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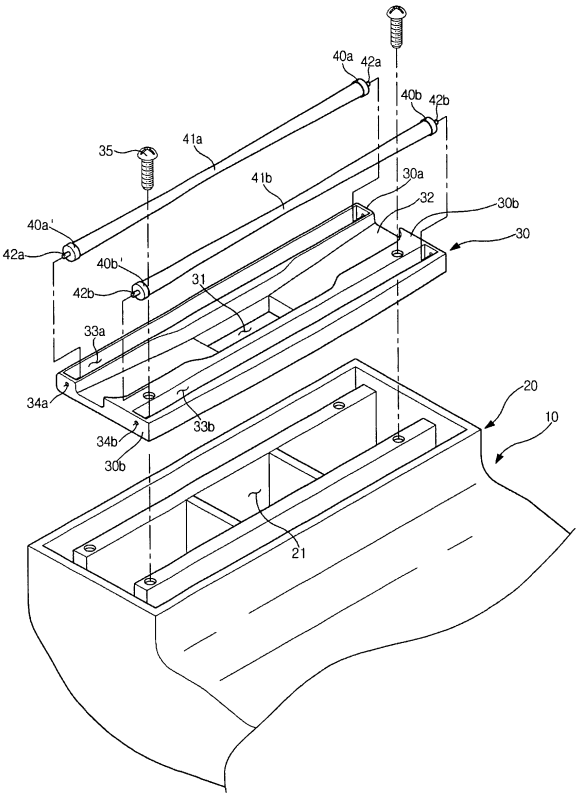
(54) **Vacuum cleaner**

(57) A vacuum cleaner comprises a suction unit (10) optimally structured to reduce noise, and can maneuver the suction unit with a small maneuvering force. The vacuum cleaner comprises a body (11) to generate suction force, and the suction unit (10) connected with the body (11) to suck dust. The suction unit (10) comprises a case (20) defining an outer appearance, a base plate (30) constituting a bottom surface of the suction unit (10) and being formed with a suction port (31) through which the dust is sucked into the suction unit (10), a plurality of wheels (40a,40b) attached to at least one of front opposite sides and rear opposite sides of the suction unit (10) to allow the suction unit (10) to roll on a floor, and a connecting rod (41b) connecting the wheels (40a,40b) with each other and having a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod (41b).

FIG.2



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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit under 35 U.S.A. §119 of Korean Patent Application No. 2005-0004025, filed on January 13, 2006 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a vacuum cleaner, and, more particularly, to a vacuum cleaner, which comprises a suction unit optimally structured to reduce noise, and can maneuver the suction unit with a small maneuvering force.

2. Description of the Related Art

[0003] Generally, a vacuum cleaner is an apparatus, which cleans a room in such a manner that foreign matter such as dust is drawn into a suction unit by a strong suction force generated by a body connected with the suction unit.

[0004] The suction unit can be classified into a floor type and a carpet type according to its utility. The carpet type suction unit generates a great negative pressure to remove dust soiled between fibers constituting a carpet. For this purpose, the carpet type suction unit is adapted to allow a base plate constituting a bottom surface of the suction unit to be brought into contact with the carpet as close as possible.

[0005] However, in the case where a gap between the carpet and the base plate becomes small due to very close contact therebetween, an area of air flow path is also reduced all the more, and thus air drawn into the suction unit through the gap increases in flow speed, which causes severe noise.

[0006] In addition, since great negative pressure is generated between the suction unit and the carpet, it is necessary to provide great maneuvering force in order to push or pull the suction unit. In some cases, when maneuvering the suction unit, the carpet is stuck to the suction unit, and dragged by the suction unit.

SUMMARY OF THE INVENTION

[0007] Accordingly, it is an aspect of the present invention to provide a vacuum cleaner, which comprises a suction unit optimally structured to reduce noise.

[0008] It is another aspect of the present invention to provide the vacuum unit, which can maneuver the suction unit with a small maneuvering force.

[0009] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

[0010] The foregoing and other aspects of the present invention are achieved by providing a vacuum cleaner, comprising a body to generate suction force, and a suction unit connected with the body to suck dust, wherein, when being supported on a floor, the suction unit has an arch-shaped suction space defined in at least one of a front side and a rear side of the suction unit, the suction space being gradually enlarged towards a central region of the suction unit.

