

(19)



(11)

**EP 1 808 113 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**24.09.2014 Bulletin 2014/39**

(51) Int Cl.:  
**A47L 9/02** <sup>(2006.01)</sup> **A47L 9/00** <sup>(2006.01)</sup>

(21) Application number: **06008559.4**

(22) Date of filing: **25.04.2006**

(54) **Vacuum cleaner**

Staubsauger

Aspirateur

(84) Designated Contracting States:  
**DE FR GB**

(30) Priority: **13.01.2006 KR 20060004025**

(43) Date of publication of application:  
**18.07.2007 Bulletin 2007/29**

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**EP-A- 1 488 726 US-A- 1 560 400**  
**US-A- 1 654 186 US-A- 2 620 506**  
**US-A- 4 238 870 US-A1- 2006 005 350**

**EP 1 808 113 B1**

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## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

**[0001]** 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

**[0002]** 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.

**[0003]** 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.

**[0004]** 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.

**[0005]** 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.

**[0006]** US 1,654,186 A describes a suction cleaner which comprises a casing supported by floor wheels. In the casing are formed a fan chamber and a suction nozzle. The suction nozzle comprises lips which are shaped with a curved surface. As the wheels are arranged behind the suction nozzle, the suction nozzle might be drawn closely onto the carpet, wherein air flow into the suction nozzle is interrupted. As a result, noise development of the suction unit can be increased. Further, when the suction nozzle is drawn onto the carpet, a huge maneuvering force is required to move the vacuum cleaner.

**[0007]** US 2006/005 350 A1 relates to a vacuum cleaner, especially to an improved suction brush that adjusts to different characteristics of a cleaning surface.

**[0008]** US 2,620,506 A relates to a suction cleaning tool with an adjustable brush. The surface cleaning brush can be moved into or out of a surface engaging position.

**[0009]** US 1,560,400 A describes a vacuum cleaner which may be supplemented by a rotary brush serving

to pick up loose particles. The case of the vacuum cleaner defines a vacuum chamber of which the walls terminate in a lip which is shaped to come into contact with a carpet or floor.

**[0010]** EP 1,488,726 A describes a vacuum cleaner nozzle of substantially triangular shape and according to the preamble of claim 1.

**[0011]** US 4,238,870 A relates to a vacuum cleaner with a brush beater roller. The casing of the vacuum cleaner has two pairs of wheels supporting the cleaner when in use.

**[0012]** In view of the cited prior arts and the above described technical disadvantages, the invention has the object to provide a vacuum cleaner with reduced noise development, as well as improved maneuverability on the floor.

**[0013]** This object can be solved with the technical features of claim 1. Improved embodiments of the invention are suggested by the technical features of the dependent claims.

### SUMMARY OF THE INVENTION

**[0014]** Accordingly, it is an aspect of the present invention to provide a vacuum cleaner, which comprises a suction unit optimally structured to reduce noise.

**[0015]** It is another aspect of the present invention to provide the vacuum unit, which can maneuver the suction unit with a small maneuvering force.

**[0016]** 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.

**[0017]** The foregoing aspects of the present invention are achieved by providing a vacuum cleaner according to claim 1.

**[0018]** 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.

**[0019]** The connecting rod may be integrally formed with the wheels.

**[0020]** 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.

**[0021]** 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.

**[0022]** 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.

**[0023]** 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.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0024]** 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

**[0025]** 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.

**[0026]** 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.

**[0027]** 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.

**[0028]** 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.

**[0029]** 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.

**[0030]** 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.

**[0031]** 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.

**[0032]** 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.

**[0033]** 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.

**[0034]** 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.

**[0035]** 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.

**[0036]** 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.

**[0037]** 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.

**[0038]** 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.

**[0039]** 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.

**[0040]** 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.

**[0041]** 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.

**[0042]** 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.

**[0043]** 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.

**[0044]** 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.

**[0045]** 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.

**[0046]** 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.

**[0047]** 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.

**[0048]** 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.

**[0049]** 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.

**[0050]** 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.

**[0051]** 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.

**[0052]** 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.

**[0053]** In this regard, since the base plate 30 consti-

tuting 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.

