

Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND

1. Field

[0001] The following description relates to a vacuum cleaner, and more particularly, to a turbine brush unit for rotating a brush and a vacuum cleaner having the same.

2. Description of the Related Art

[0002] A vacuum cleaner, in general, may include a brush member that comes in contact with a surface to be cleaned and cleans dust on the surface to be cleaned. The brush member may scratch or bump the surface to be cleaned by a rotation force while moving along the surface to be cleaned, so that the dust on the surface to be cleaned is separated from the surface to be cleaned. The dust separated from the surface to be cleaned by the brush member is drawn into a main body by a suction force generated from the main body.

[0003] The brush member may be configured to be rotated by a drive motor or to be rotated by air drawn through a suction portion. Also, the brush member may generally be configured to be rotated by inlet wind for the purpose of simplifying the configuration and saving cost.

[0004] FIG. 1 is a perspective view of a related art vacuum cleaner 1 having a turbine brush unit 100, a hose 200 and a main body 300. FIG. 2 is a sectional view of the turbine brush unit 100 of FIG. 1.

[0005] As shown in FIG. 2, the turbine brush unit includes a turbine brush case 101, a brush member 102 mounted in the turbine brush case 101, and a turbine fan unit 110.

[0006] The turbine fan unit 110 includes an inlet duct 103, an outlet duct 104 and a fan member 110a disposed between the inlet and outlet ducts 103 and 104. The turbine fan unit 110 is configured so that rotative power is provided to the brush member 102 by a belt (not shown).

[0007] As shown in FIG. 2, the fan member 110a has a plurality of wings 112 and a rotating plate 111 having the plurality of wings 112 radially disposed thereon. Primary inlet air a1 sucked through an inlet port collides with the wings 112, so that the fan member 110a is rotated in a rotation direction D.

[0008] However, in the related art vacuum cleaner, the primary inlet air a1 may not collide with the wings 112 but form secondary reverse-current air a2 in the region of a fan member mounting portion P, in which the inlet and outlet ducts 103 and 104 are formed. Therefore, the secondary reverse-current air a2 is drawn into the fan member 110a.

[0009] As shown in FIG. 2, the secondary reverse-current air a2 collides with the rear surface (the opposite surface to the surface facing the inlet port 103a) of each of the wings 112, and therefore, a frictional force is generated with respect to the rotation direction D. As a result,

the rotation force of the fan member 110a is decreased. The decrease in the rotation force of the fan member 110a results in a decrease in the rotation force of the brush member 102. Therefore, cleaning may not be smoothly performed with respect to a surface to be cleaned, and loss of pressure may be increased.

SUMMARY

10 [0010] In one general aspect, there is provided a turbine brush unit for a vacuum cleaner including a turbine brush case, a brush member mounted in the turbine brush case, and a turbine fan unit having a plurality of wings and rotating the brush member. Each of the plu-
15 rality of the wings has a curvature point, a primary collision surface with which a primary inlet wind drawn through the inlet portion of the turbine fan unit collides and a secondary collision surface with which a secondary inlet wind collides, and the primary and secondary inlet
20 winds apply a force in a rotation direction of the turbine fan unit.

[0011] The angle at which the primary inlet wind collides with each of the plurality of wings may be substantially 90 degrees or less.

25 [0012] Each of the plurality of wings may have an included angle of substantially 100 degrees or less, which is an angle made by two lines passing between the curvature point and ends of the wing.

[0013] Each of the plurality of wings may be formed in a U shape.

30 [0014] Each of the plurality of wings may be formed in a V shape.

[0015] In another aspect, there is provided a vacuum cleaner including a main body and a turbine brush unit, the turbine brush unit including a turbine brush case, a brush member mounted in the turbine brush case, and a turbine fan unit having a plurality of wings and rotating the brush member. Each of the plurality of the wings has a curvature point, a primary collision surface with which a primary inlet wind drawn through the inlet portion of the turbine fan unit collides and a secondary collision surface with which a secondary inlet wind collides, and the primary and secondary inlet winds apply a force in a rotation direction of the turbine fan unit.

45 [0016] The primary collision surface and the secondary collision surface may be positioned at an angle relative to one another.