[0011] The suction unit may comprise a case defining an outer appearance, a base plate constituting a bottom surface of the suction unit and being formed with a suction port through which the dust is sucked into the suction unit, and a plurality of wheels attached to at least one of front opposite sides and rear opposite sides of the suction unit to allow the suction unit to roll on a floor.

[0012] The wheels attached to at least one of the front opposite sides and the rear opposite sides of the suction unit with respect to the suction port may be connected with each other by a connecting rod.

[0013] The connecting rod may be integrally formed with the wheels.

[0014] The connecting rod may have a smaller diameter than that of each wheel, and have a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod.

[0015] The connecting rod may have a symmetrical shape with respect to an axis of the connecting rod such that, when the wheels are rotated on the floor, the connecting rod is maintained a constant distance from the floor supporting the wheels.

[0016] A lowermost portion of the connecting rod where the connecting rod has the smallest diameter may be separated a distance of 1.5 ~ 2.2 mm from the floor supporting the wheels.

[0017] The base plate may have a lowermost surface coplanar with or above the lowermost portion of the connecting rod where the connecting rod has the smallest diameter.

[0018] In accordance with another aspect of the present invention, a vacuum cleaner comprises a body to generate suction force, and a suction unit connected with the body to suck dust, wherein the suction unit comprises a case defining an outer appearance, a base plate constituting a bottom surface of the suction unit and being formed with a suction port through which the dust is sucked into the suction unit, a plurality of wheels attached to at least one of front opposite sides and rear opposite sides of the suction unit to allow the suction unit to roll on a floor, and a connecting rod connecting the wheels with each other and having a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

FIG. 1 is a schematic view illustrating the configuration of a vacuum cleaner in accordance with a preferred embodiment of the present invention;
FIG. 2 is an exploded perspective view illustrating a suction unit of the vacuum cleaner shown in FIG. 1;
FIG. 3 is a front view illustrating the suction unit of the vacuum cleaner shown in FIG. 1;
FIG. 4 is a side sectional view illustrating the suction unit of the vacuum cleaner shown in FIG. 1; and
FIG. 5 is a graph depicting variation in noise according to a distance between a floor and a lowermost portion of a connecting rod where the connecting rod has the smallest diameter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The embodiments are described below to explain the present invention by referring to the figures.

[0021] Referring to FIG. 1, a vacuum cleaner according to a preferred embodiment of the present invention comprises a suction unit 10 to suck foreign matter such as dust together with air via suction force, and a body 11 to generate the suction force and collect dust suctioned by the suction unit 10.

[0022] The body 11 and the suction unit 10 are connected via a connection hose 12 and a connection pipe 13 such that the suction force generated from the body 11 is transferred to the suction unit 10 therethrough. The vacuum cleaner is further provided with a handle 14 between the connection hose 12 and the connection pipe 13 so as to be gripped by a user when using the vacuum cleaner.

[0023] The connection hose 12 is made of a stretchable corrugated pipe and the like. The connection hose 12 is connected at one end with the body 11, and at the other end with the handle 14 such that the suction unit 10 can be freely moved in a predetermined radius around the body 11. The connection pipe 13 has a predetermined length, and is connected at one end with the suction unit 10 while being connected at the other end with the handle 14 to allow the user to clean the floor using the vacuum cleaner while standing on the floor.

[0024] The suction unit 10 serves to suck air and dust thereto, and, as shown in FIG. 2, comprises a case 20 defining an outer appearance, a base plate 30 constituting a bottom surface of the suction unit 10 and being formed with a suction port 31 through which the dust is sucked into the suction unit 10, and front and rear wheels 40a and 40b attached to lower portions of front and rear sides of the suction unit 10 to allow the suction unit 10 to roll on a floor.

[0025] While defining the outer appearance of the suction unit 10, the case 20 of the suction unit 10 has a guide flow path 21 formed therein to guide the air and dust suctioned into the suction unit 10 towards the connection pipe 13 connected with the suction unit 10.