**[0054]** 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.

**[0055]** 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.

**[0056]** 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.

**[0057]** 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.

**[0058]** 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.

**[0059]** 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 scope of the invention, as defined in the claims.

## Claims

1. A vacuum cleaner, comprising  
a body (11) to generate suction force,  
a suction unit (10) connected with the body (11) to suck dust,  
wherein, when being supported on a floor (50), the suction unit (10) has an arch-shaped suction space (51) defined in at least one of a front side and a rear side of the suction unit (10), the suction space (51) being gradually enlarged towards a central region of the suction unit (10), and wherein 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), and 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, wherein the wheels (40a, 40b) with respect to the suction port (31) are connected with each other by a connecting rod (41a, 41b), which has a smaller diameter than that of each wheel (40a, 40b), and **characterized in that**  
the connecting rod (41 a, 41 b) comprises a reversed arch-shaped outer periphery gradually decreased in diameter towards a center of the connecting rod (41 a, 41 b).
2. The vacuum cleaner according to claim 1 , wherein the connecting rod (41a, 41 b) is integrally formed with the wheels (40a, 40b).
3. The vacuum cleaner according to claim 1 or 2, wherein the connecting rod (41 a, 41 b) has a symmetrical shape with respect to an axis of the connecting rod (41 a, 41 b) such that, when the wheels (40a, 40b) are rotated on the floor (50), the connecting rod (41a, 41b) is maintained a constant distance from the floor (50) supporting the wheels (40a, 40b).
4. The vacuum cleaner according to one of the claims 1 to 3, wherein a lowermost portion (45) of the connecting rod (41a, 41b) where the connecting rod (41a, 41b) has the smallest diameter is separated a distance of 1.5 ~ 2.2 mm from the floor (50) supporting the wheels (40a, 40b).
5. The vacuum cleaner according to one of the claims 1 to 4, wherein the base plate (30) has a lowermost surface (30a, 30b) coplanar with or above the lowermost portion (45) of the connecting rod (41a, 41b) where the connecting rod (41a, 41b) has the smallest diameter.

## Patentansprüche

1. Staubsauger, umfassend  
einen Körper (11) zum Erzeugen einer Saugkraft,  
eine Saugereinheit (10), die mit dem Körper (11) ver-  
bunden ist, um Staub aufzusaugen,  
wobei die Saugereinheit (10), wenn sie auf einem  
Fußboden (50) steht, eine bogenförmige Saugaus-  
sparung (51) hat, die an der Vorderseite und/oder  
an der Rückseite der Saugereinheit (10) ausgebildet  
ist, wobei die Saugaussparung (51) sukzessive inner-  
wärts zu einer zentralen Region der Saugereinheit  
(10) größer wird, und wobei die Saugereinheit (10) ein  
Gehäuse (20), das ein äußeres Erscheinungsbild  
definiert, eine Basisplatte (30), die eine Bodenober-  
fläche der Saugereinheit (10) darstellt und mit einer  
Saugöffnung (31) ausgebildet ist, durch welche der  
Staub in die Saugereinheit (10) gesaugt werden kann,  
sowie eine Vielzahl von Rädern (40a, 40b), die an  
vorderen gegenüberliegenden Seiten und/oder an  
hinteren gegenüberliegenden Seiten der Saugerein-  
heit (10) befestigt sind, um der Saugereinheit (10) zu  
gestatten, auf dem Fußboden zu rollen, umfasst,  
wobei die Räder (40a, 40b) bezüglich der Saugöff-  
nung (31) durch eine Verbindungsstange (41 a, 41  
b) verbunden sind, die einen kleineren Durchmesser  
als jedes der Räder (40a, 40b) hat,  
**dadurch gekennzeichnet, dass**  
die Verbindungsstange (41 a, 41 b) eine bogenförmige  
Umfangsfläche umfasst und sukzessive inner-  
wärts Richtung Zentrum der Verbindungsstange (41  
a, 41 b) im Durchmesser abnimmt.
2. Staubsauger nach Anspruch 1, wobei die Verbin-  
dungsstange (41 a, 41 b) integral mit den Rädern  
(40a, 40b) ausgebildet ist.
3. Staubsauger nach Anspruch 1 oder 2, wobei die Ver-  
bindungsstange (41a, 41b) eine symmetrische Form  
bezüglich einer Achse der Verbindungsstange (41  
a, 41 b) aufweist, sodass die Verbindungsstange (41  
a, 41 b) in gleichbleibendem Abstand vom Fußboden  
(50), der die Räder (40a, 40b) unterstützt, gehalten  
werden kann, wenn die Räder (40a, 40b) auf dem  
Fußboden (50) rollen.
4. Staubsauger nach einem der Ansprüche 1 bis 3, wo-  
bei ein tiefster Bereich (45) der Verbindungsstange  
(41 a, 41 b), wo die Verbindungsstange (41 a, 41 b)  
den kleinsten Durchmesser hat, eine Entfernung von  
1.5 bis 2.2 mm vom Fußboden (50), der die Räder  
(40a, 40b) unterstützt, entfernt ist.
5. Staubsauger nach einem der Ansprüche 1 bis 4, wo-  
bei die Basisplatte 30 eine unterste Oberfläche (30a,  
30b) hat, die in der gleichen Ebene des unteren Be-  
reichs (45) der Verbindungsstange (41a, 41 b), wo  
die Verbindungsstange (41 a, 41 b) den kleinsten