[0017] The angle may be smaller than 100 degrees.

[0018] The angle may be smaller than 90 degrees.

50 [0019] An angle may be formed by two lines which pass through the curvature point which is positioned on respective wings at a center point between the primary and secondary collision surfaces, and the angle is less than 100 degrees.

55 [0020] The angle may be less than 90 degrees.

[0021] In still another aspect, there is provided a turbine brush unit of a vacuum cleaner, the turbine brush unit including a turbine brush case, a brush member

mounted in the turbine brush case, and a turbine fan unit having a plurality of wings and rotating the brush member. Each of the plurality of the wings includes a primary collision surface and a secondary collision surface angled relative to the first collision surface, and a primary inlet wind drawn through the inlet portion of the turbine fan unit collides the primary collision surface and a secondary inlet wind collides with the secondary collision surface, and the primary and secondary inlet winds apply a force in a rotation direction of the turbine fan unit.

[0022] Other features and aspects will be apparent from the follow detailed description, the drawings, and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a perspective view of a related art vacuum cleaner having a turbine brush unit, a hose and a main body.

FIG. 2 is a sectional view of the turbine brush unit of FIG. 1.

FIG. 3 is a perspective view of an example of a first fan member.

FIG. 4 is a view showing an example of the structure of a first wing.

FIG. 5 is a sectional view of an example of a turbine brush unit illustrating the operational state of a first turbine fan unit having the first fan member.

FIG. 6 is a perspective view of an example of a second fan member.

FIG. 7 is a view showing an example of the structure of a second wing.

FIG. 8 is a sectional view of an example of a turbine brush unit illustrating the operational state of a second turbine fan unit having the second fan member.

[0024] Throughout the drawings and the detailed description, unless otherwise described, the same drawing reference numerals will be understood to refer to the same elements, features, and structures. The relative size and depiction of these elements may be exaggerated for clarity, illustration, and convenience.

DETAILED DESCRIPTION

[0025] The following detailed description is provided to assist the reader in gaining a comprehensive understanding of the methods, apparatuses, and/or systems described herein. Accordingly, various changes, modifications, and equivalents of the systems, apparatuses, and/or methods described herein will be suggested to those of ordinary skill in the art. The progression of processing steps and/or operations described is an example; however, the sequence of and/or operations is not limited to that set forth herein and may be changed as is known in the art, with the exception of steps and/or

operations necessarily occurring in a certain order. Also, descriptions of well-known functions and constructions may be omitted for increased clarity and conciseness.

[0026] FIG. 3 illustrates an example of a first fan member 120a. FIG. 4 illustrates an example of the structure of a first wing 122. FIG. 5 illustrates an example of a turbine brush unit 100a illustrating the operational state of a first turbine fan unit 120 having the first fan member 120a.

10 [0027] Referring to FIGS. 3 to 5, for example, the turbine brush unit 100a includes a turbine brush case 101, a first turbine fan unit 120 and a brush member 102.

[0028] Referring to the example in FIG. 5, the first turbine fan unit 120 includes a first fan member 120a provided with bent first wings 122 and a first rotating plate 121. The first turbine fan unit 120 is mounted in a fan member mounting portion P formed by an outlet duct 104 and an inlet duct 103.

[0029] As shown in FIG. 4, the first wing 122 may be formed in a V shape having a first inclined angle $\theta 1$ within a specific range about a first curvature point C1 at which a primary operating portion 122a and a secondary operating portion 122b intersect with each other. In the plurality of first wings 122, the first included angle $\theta 1$ is an angle made by the first curvature point C1, the primary operating portion 122a and the secondary operating portion 122b.

[0030] Due to the first included angle $\theta 1$ made between the primary and secondary operating portions 122a and 122b, primary and secondary inlet winds A1 and A2, drawn into the interior of the first fan member 120a from a circumferential region of the first rotating plate 121, may collide with a primary or secondary collision surface 120a' or 120b' of each of the first wings 122, positioned opposite to the rotation direction of the rotating plate 121. The first included angle $\theta 1$ may be an angle smaller than 100 degrees.