[0026] The base plate 30 is coupled to a lower side of the suction unit 10, and has a lower surface 30a, which is formed at the center thereof with a suction port 31. The suction port 31 of the lower surface 30a is depressed a predetermined depth from the lower surface 30a of the base plate 30, and communicated with the guide flow path 21 formed in the case 20.

[0027] In order to allow air to be drawn into the suction unit 10 through both sides 30b of the base plate 30, the lower surface 30a of the base plate 30 is formed with a trench 32, which extends from both sides 30b of the base plate 30 to the suction port 31, while being gradually depressed from both sides 30b towards the suction port 31 such that the air suctioned through both sides 30b is guided towards the suction port 31 therethrough.

[0028] The lower surface 30a of the base plate 30 has planar surfaces formed at front and rear sides thereof centered on the trench 32. The planar surfaces are formed with first and second openings 33a and 33b such that the wheels 40a and 40b, and connecting rods 41 a and 41 b connecting the wheels 40a and 40b with each other are partially protruded from the planar surfaces.

[0029] The base plate 30 is formed by machining a material such as stainless steel with press work and the like, and is fastened to the case 20 via fastening members 35 such as screws.

[0030] Meanwhile, in order to allow the suction unit 10 to be maneuvered with a small maneuvering force, the front wheels 40a are mounted to opposite front lower sides of the suction unit 10. As such, with the front wheels 40a mounted to the opposite front lower sides of the suction unit 10, the suction unit 10 can be moved by a small maneuvering force.

[0031] In addition, the rear wheels 40b are mounted to opposite rear lower sides of the suction unit 10, so that the suction unit 10 can be moved by a small maneuvering force.

[0032] The front wheels 40a or the rear wheels 40b comprises two wheels mounted to the lower side of the suction unit 10 in which the two wheels constituting the front wheels 40a are connected with each other by a first connecting rod 41 a, and the two wheels constituting the rear wheels 40b are connected with each other by a second connecting rod 41 b.

[0033] Preferably, the first connecting rod 41 a is integrally formed with the front wheels 40a, and the second connecting rod 41 b is integrally formed with the rear wheels 40b. This structure is devised for the purpose of

preventing tolerance from being created when assembling the connecting rods 41 a and 41 b to the wheels 40a and 40b after separately manufacturing the connecting rods 41a and 41b with respect to the wheels 40a and 40b.

[0034] Each of the front wheels 40a connected by the first connecting rod 41 a has a first shaft 42a such that the front wheels 40a are secured to both sides 30b from the front side of the base plate 30, and each of the rear wheels 40b connected by the second connecting rod 41 b has a second shaft 42b such that the rear wheels 40b are secured to both sides 30b from the rear side of the base plate 30. The base plate 30 has first and second receipt holes 34a and 34b formed at both sides 30b thereof to receive the first and second shafts 42a and 42b, respectively.

[0035] The first receipt holes 34a are formed at the front side with respect to the trench 32, and the second receipt holes 34b are formed at the rear side with respect to the trench 32, so that the first connecting rod 41 a is disposed at the front side with respect to the trench 32 and connects the front wheels 40a with each other, and the second connecting rod 41 b is disposed at the rear side with respect to the trench 32 and connects the rear wheels 40b with each other.

[0036] With the first and second shafts 42a and 42b of the front and rear wheels 40a and 40b fitted into the respective receipt holes 34a and 34b, the front and rear wheels 40a and 40b are rotated about the respective shafts 42a and 42b. At this time, the front wheels 40a and the first connecting rod 41a are positioned in the first opening 33a to be partially exposed from the first opening 33a, and the rear wheels 40b and the second connecting rod 41 b are positioned in the second opening 33b to be partially exposed from the second opening 33b.

[0037] With the front and rear wheels 40a and 40b partially exposed from the first and second openings 33a and 33b, respectively, the front and rear wheels 40a and 40b are rotated on the floor. At this time, since the two wheels constituting the front wheels 40a are integrally formed with the first connecting rod 41 a, and the two wheels constituting the rear wheels 40b are integrally formed with the second connecting rod 41 b, the front wheels 40a rotate together with the first connecting rod 41 a, and the rear wheels 40b rotate together with the second connecting rod 41 b.