Durchmesser hat, oder darüber liegt.

## Revendications

1. Aspirateur comprenant  
un corps (11) pour générer une force d'aspiration,  
une unité d'aspiration (10) connectée au corps (11)  
pour aspirer de la poussière,  
dans lequel, quand elle est supportée sur un sol (50),  
l'unité d'aspiration (10) présente un espace d'aspi-  
ration en forme de voûte (51) défini dans au moins  
un côté avant et un côté arrière de l'unité d'aspiration  
(10), l'espace d'aspiration (51) étant graduellement  
plus grand vers une zone centrale de l'unité d'aspi-  
ration (10), et dans lequel l'unité d'aspiration (10)  
comprend un boîtier (20) définissant une apparence  
externe, une plaque de base (30) constituant une  
surface de fond de l'unité d'aspiration (10) et confor-  
mée avec un orifice d'aspiration (31) à travers lequel  
la poussière est aspirée dans l'unité d'aspiration  
(10), et une pluralité de roues (40a, 40b) attachées  
à au moins un côté parmi des côtés opposés avant  
et des côtés opposés arrière de l'unité d'aspiration  
(10) pour permettre à l'unité d'aspiration (10) de rou-  
ler sur un sol,  
dans lequel les roues (40a, 40b), par rapport à l'ori-  
fice d'aspiration (31), sont connectées entre elles  
par une barre de connexion (41a, 41b) qui présente  
un diamètre inférieur à celui de chaque roue (40a,  
40b), et  
**caractérisé en ce que**  
la barre de connexion (41a, 41b) comprend une pé-  
riphérie externe en forme de voûte inversée dont le  
diamètre décroît graduellement vers un centre de la  
barre de connexion (41a, 41b).
2. Aspirateur selon la revendication 1, dans lequel la  
barre de connexion (41a, 41b) est conformée inté-  
gralement avec les roues (40a, 40b).
3. Aspirateur selon la revendication 1 ou 2, dans lequel  
la barre de connexion (41a, 41b) présente une forme  
symétrique par rapport à un axe de la barre de con-  
nexion (41a, 41b), de telle sorte que quand les roues  
(40a, 40b) tournent sur le sol (50), la barre de con-  
nexion (41a, 41b) est maintenue à une distance  
constante du sol (50) qui supporte les roues (40a,  
40b).
4. Aspirateur selon l'une des revendications 1 à 3, dans  
lequel une partie la plus basse (45) de la barre de  
connexion (41a, 41b) où la barre de connexion (41a,  
41b) présente son plus faible diamètre est séparée  
par une distance de 1,5 mm à 2,2 mm du sol (50)  
qui supporte les roues (40a, 40b).
5. Aspirateur selon l'une des revendications 1 à 4, dans

lequel la plaque de base (30) comporte une surface la plus basse (30a, 30b) qui est coplanaire avec la partie la plus basse (45) de la barre de connexion (41a, 41b) ou qui se trouve au-dessus de celle-ci, où la barre de connexion (41a, 41b) présente son diamètre le plus faible.