[0031] As shown in the examples of FIGS. 3 to 5, the V-shaped first wings 122 may be radially disposed on a circumferential side surface of the first rotating plate 121 in the first fan member 120a. Sides of the first wings 122 may be connected to the first rotating plate 122. The primary and secondary inlet winds A1 and A2 drawn into the interior of the first fan member 120a may collide with the primary or secondary collision surface 120a' or 120b' of each of the first wings 122.

[0032] That is, the primary and secondary inlet winds A1 and A2 drawn into the first rotating plate 121 may collide with the surfaces (the primary and secondary collision surfaces 120a' and 120b' in FIG. 5) of each of the first wings 122, which face an inlet port 103a, due to the V shape of the first wings 122. However, the primary and secondary inlet winds A1 and A2 may avoid colliding with the rear surfaces (the opposite surface of the primary and secondary collision surface 120a' or 120b' in FIG. 5) of each of the wings 122.

[0033] Due to the additional collision of the secondary inlet wind A2, a secondary operating force B that rotates

the first fan member 120a in the rotation direction D may be additionally formed, and thus, the rotation force of the first fan member 120 may be increased. Since the secondary inlet wind A2 may avoid colliding with the surface (the opposite surface of the primary or secondary collision surface 120a' or 120b') of each of the wings 122 in the rotation direction D, the friction with the flow of air, caused by the first wings 122, may be minimized, and thus, the loss of pressure may be reduced.

[0034] In FIGS. 3 to 5, the first wings 122, in one example, may be disposed so that the center line passing the first curvature point C1 is parallel with the tangent line of the first rotating plate 121. However, this example is non-limiting, and it is unnecessary that the center line is parallel with the tangent line. As such, other suitable configurations may be employed.

[0035] For vacuum cleaners with output powers of 1200W and 2000W, the revolution per minute (RPM) of the first fan member 120a having the V-shaped first wings 122 of FIGS. 3 to 5 was compared with the RPM of the fan member 110a having the wings 112 of the related art.

[0036] In the vacuum cleaner with the output power of 1200W, the RPM of the fan member 110a having the wings 112 of the related art showed 3800 RPM in load and 5200 RPM in unload. However, the RPM of the first fan member 120a having the V-shaped first wings 122 arranged similar to the examples shown in FIGS. 3 to 5 showed 4200 RPM in load and 5700 RPM in unload. Accordingly, it can be seen that the rotation speed may be increased.

[0037] In the vacuum cleaner with the output power of 2000W, the RPM of the fan member 110a having the wings 112 of the related art showed 3900 RPM in load and 5200 RPM in unload. However, the RPM of the first fan member 120a having the V-shaped first wings 122 arranged similar to the examples shown in FIGS. 3 to 5 showed 4300 RPM in load and 5700 RPM in unload. Thus, it can be seen that the rotation speed may be increased.

[0038] FIG. 6 illustrates a perspective view of an example of a second fan member 130a. FIG. 7 illustrates a view showing an example of the structure of a second wing 132. FIG. 8 illustrates a sectional view of an example of a turbine brush unit 100b illustrating the operational state of a second turbine fan unit 130 having the second fan member 130a.

[0039] As shown in FIGS. 6 to 8, for example, the second fan member 130a has U-shaped second wings 132. The second included angle θ_2 of each of the second wings 132 is an angle made by two lines that pass between a second curvature point C2 and ends of primary and second operating portions 132a and 132b (see FIG. 7). The second included angle θ_2 may be an angle smaller than about 100 degrees. Similar to the examples of FIGS. 3 to 5, sides of the second wings 132 may be fixed to a second rotating plate 131.

[0040] A primary inlet wind A1 drawn into the interior of the second fan member 130a may collide with a pri-

mary collision surface 130a' of each of the second wings 132, and a secondary inlet wind A2 may then collide with a secondary collision surface 130b' of each of the second wings 132.

[0041] The primary inlet wind A1 drawn from an inlet port 103a may collide with the primary collision surface 130a' of the primary operating portion 132a, thereby rotating the second fan member 130a. The secondary inlet wind A2 drawn into a fan member mounting portion P along the circumference of the second fan member 130a may collide with the secondary collision surface 130b' of the secondary operating portion 132b, thereby generating a secondary operating force B.

