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(54) **FAN GUIDE**

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(57) **ABSTRACT**

Disclosed is a fan guide including a rectangular guide body located at a suction part of a fan, a central frame positioned at a central portion of the guide body, motor fixtures provided at an outer circumferential surface of the central frame, and frames for connecting the guide body and the central frame to each other while supporting the fan and a driving motor adapted to drive the fan. The frames are arranged around the central frame while being circumferentially spaced apart from one another by different angles, respectively. The arrangement of the frames is set so that intersections among lines extending inwardly along the frames beyond the central frame, respectively, discord from one another. By this arrangement, it is possible to decrease the degree of noise resulting from a blade passing frequency while destroying the regularity of a vortex shedding formed at each frame to reduce the interaction between a vortex flow and fan blades, thereby achieving a reduction in noise and flow loss.

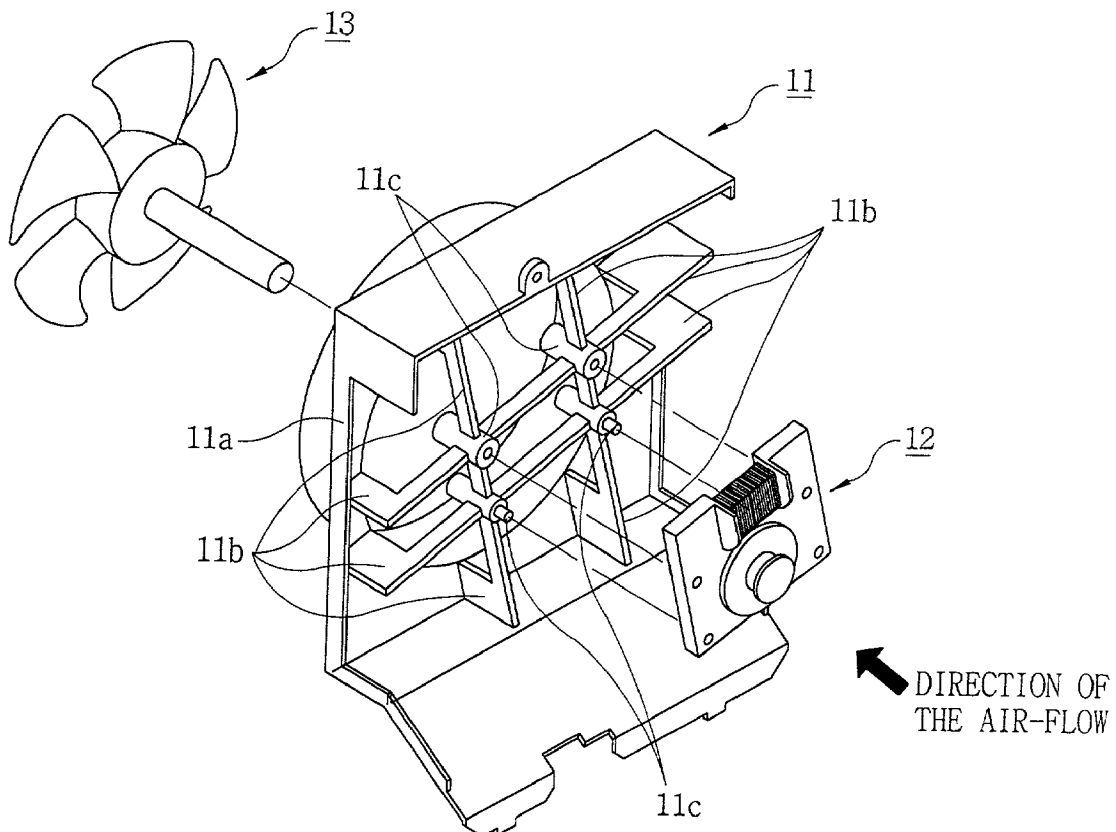


FIG. 1
CONVENTIONAL ART

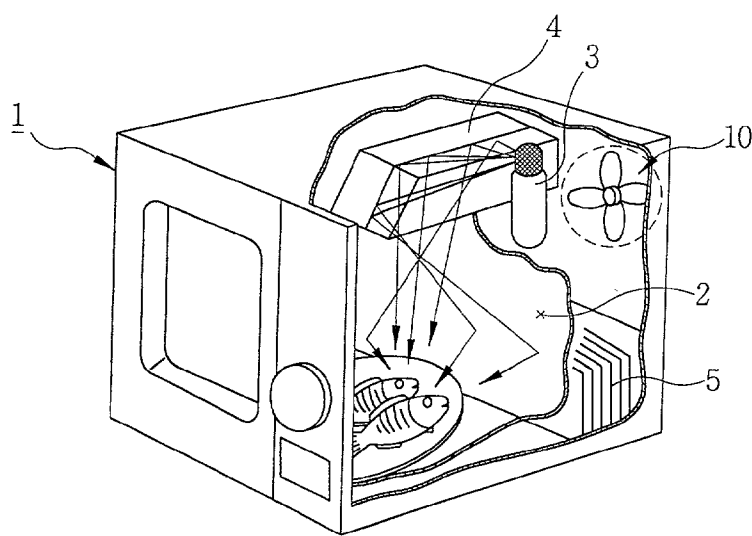


FIG. 2
CONVENTIONAL ART

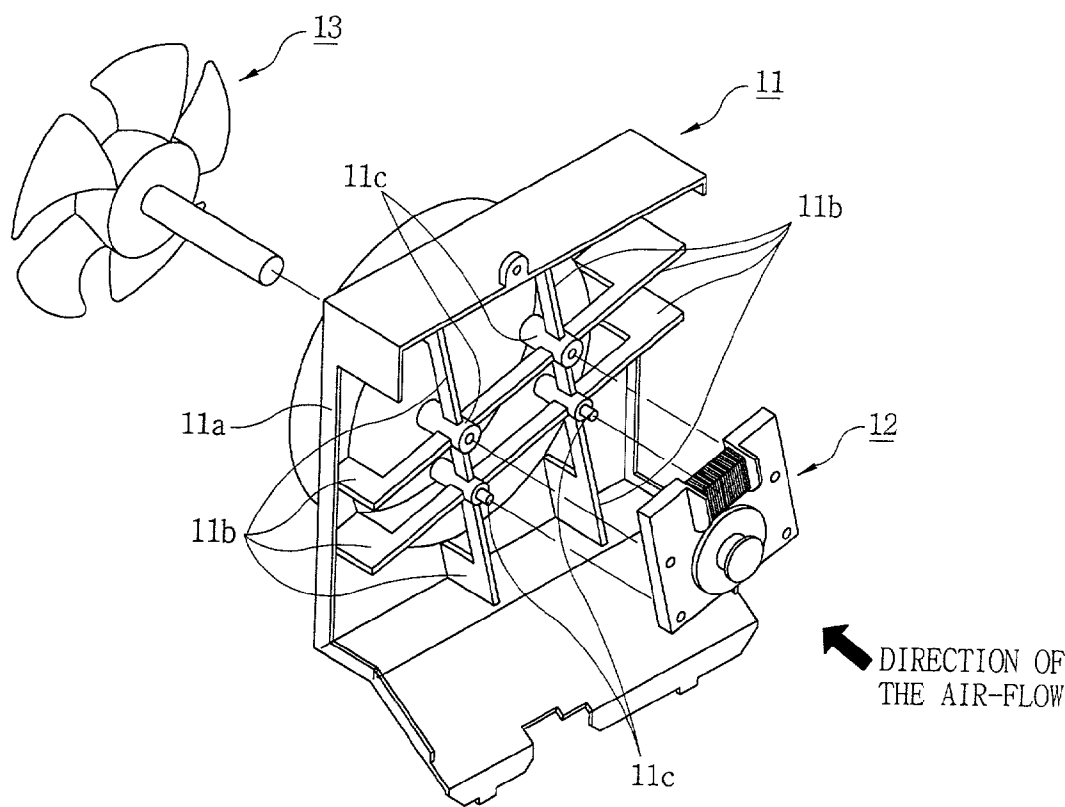


FIG. 3
CONVENTIONAL ART