[0038] The first connecting rod 41 a connecting the front wheels 40a with each other has a smaller diameter than that of the front wheels 40a, and the second connecting rod 41 b connecting the rear wheels 40b with each other has a smaller diameter than that of the rear wheels 40b. Each of the connecting rods 41 a and 42b has a reversed arch-shaped outer periphery with a diameter of the connecting rod gradually decreased towards the center of the connecting rod.

[0039] In addition, each of the connecting rods 41 a and 41 b has a symmetrical shape with respect to an axis of the connecting rod 41 a or 41 b such that, when the front and rear wheels 40a and 40b are rotated on the floor 50, the connecting rods 41 a and 41 b are maintained at a constant distance from the floor 50 supporting the wheels 40a and 40b.

[0040] FIGS. 3 and 4 are a front view and a side sectional view illustrating the suction unit 10 after the base plate 30, the wheels 40a and 40b, and the case 20 shown in FIG. 2 are assembled thereto, respectively.

[0041] As shown in FIGS. 3 and 4, since the first connecting rod 41 a positioned at the front lower sides of the suction unit 10 to connect the rear wheels 40b with each other has the reversed arch-shaped outer periphery gradually decreased in diameter towards the center of the connecting rod, an arch-shaped suction space 51 is defined in the front of the lower side of the suction unit 10 when the suction unit 10 is supported on the floor 50, and gradually enlarges towards the center of the suction unit 10.

[0042] Such a suction space 51 is also defined by the second connecting rod 41 b connecting the rear wheels 40b positioned in the rear of the lower side of the suction unit 10.

[0043] As such, according to the present invention, the suction unit 10 has the arch-shaped suction space 51 gradually enlarged towards the center of the suction unit 10 when the suction unit 10 is supported on the floor 50, and this structure is devised to secure a large area of an air flow path at the center of the suction unit 10 in consideration of the fact that suction force becomes the maximum value at the center of the suction unit 10 where the suction port 31 is formed, and suctioning speed of air becomes the highest value thereat.

[0044] At this time, in order to form the suction space 51 between the respective connecting rods 41 a and 41 b and the floor 50, the lowermost surface of the base plate 30 is coplanar with or above a lowermost portion 45 of each of the connecting rods 41 a and 41 b where each of the connecting rods 41 a and 41 b has the smallest diameter.

[0045] With the arch-shaped suction space 51 formed in the front and rear of the suction unit 10 to define the flow path through which air is drawn into the suction unit 10, it is possible to reduce noise from the suction unit 10.

[0046] FIG. 5 is a graph depicting variation in noise reduction effect according to a distance "h" (which will hereinafter referred to as a "gap h") between the floor 50 supporting the wheels 40a and 40b and the lowermost portion 45 of each of the connecting rods 41 a and 41 b where each of the connecting rods 41 a and 41 b has the smallest diameter.

[0047] From FIG. 5, it can be appreciated that, when a gap h is 1.8 mm, the noise reduction effect is high, and when the gap h is increased to 3 mm or more, the noise reduction effect is not so high. Accordingly, the gap h is preferably in the range of 1.5~2 mm.

[0048] In this regard, since the base plate 30 constituting the lower surface of the suction unit 10 has a complicated structure, it is difficult to form the base plate 30

such that the gap h of about 1.8 mm is defined between the floor 50 and the lowermost portion 45 of each connecting rod. However, this gap can be secured by the structure wherein the connecting rods 41 a and 41 b are formed to have the reversed arch-shaped outer periphery gradually decreased in diameter to define the suction space 51 between the connecting rods 41 a and 41 b and the floor 50.

[0049] Meanwhile, even though the gap can be formed using a thin base plate 30, the base plate 30 is likely to deform when the thin base plate 30 is fastened to the case 20 by the fastening members 35, and thus it is difficult to maintain the gap of about 1.8 mm with respect to the floor. In this regard, the reversed arch-shaped outer periphery of the connecting rods can overcome such a difficulty.

