, 5b, ... interposed therebetween is set to 0.5 to 1.5 times the height H of the crests ($S/H = 0.5$ to 1.5).

Like this, with a sawtoothed structure of the front edge portion 3a of the grille vane 2a in view of reducing the breakaway of air flow on the negative-pressure surface side, which is the rear side with respect to the direction in which air impinges on the grille vanes 2a in the air outlet grille 2, there arise small-scaled longitudinal eddies from the troughs 5b, 5b, ... of the sawtoothed portion 5, as shown in Fig. 2, so that the air flow of high flow velocity at places away from the negative-pressure surface of the grille vanes 2a of the air outlet grille 2 can be drawn near the negative-pressure surface of the grille vanes 2a, making it unlikely that the flow on the negative-pressure surface side breaks away. As a result, breakaway noise is reduced effectively in contrast with the conventional grille vanes.

To verify such functional effects, with the aforementioned numerical relationships ($H/L = 0.05 - 0.25$ or $S/H = 0.5 - 1.5$) adopted for the grille vanes 2a independently of each other, actual measurement of the noise level on these grille vanes was carried out and their results are shown in Figs. 3 and 4. From these charts, it can be understood that in the range of $H/L = 0.05 - 0.25$ or $S/H = 0.5 - 1.5$, the noise level is particularly low, hence a high noise-reduction effect.

Further, noise level was measured with various grille vanes that fell within the above ranges of H/L and S/H, and their measured values are as shown in Fig. 5, in comparison with the noise level under the conventional grille vane structure shown in Figs. 6 to 9. From Fig. 5, it can be seen that the grille vanes of the structure according to the present embodiment are lower in noise level by approximately 0.7 dB, regardless of the air flow rate, producing a higher noise-reduction effect.

As described above, according to the outdoor unit for air conditioners which adopts the grille vanes of the present invention, breakaway of air flow on the negative-pressure surface side of the grille vanes on which blown-off air impinges obliquely can be suppressed. As a result, noise due to the breakaway of air flow at the grille vanes can be reduced remarkably as compared with the prior art, so that improvement in the quietness performance of the outdoor unit for air conditioners can be achieved.

INDUSTRIAL APPLICABILITY

The present invention is applied to grille vanes at the air outlet grille of an outdoor unit for air conditioners.



CLAIMS

1. An outdoor unit for air conditioners, characterized in that a sawtoothed portion is formed in a front edge of wing-shaped grille vanes provided in an air outlet grille of an outdoor unit casing.
5
2. The outdoor unit for air conditioners according to Claim 1, wherein each crest of the sawtoothed portion is rounded at its tip.
3. The outdoor unit for air conditioners according to Claim 1 or 2, wherein height of each crest of the sawtoothed portion is set to a size of 0.05 to 0.25 times the length of each wing-shaped grille vane.
10
4. The outdoor unit for air conditioners according to any one of Claims 1 to 3, wherein a crest-to-crest pitch of the sawtoothed portion is set to a size of 0.5 to 1.5 times the height of the crest itself.
15

ABSTRACT OF THE DISCLOSURE

A sawtoothed portion 5 is provided in a front edge 3a of grille vanes 2a constituting an air outlet grille of an outdoor unit. Each crest 5a of the sawtoothed portion 5 is rounded at its tip. The height H of each crest of the sawtoothed portion 5 is set to a size of 0.05 to 0.25 times the length of the wing-shaped grille vane (chord length), and the crest-to-crest pitch S of the sawtoothed portion 5 is set to a size of 0.5 to 1.5 times the height H of each crest. As a result, there arise numerous longitudinal eddies from troughs 5b of the sawtoothed portion 5, so that an air flow of high flow rate at places away from the negative-pressure surface of the grille vanes 2a can be drawn near the negative-pressure surface. Thus, the flow on the negative-pressure surface side is unlikely to break away, and noise is reduced.