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FIG.1

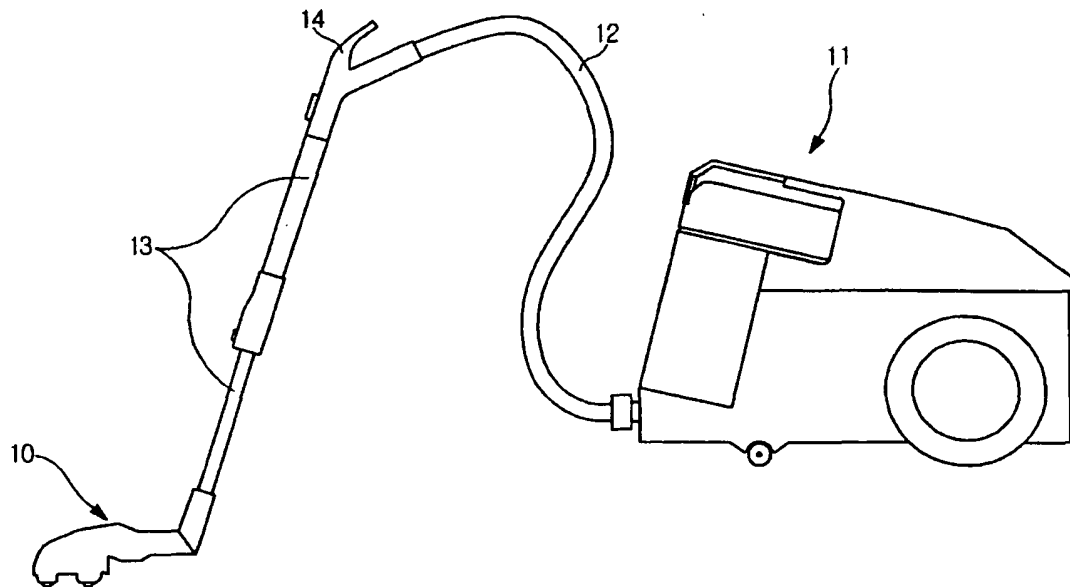




FIG.2

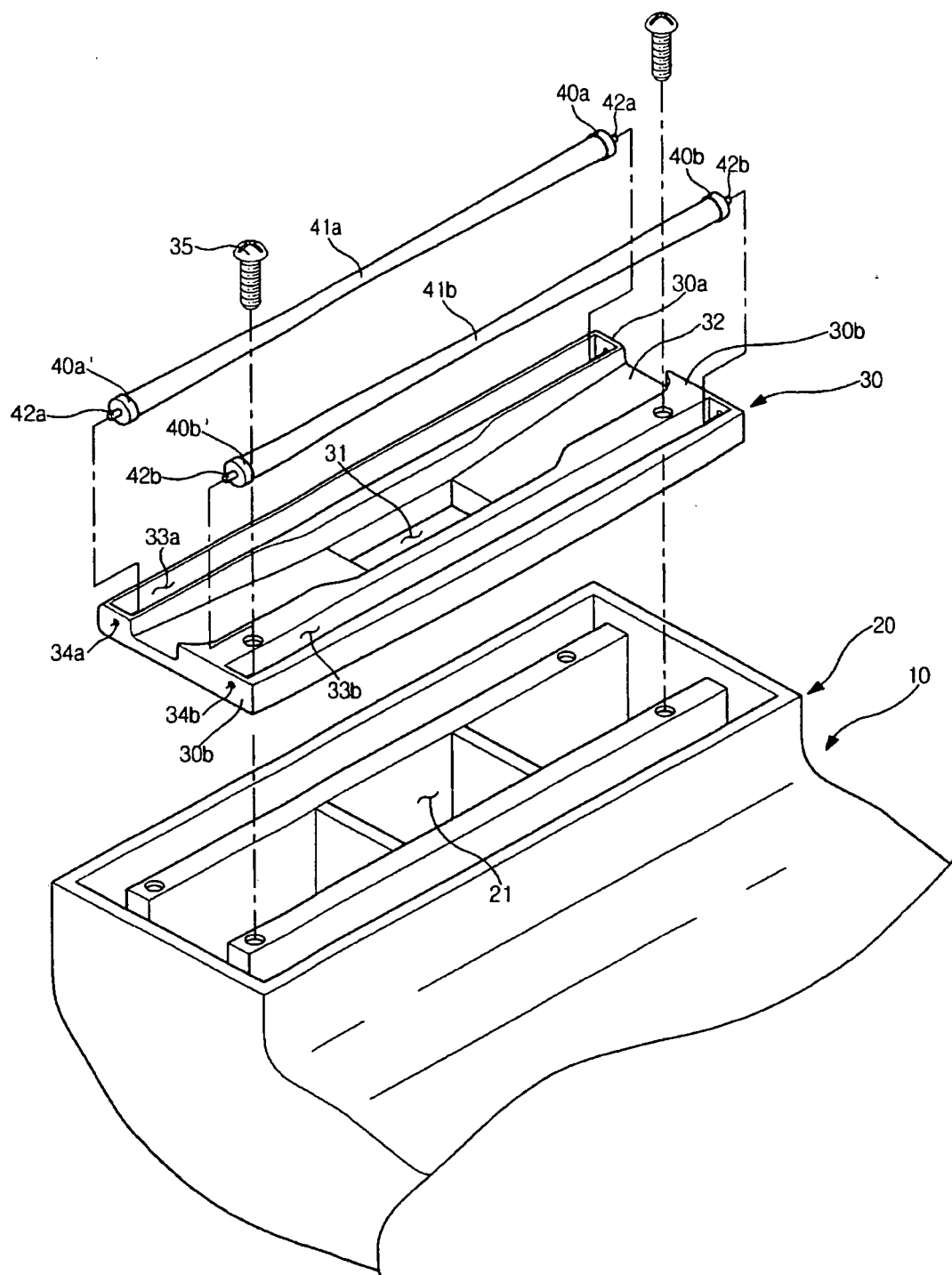