[0050] On the other hand, the first and second connecting rods 41 a and 41 b are integrally formed with the front and rear wheels 40a and 40b, respectively, and have the symmetrical shape with respect to the axis thereof, so that, when the suction unit 10 is moved, and the respective wheels 40a and 40b are rotated with respect to the shafts 42a and 42b, the respective connecting rods 41 a and 41 b can maintain a constant gap h from the floor 50.

[0051] According to the embodiment described above, the front wheels 40a and the first connecting rod 41a connecting the front wheels 40a with each other are disposed at the front side of the suction unit 10, and the rear wheels 40b and the second connecting rod 41 b connecting the rear wheels 40b with each other are disposed at the rear side of the suction unit 10. However, it should be noted that the present invention is not limited to this structure, and that the connecting rods and wheels are not necessarily disposed at both front and rear sides of the suction unit. Alternatively, a pair of wheels and a connecting rod to connect the wheels may be disposed at one side of the front side and the rear side of the suction unit.

[0052] As apparent from the above description, the vacuum cleaner according to the present invention has a suction space formed between the floor and the connecting rod to connect the wheels of the suction unit to define an air flow path through which air is suctioned into the suction unit, so that noise generated from the suction unit is significantly reduced.

[0053] In addition, since the suction unit is provided at a lower side with the wheels, it is possible to maneuver the suction unit with a small maneuvering force.

[0054] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that various modifications, additions and substitutions may be made in these embodiments without departing from the principle and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. A vacuum cleaner, comprising a body to generate suction force, and a suction unit connected with the body to suck dust,
wherein, when being supported on a floor, the suction unit has an arch-shaped suction space defined in at least one of a front side and a rear side of the suction unit, the suction space being gradually enlarged towards a central region of the suction unit.

2. The vacuum cleaner according to claim 1, wherein the suction unit comprises a case defining an outer appearance, a base plate constituting a bottom surface of the suction unit and being formed with a suction port through which the dust is sucked into the suction unit, and a plurality of wheels attached to at least one of front opposite sides and rear opposite sides of the suction unit to allow the suction unit to roll on a floor.

3. The vacuum cleaner according to claim 2, wherein the wheels attached to at least one of the front opposite sides and the rear opposite sides of the suction unit with respect to the suction port are connected with each other by a connecting rod.

4. The vacuum cleaner according to claim 3, wherein the connecting rod is integrally formed with the wheels.

5. The vacuum cleaner according to claim 3, wherein the connecting rod has a smaller diameter than that of each wheel, and has a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod.

6. The vacuum cleaner according to claim 5, wherein the connecting rod has a symmetrical shape with respect to an axis of the connecting rod such that, when the wheels are rotated on the floor, the connecting rod is maintained a constant distance from the floor supporting the wheels.

7. The vacuum cleaner according to claim 5, wherein a lowermost portion of the connecting rod where the connecting rod has the smallest diameter is separated a distance of 1.5 ~ 2.2 mm from the floor supporting the wheels.

8. The vacuum cleaner according to claim 7, wherein the base plate has a lowermost surface coplanar with or above the lowermost portion of the connecting rod where the connecting rod has the smallest diameter.

9. A vacuum cleaner, comprising a body to generate suction force, and a suction unit connected with the body to suck dust,

wherein the suction unit comprises a case defining an outer appearance, a base plate constituting a bottom surface of the suction unit and being formed with a suction port through which the dust is sucked into the suction unit, a plurality of wheels attached to at least one of front opposite sides and rear opposite sides of the suction unit to allow the suction unit to roll on a floor, and a connecting rod connecting the wheels with each other and having a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod.

10. The vacuum cleaner according to claim 9, wherein the connecting rod is integrally formed with the wheels.

11. The vacuum cleaner according to claim 9, wherein a lowermost portion of the connecting rod where the connecting rod has the smallest diameter is separated a distance of 1.5 ~ 2.2 mm from the floor supporting the wheels.