Fig. 1

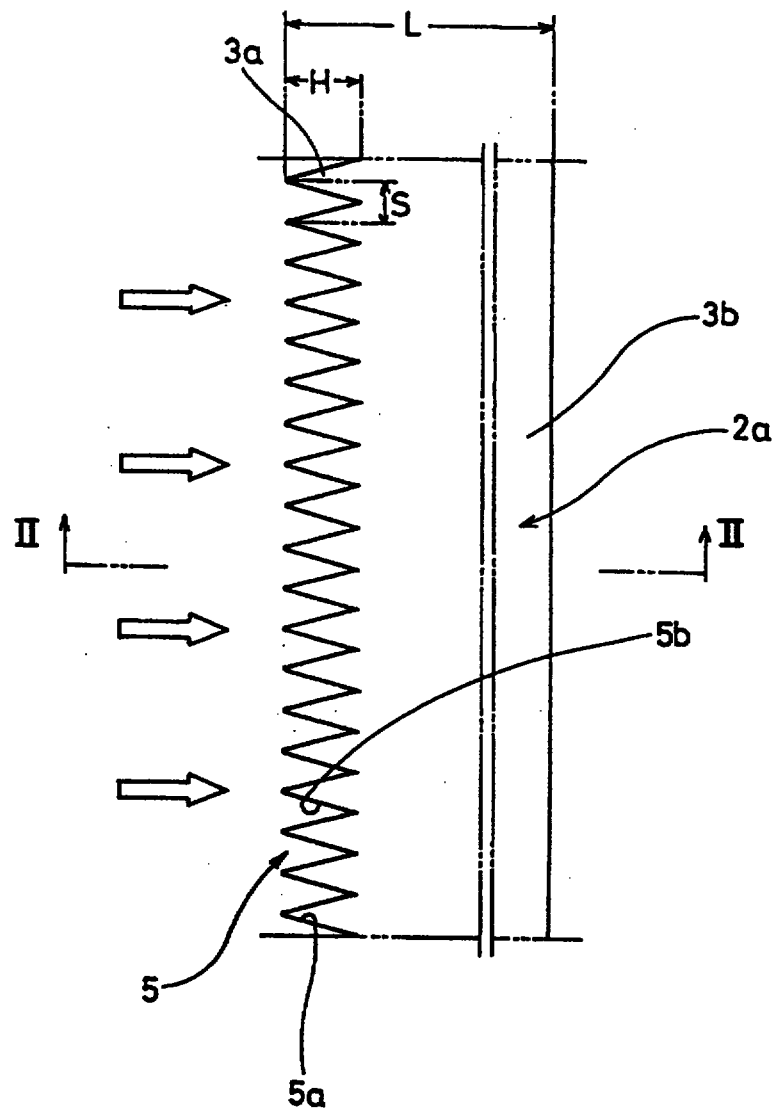


Fig. 2

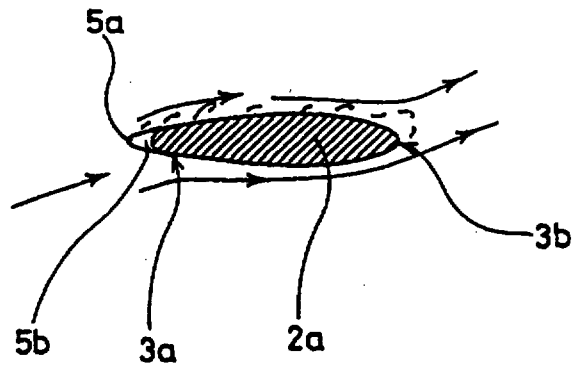


Fig. 3

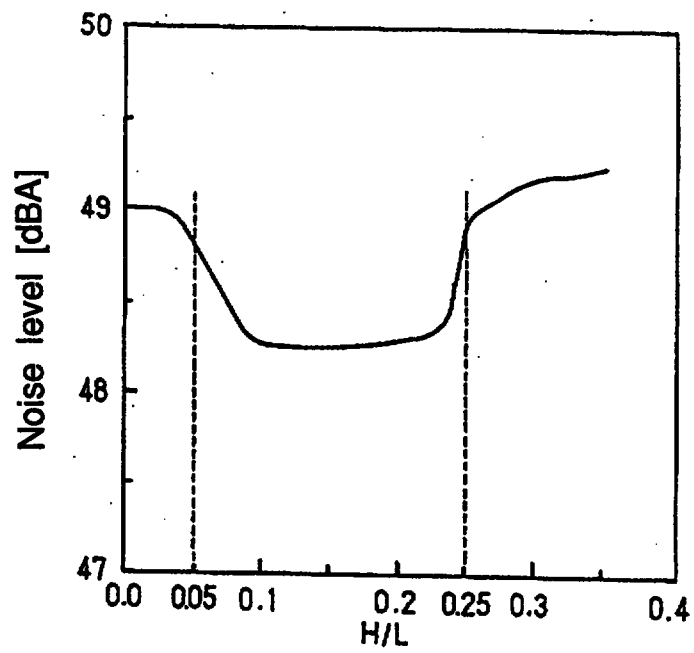