FIG.3

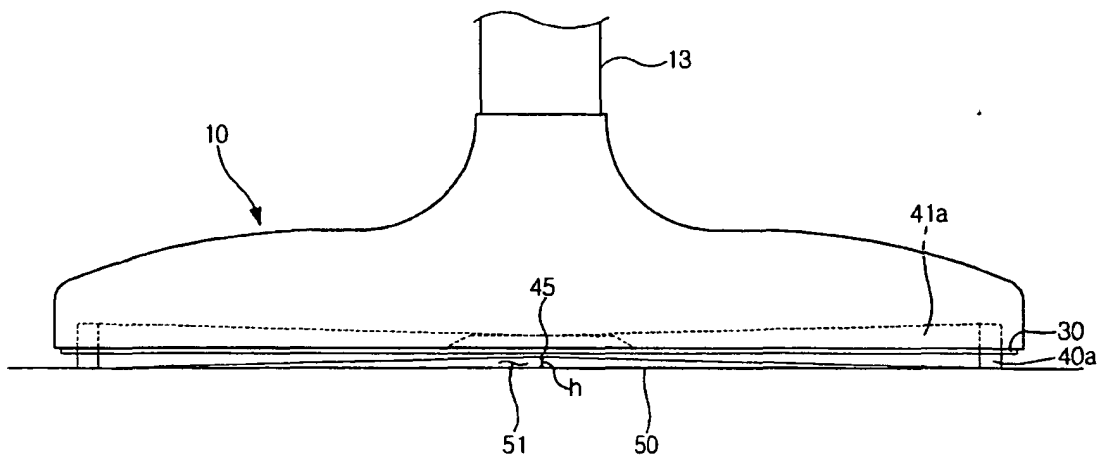


FIG.4

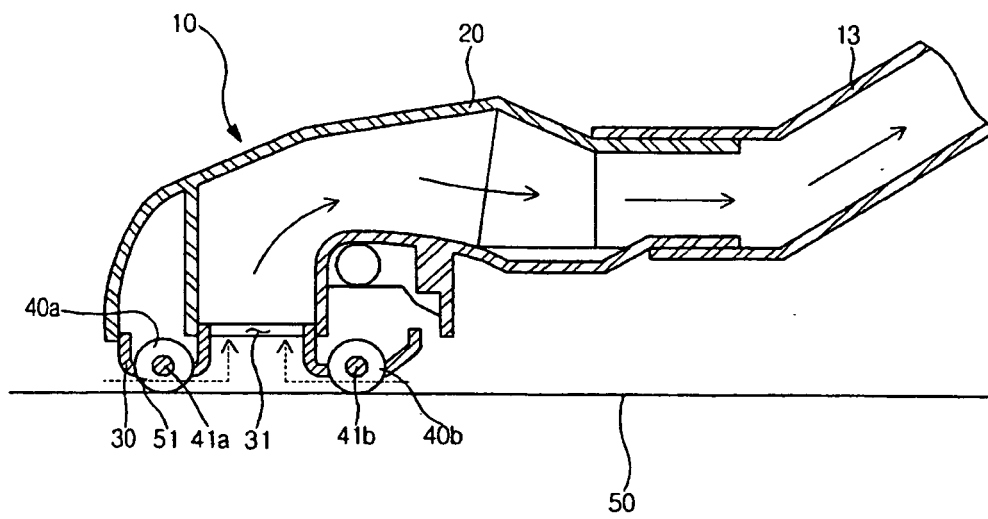