FIG.1

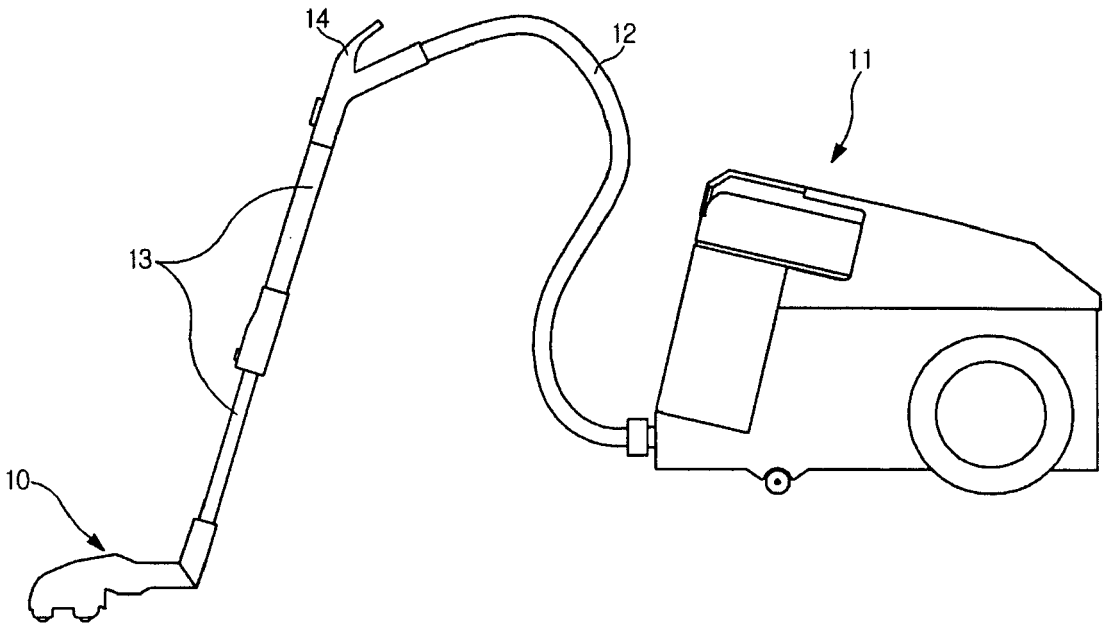
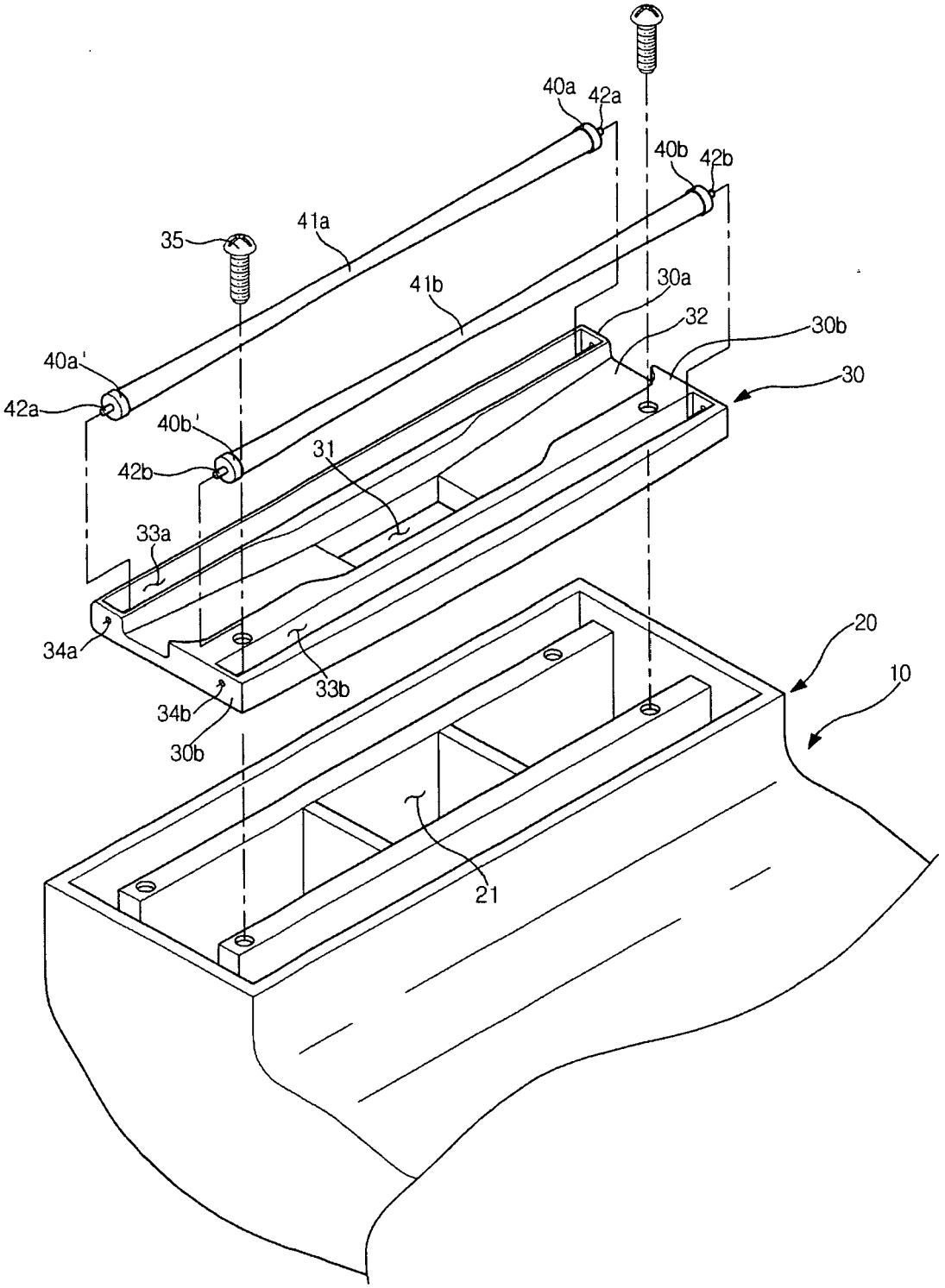