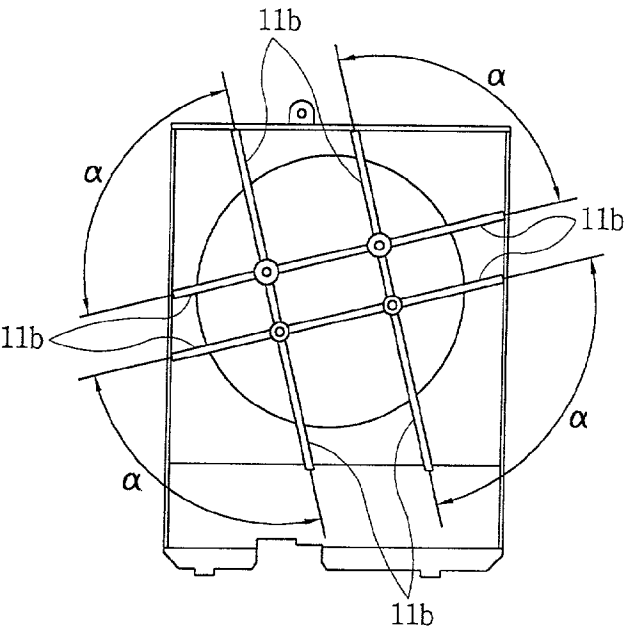


FIG. 4

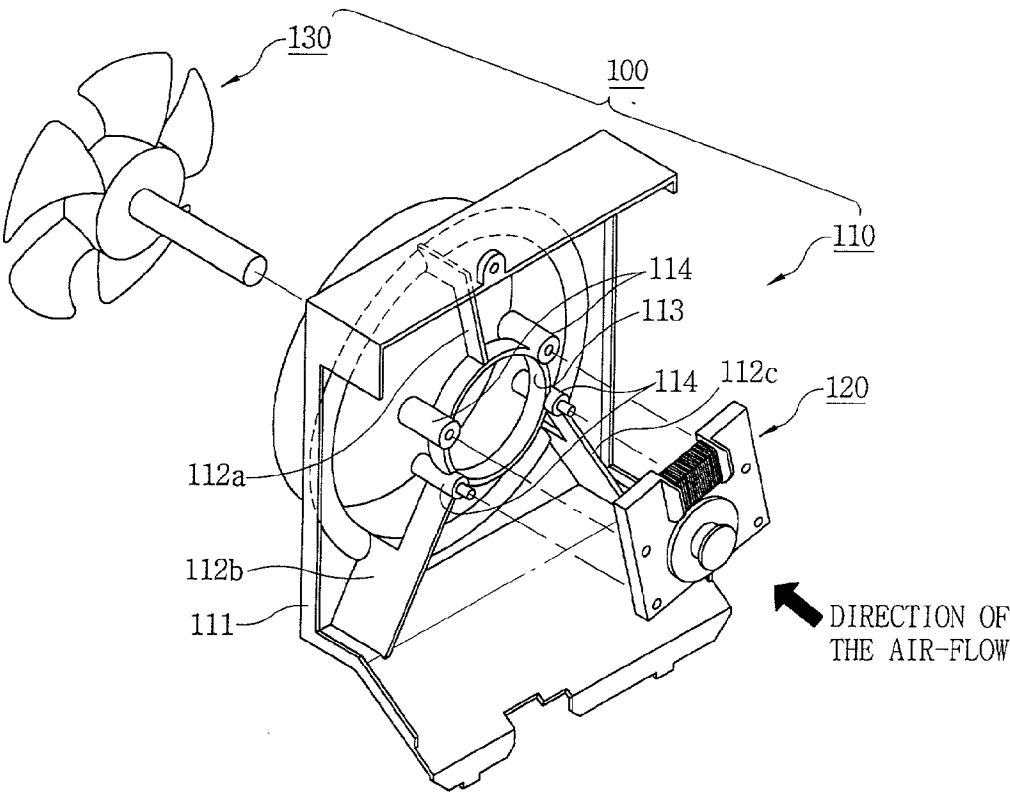


FIG. 5

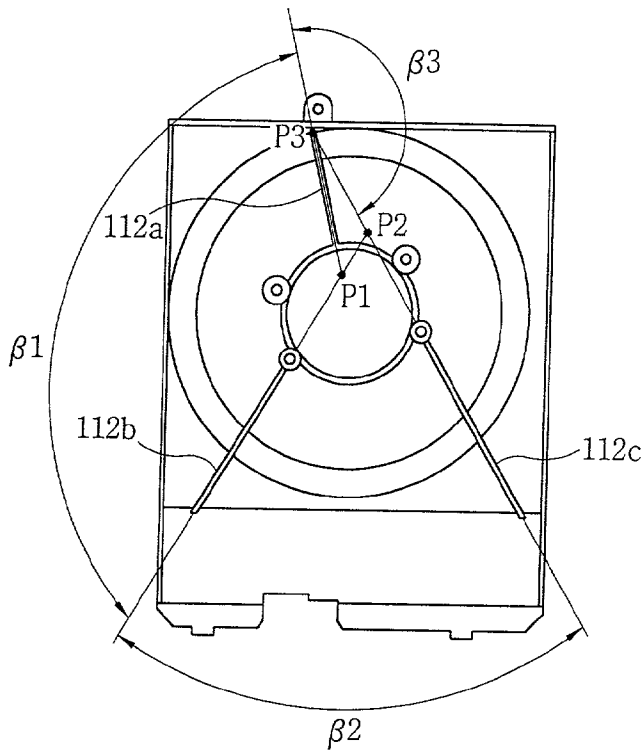


FIG. 6

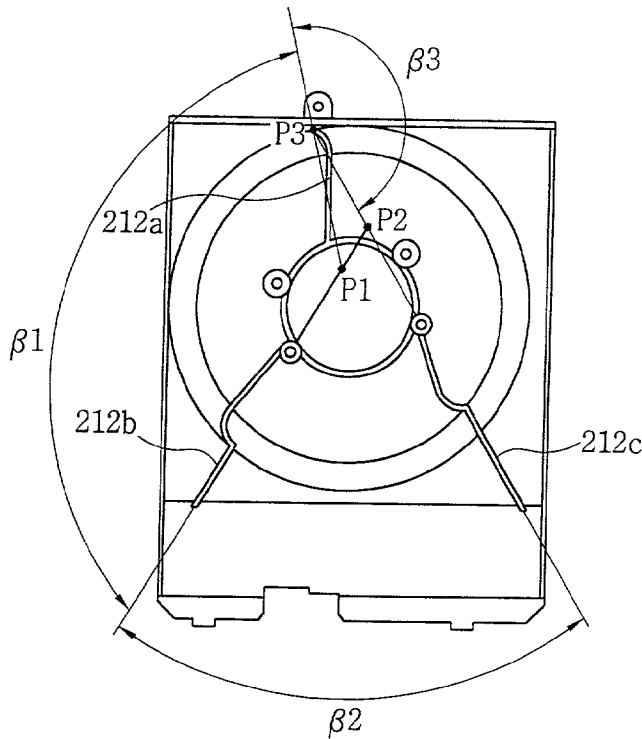
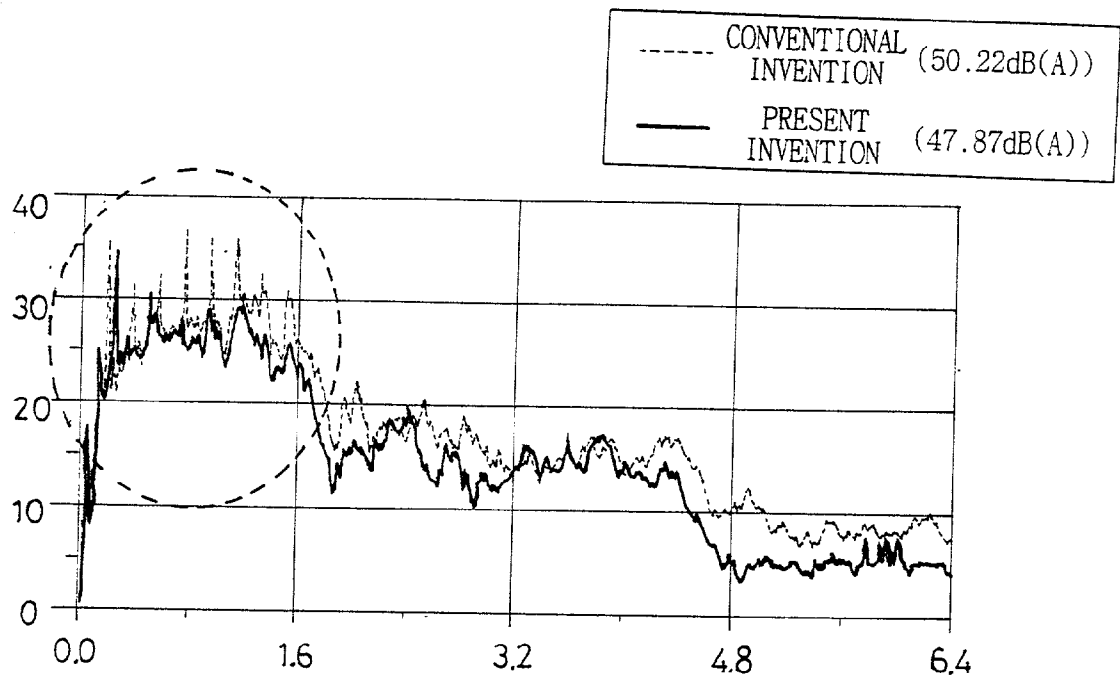


FIG. 7



FAN GUIDE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a fan guide, and, more particularly, to a fan guide for fixing and supporting a fan and a driving motor adapted to drive the fan at an intake part of the fan.