[0042] For a vacuum cleaner with an output power of 2000W, the RPM of the second fan member 130a having the U-shaped second wings 132 of FIGS. 6 to 8 was compared with the RPM of the fan member 110a having the wings 112 of the related art.

[0043] In the vacuum cleaner with the output power of 2000W, the RPM of the fan member 110a having the wings 112 of the related art showed 3700 RPM in load and 5000 RPM in unload.

[0044] However, the RPM of the second fan member 130a having the U-shaped second wings 132 arranged as shown in the examples of FIGS. 6 to 8 showed 4200 RPM in load and 5700 RPM in unload. Accordingly, it can be seen that the rotation speed may be increased. As described above, inlet wind sucked into the interior of a fan member from the outer circumference of the fan member may collide with a plurality of wings so that an operating force is applied to the rotation direction of the fan member, and may thereby increase the rotation force of the fan member.

[0045] Further, air that collides with the fan member collides with the wings so that the generation of a frictional force with respect to the rotation direction of the fan member may be avoided. Accordingly, the interruption of the flow of air may be decreased, and thus, the loss of pressure may be reduced.

[0046] Furthermore, the rotation force of the fan member may be increased, and thus, the rotation force of a brush member may be increased. In this case, cleaning efficiency is enhanced.

[0047] A number of examples have been described above. Nevertheless, it will be understood that various modifications may be made. For example, suitable results may be achieved if the described techniques are performed in a different order and/or if components in a described system, architecture, device, or circuit are combined in a different manner and/or replaced or supplemented by other components or their equivalents. Accordingly, other implementations are within the scope of the following claims.

Claims

1. A turbine brush unit (100a) for a vacuum cleaner,

the turbine brush unit (100a) comprising:

a turbine brush case (101);
a brush member (102) mounted in the turbine
brush case (101); and
a turbine fan unit (120, 130) comprising a plu-
rality of wings (122, 132) and configured to rotate
the brush member (102), each of the plurality of
the wings (122, 132) comprising:

a curvature point (C1, C2);
a primary collision surface (120a', 130a')
with which a primary inlet wind (A1) drawn
through the inlet portion (103a) of the tur-
bine fan unit (120, 130) collides; and
a secondary collision surface (120b', 130b')
with which a secondary inlet wind (A2) col-
lides,
wherein the primary and secondary inlet
winds (A1, A2) apply a force in a rotation
direction (D) of the turbine fan unit (120,
130).

2. The turbine brush unit (100a) for vacuum cleaner of
claim 1, wherein the angle at which the primary inlet
wind (A1) collides with each of the plurality of wings
(122, 132) is substantially 90 degrees or less.

3. The turbine brush unit (100a) for vacuum cleaner of
claim 1, wherein each of the plurality of wings (122,
132) comprises an included angle (θ_1 , θ_2) of sub-
stantially 100 degrees or less, which is an angle
made by two lines passing between the curvature
point (C1, C2) and ends of the wing.

4. The turbine brush unit (100a) for vacuum cleaner
according to any preceding claim, wherein each of
the plurality of wings (132) are formed in a U shape.

5. The turbine brush unit (100a) for vacuum cleaner
according to claims 1 to 3, wherein each of the plu-
rality of wings (122) are formed in a V shape.

6. A vacuum cleaner, comprising:

a main body; and
a turbine brush unit (100a), the turbine brush
unit (100a) comprising:

a turbine brush case (101);
a brush member (102) mounted in the tur-
bine brush case (101); and
a turbine fan unit (120, 130) comprising a
plurality of wings (122, 132) and configured
to rotate the brush member (102), each of
the plurality of the wings (122, 132) com-
prising:

a curvature point (C1, C2);
a primary collision surface (120a',
130a') with which a primary inlet wind
(A1) drawn through the inlet portion
(103a) of the turbine fan unit (120, 130)
collides; and
a secondary collision surface (120b',
130b') with which a secondary inlet
wind (A2) collides,
wherein the primary and secondary in-
let winds (A1, A2) apply a force in a ro-
tation direction (D) of the turbine fan unit
(120, 130).