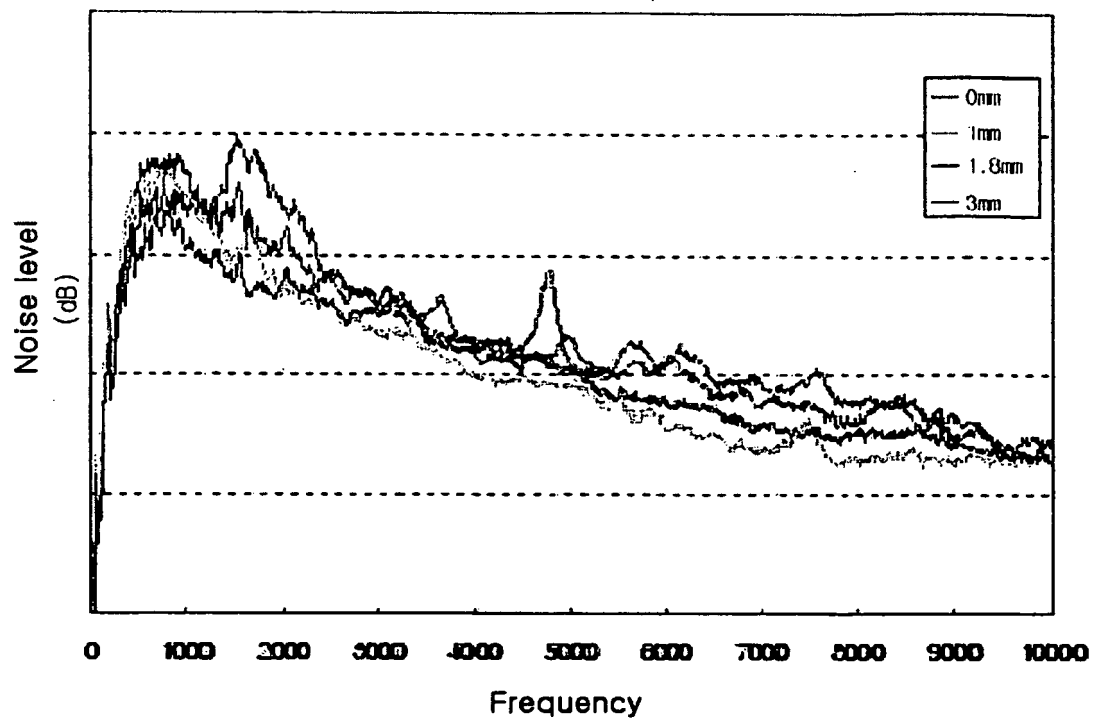


FIG.5



**REFERENCES CITED IN THE DESCRIPTION**

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