[0003] 2. Description of the Conventional Art

[0004] In general, a fan guide is used to support a fan and a driving motor, which are used in a cooling device or a ventilator of electronic products to produce an air flow.

[0005] In such a cooling device or ventilator, an air flow passing through the driving motor by a rotation of the fan generates a noise mainly by the fan. In an interrelation between the fan and the fan guide, it is known that the degree of the noise may vary greatly depending on the shape of the fan guide. No matter what any kind of the fan is used, the cooling device or the ventilator having the above mentioned fan guide structure produces a blade passing frequency, thus generating noise.

[0006] As shown in FIG. 1, a conventional microwave oven has a casing 1 defined with a cooking chamber 2 therein. A magnetron 3 producing a microwave is attached to an outer wall portion of the cooking chamber 2. A waveguide 4 guiding the microwave is coupled between the magnetron 3 and the cooking chamber 2. A cooling fan assembly 10 is attached to an inner wall portion of the casing 1 to cool the magnetron 3 along with a power supply unit 5.

[0007] As shown in FIG. 2, the cooling fan assembly 10 comprises a fan guide 11 fixed to the inner wall portion of the casing 1, a driving motor 12 arranged in front of the fan guide 11, that is, upstream of the fan guide 11, when viewed in a flow direction of air, and attached to the fan guide 11, and a fan 13 connected to a driving shaft of the driving motor 12 and adapted to suck and discharge air.

[0008] Referring to FIG. 3, the fan guide 11 is more specifically described. The fan guide 11 comprises a guide body 11a and eight frames 11b. The frames 11b are arranged in pair around the center of the guide body 11a in the form of a lattice in such a fashion that those of each frame pair are connected together while defining a right angle there between. The drive motor 12 is fixedly mounted to the fan guide 11 at a joint between the frames 11b of each frame pair.

[0009] In FIG. 2, the reference numeral 11c denotes a motor fixture arranged at the joint between the frames 11b of each frame pair.

[0010] In the microwave oven having the above mentioned conventional fan guide 11, the operating procedure of the microwave oven and the procedure of sucking air are carried out as follows.

[0011] Once electric power is supplied to the power supply unit 5, a microwave is generated from the magnetron 3, and supplied to the cooking chamber 2 through the wave guide 4. By the supplied microwave, food in the cooking chamber 2 is heated and cooked. The electric power is also supplied to the driving motor 12 simultaneously with the application thereof to the power supply unit 5, so that the driving motor

12 rotates. As a result, the fan 13 connected to the driving shaft of the driving motor 12 is rotated, thereby sucking outside air. Accordingly, the magnetron 3 and the power supply unit 5 are cooled by the sucked air.

[0012] At this time, the air, which is sucked by the fan 13, flows toward the fan 12 after passing through spaces defined among the frames 11b arranged at the front surface of the fan guide 11. During this sucking procedure, flow noise and flow loss may be generated due to the geometrical characteristics of the frames 11b coupled to the fan guide 11.

[0013] This problem will now be described in detail.

[0014] In the conventional fan guide in which frames are arranged in pair around the center of the guide body in the form of a lattice in such a fashion that those of each frame pair are connected together while defining an angle α there between, the blade passing frequency generated by the fan is reinforced when the geometrical structure of those frames is more regular and uniform. The reinforced blade passing frequency results in a generation of flow noise. The air passing the frames generates a vortex shedding phenomenon, so that it interferes with the blades of the fan. Due to such an interference, there are problems of an increase in noise and an occurrence of flow loss.

SUMMARY OF THE INVENTION

[0015] Accordingly, an object of the present invention is to provide a fan guide having an asymmetric arrangement of frames capable of decreasing the degree of noise resulting from a blade passing frequency while destroying the regularity of a vortex shedding formed at each frame to reduce the interaction between a vortex flow and fan blades, thereby achieving a reduction in noise and flow loss.

[0016] In accordance with the present invention, this object is accomplished by providing a fan guide comprising: a rectangular guide body located at a suction part of a fan; a central frame positioned at a central portion of the guide body; motor fixtures provided at an outer circumferential surface of the central frame; and at least two frames for connecting the guide body and the central frame to each other while supporting the fan and a driving motor adapted to drive the fan, the frames being arranged around the central frame while being circumferentially spaced apart from one another by different angles, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a partially-broken schematic view of a conventional microwave oven.