7. The vacuum cleaner of claim 6, wherein the primary
collision surface (120a', 130a') and the secondary
collision surface (120b', 130b') are positioned at an
angle relative to one another.

8. The vacuum cleaner of claim 7, wherein the angle
is smaller than 100 degrees.

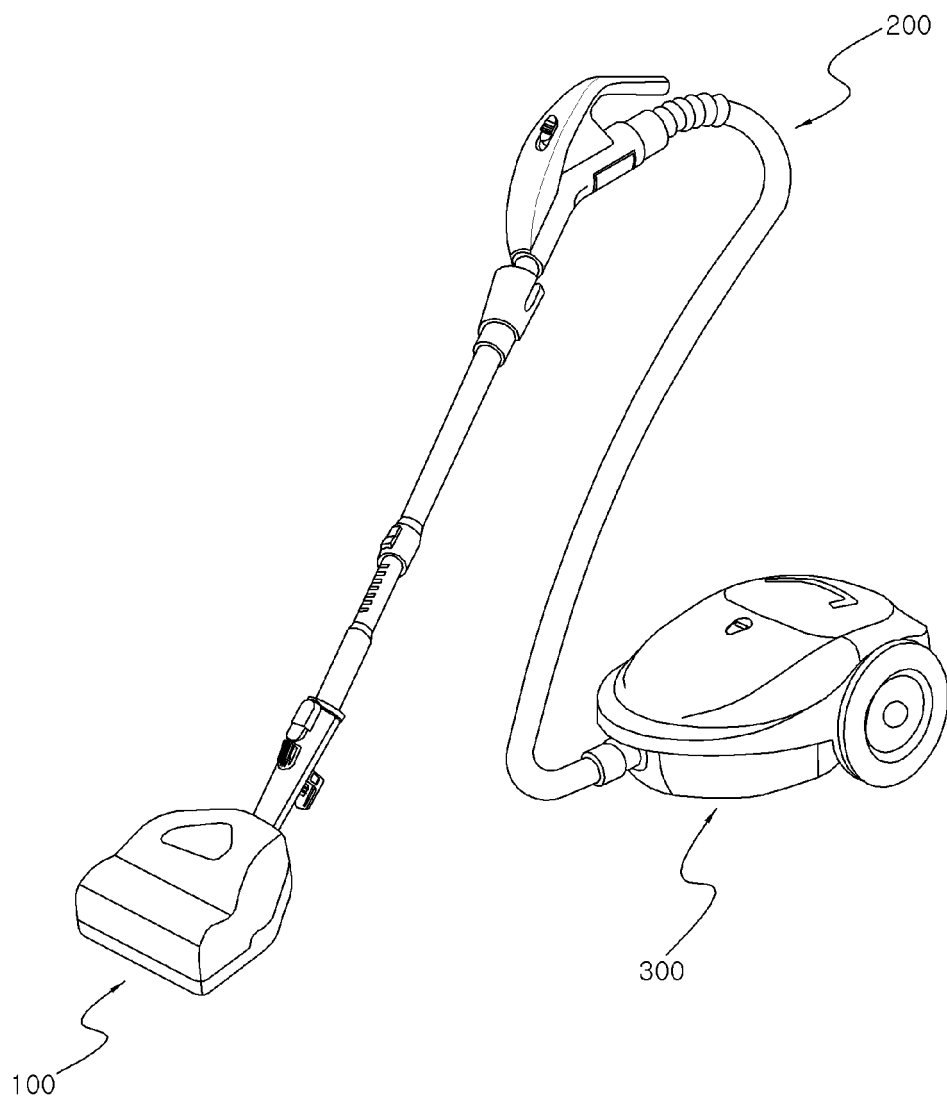
9. The vacuum cleaner of claim 7, wherein the angle
is smaller than 90 degrees.

10. The vacuum cleaner of claim 6, wherein:

an angle (θ_1 , θ_2) is formed by two lines which
pass through the curvature point (C1, C2) which
is positioned on respective wings at a center
point between the primary and secondary colli-
sion surfaces (120a', 130a', 120b', 130b'); and
the angle (θ_1 , θ_2) is less than 100 degrees.