Fig. 4

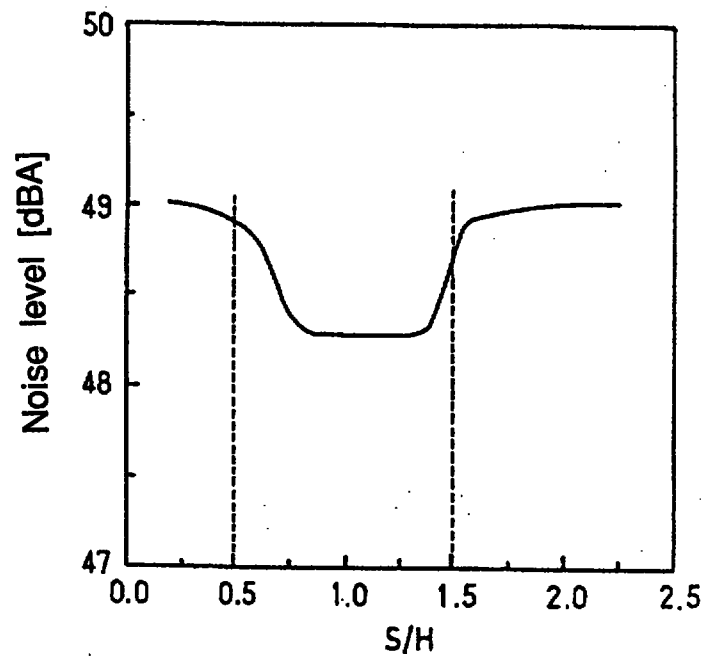


Fig. 5

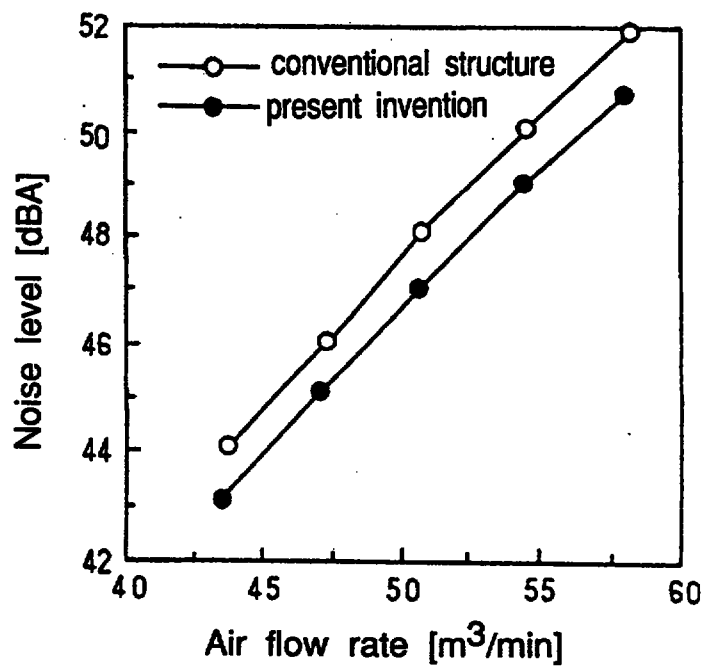


Fig. 6