[0018] FIG. 2 is an exploded perspective view of a fan guide according to the conventional microwave oven.

[0019] FIG. 3 is a front view of the conventional fan guide.

[0020] FIG. 4 is an exploded perspective view of a fan guide according to the present invention.

[0021] FIG. 5 is a front view of a fan guide of the present invention.

[0022] FIG. 6 is a front view of another fan guide modified from the fan guide of FIG. 5.

[0023] FIG. 7 is a graph representing a comparative analysis of rear noise characteristics exhibited in a microwave oven, to which the fan guide of the present invention is applied, as compared to the case in which a conventional fan guide is applied.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0024] The above and other objects, characteristics, and advantages of the present invention will become apparent from the following description along with the accompanying drawings, in which the same elements as those in the related art will be designated by the same reference numerals.

[0025] As shown in FIG. 4, a cooling fan assembly 100 of a microwave oven having a fan guide of the present invention includes a fan guide 110 attached to an inner wall portion of a casing 1, a driving motor 120 arranged in front of the fan guide 110, and a fan 130 connected to a motor shaft of the driving motor 120 and located in rear of the fan guide 110, that is, downstream of the fan guide 110, and adapted to suck air from the front end of the fan guide 110 and to discharge the sucked air toward a magnetron 3 located in rear of the fan 130.

[0026] As shown in FIG. 5, the fan guide 110 includes a guide body 111 receiving the fan 130, three straight frames 112a, 112b, and 112c, and a central frame 113. Each of the straight frames 112a, 112b, and 112c is integral, at the outer end thereof, with the front surface of the guide body 111 while being integral, at the inner end thereof, with the central frame 113.

[0027] The straight frames 112a, 112b, and 112c are arranged around the central frame 113 to extend in a direction similar to a radial direction while being circumferentially spaced apart from one another by different angles $\beta 1$, $\beta 2$, and $\beta 3$, respectively.

[0028] Further, the arrangement of the straight frames 112a, 112b, and 112c are set so that intersections P1, P2, and P3 among lines extending inwardly along the straight frames 112a, 112b, and 112c beyond the central frame 113, respectively, discord from one another.

[0029] An another embodiment of the straight frames 112a, 112b, and 112c is shown in FIG. 6. In accordance with this embodiment, curved frames 212a, 212b, and 212c are provided.

[0030] The reference numeral 114 in FIG. 4 denotes a motor fixture.

[0031] Even in the microwave oven equipped with the fan guide of the present invention, the above mentioned blade passing frequency and vortex shedding may be generated when air is sucked. However, since the straight frames 112a,

112b, and 112c or curved frames 212a, 212b, and 212c are asymmetrically arranged, the degree of noise generated by the blade passing frequency is reduced as air passes through those frames. The regularity of the vortex shedding formed at each frame is also destroyed, thereby reducing the interaction between a vortex flow generated at each frame and the fan. Accordingly, a reduction in flow noise and flow loss is achieved.

[0032] Where the fan guide of the present invention is applied to a microwave oven, it is possible to considerably reduce the flow noise generated during the operation of the fan while considerably reducing the level of noise outwardly emitted from the oven, as compared to the cases using conventional fan guides. This is apparent from FIG. 7. As shown in FIG. 7, the fan guide of the present invention provides an effect of reducing the ventilation noise generated during the operation of the fan by an average of about 2.3 dB(A) when detected outside the casing.

[0033] While there have been illustrated and described what are considered to be preferred specific embodiments of the present invention, it will be understood by those skilled in the art that the present invention is not limited to the specific embodiments thereof, and various changes and modifications and equivalents may be substituted for elements thereof without departing from the true scope of the present invention.

What is claimed is:

1. A fan guide comprising:

a rectangular guide body located at a suction part of a fan;

a central frame positioned at a central portion of the guide body;

motor fixtures provided at an outer circumferential surface of the central frame; and

at least two frames for connecting the guide body and the central frame to each other while supporting the fan and a driving motor adapted to drive the fan, the frames being arranged around the central frame while being circumferentially spaced apart from one another by different angles, respectively.

2. A fan guide as claimed in claim 1, wherein the frames are arranged so that intersections among lines extending inwardly along the frames beyond the central frame, respectively, discord from one another.

3. A fan guide as claimed in claim 1, wherein the central frame has a circular structure.

4. A fan guide as claimed in claim 1, wherein each of the frames has a straight structure.

5. A fan guide as claimed in claim 1, wherein each of the frames has a curved structure.

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