11. The vacuum cleaner of claim 10, wherein the angle
(θ_1 , θ_2) is less than 90 degrees.

FIG. 1
(PRIOR ART)



1

FIG. 2
(PRIOR ART)

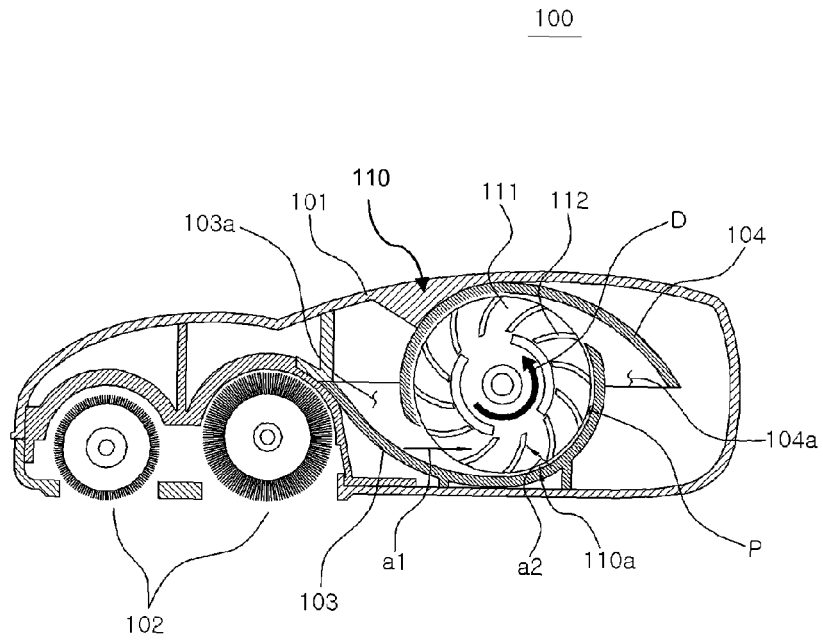


FIG. 3