FIG.2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41a
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30a
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30b
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34a
33b
34b
30b
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10
21

FIG.3

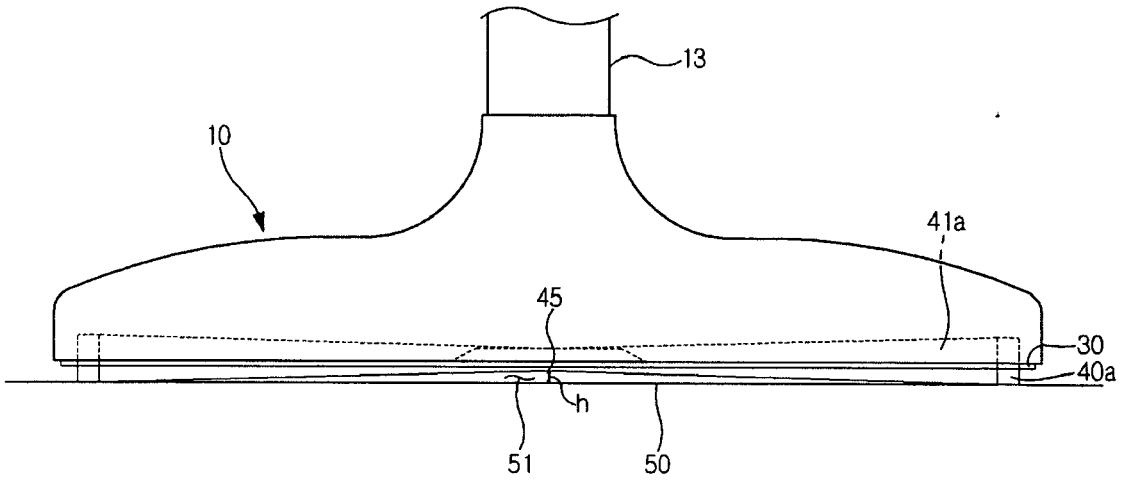


FIG.4