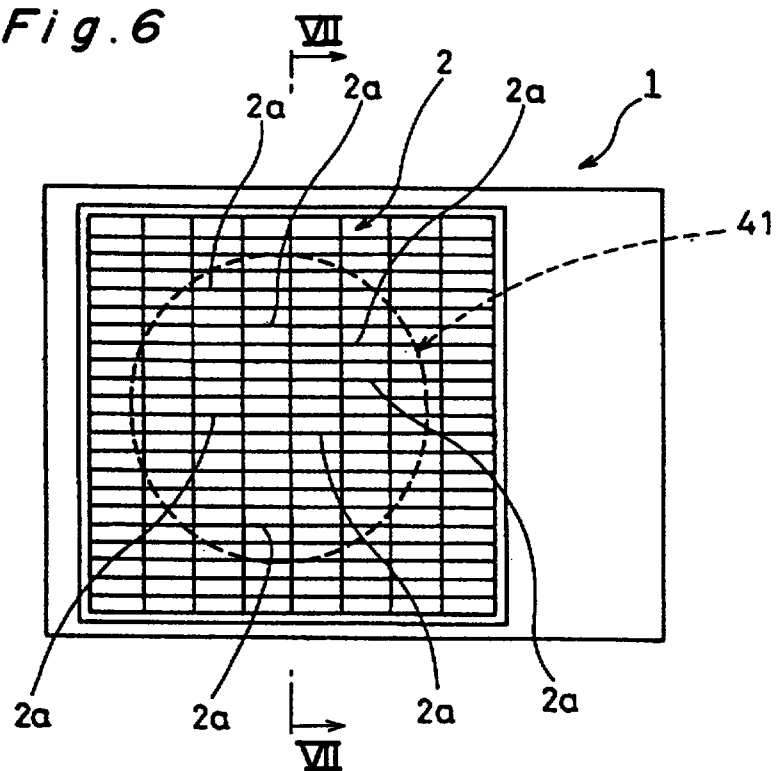


Fig. 7

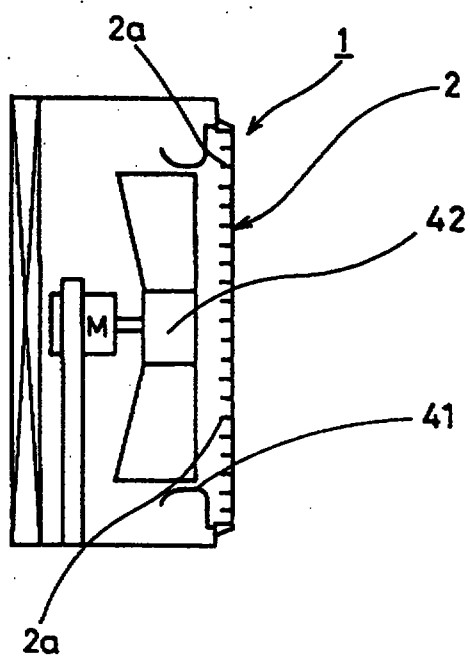


Fig. 8

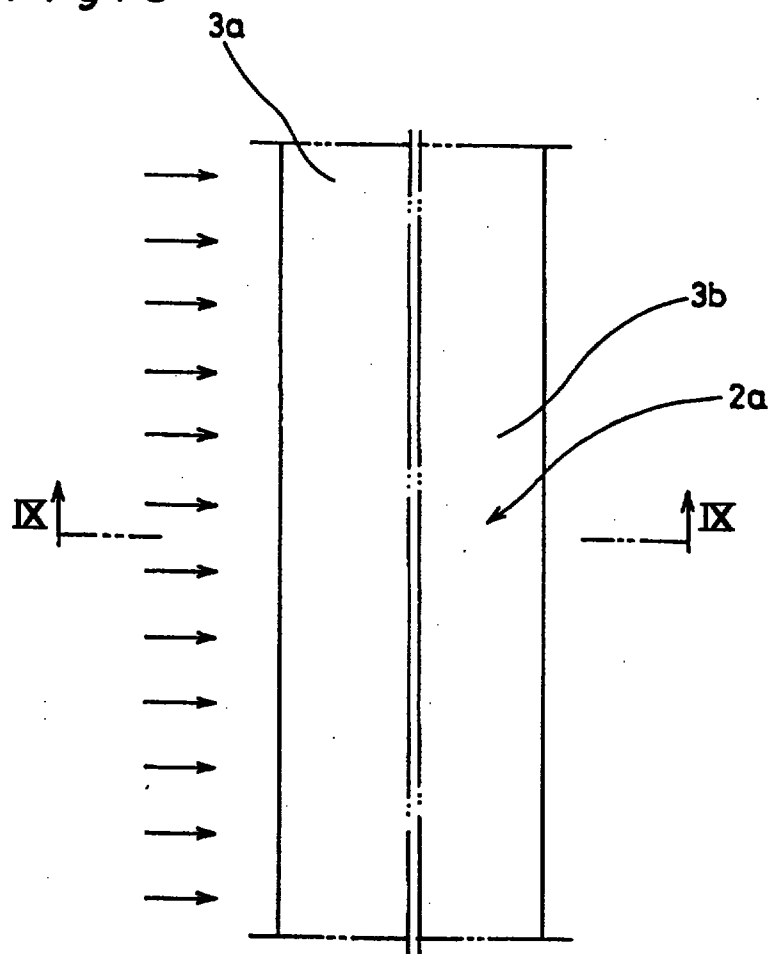


Fig. 9