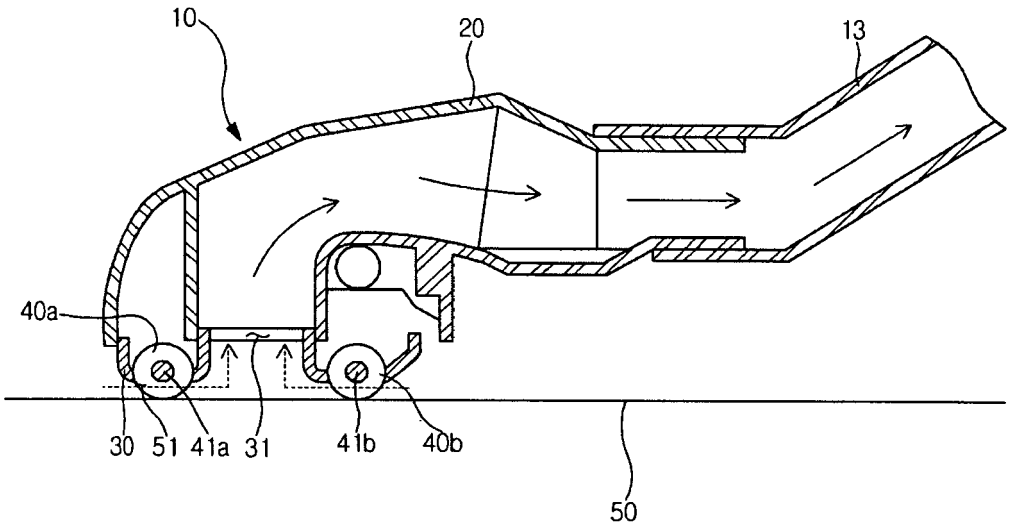
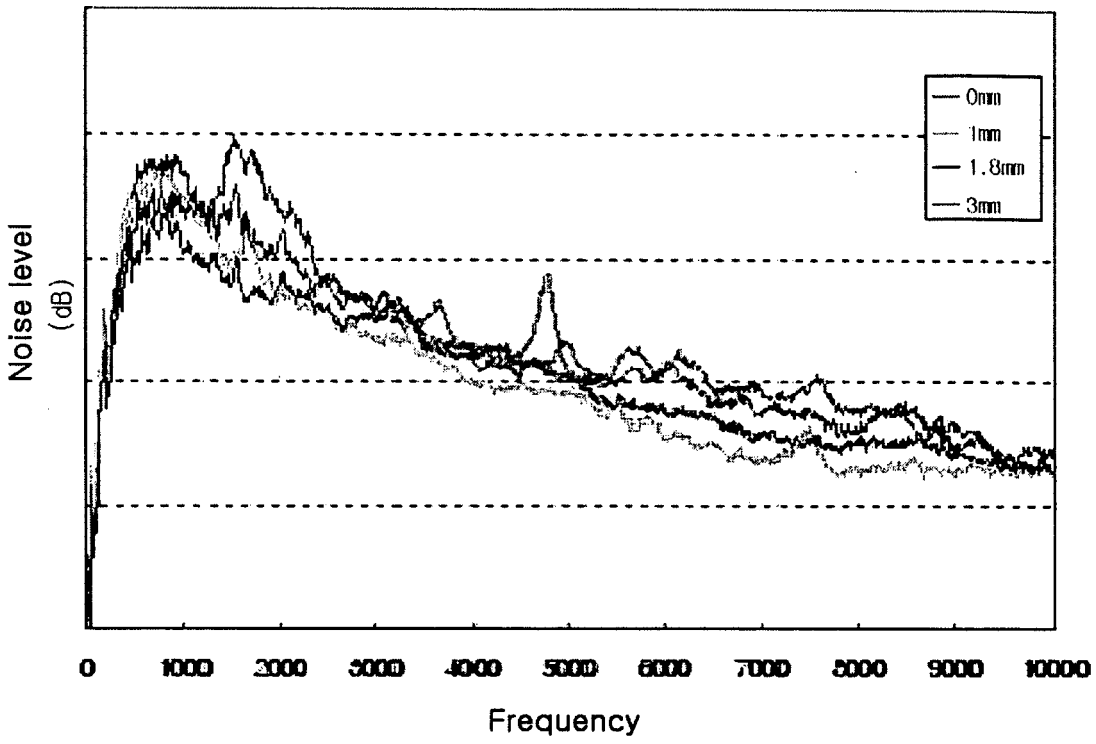


FIG.5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3mm
Noise level
(dB)
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2000
3000
4000
5000
6000
7000
8000
9000
10000
Frequency

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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