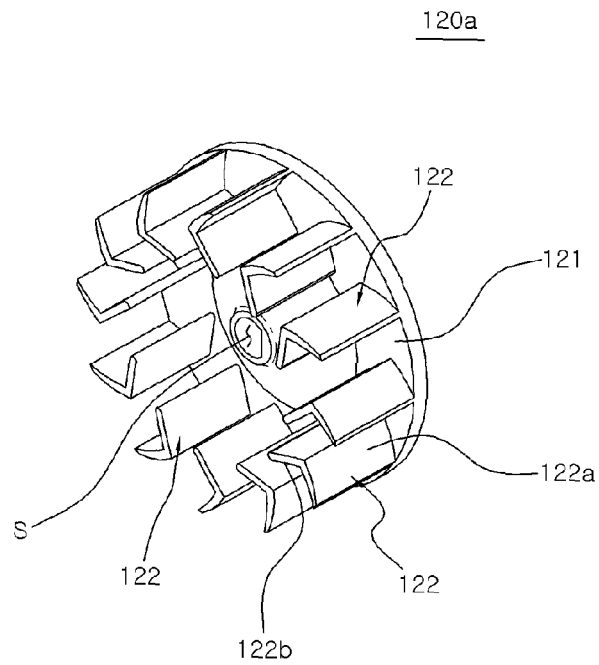


FIG. 4

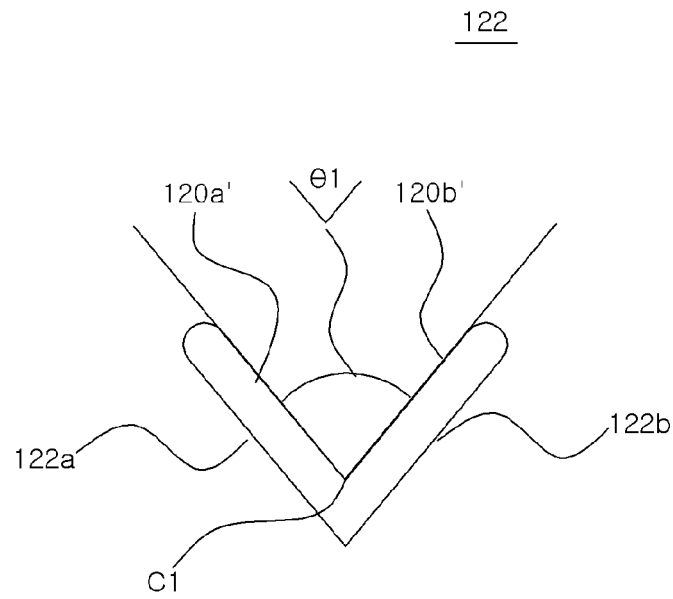


FIG. 5

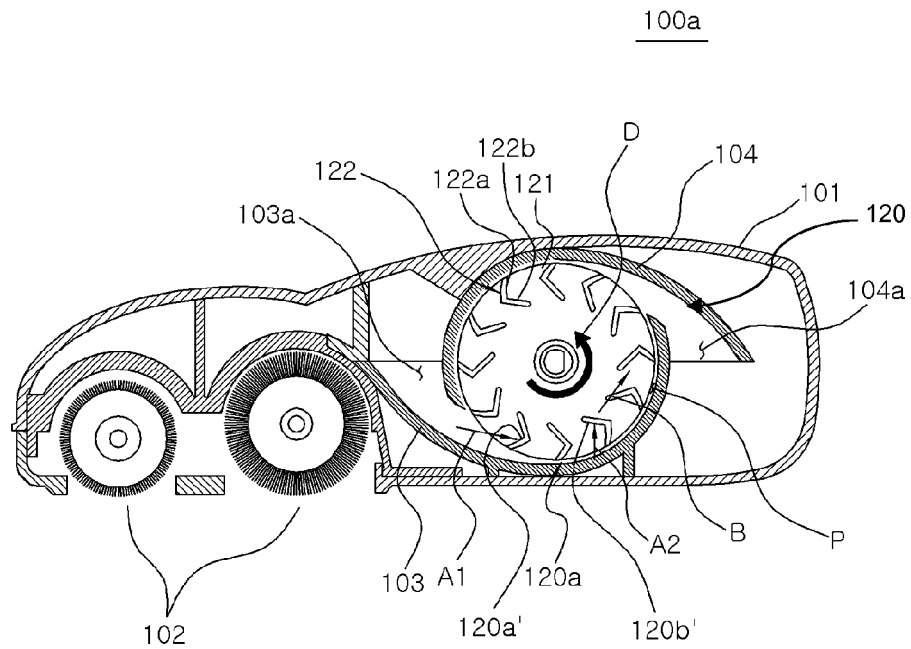


FIG. 6

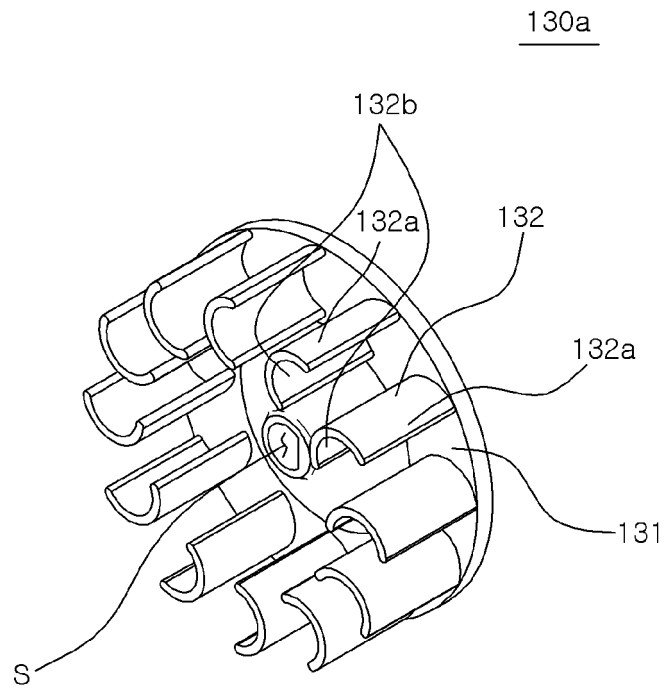


FIG. 7

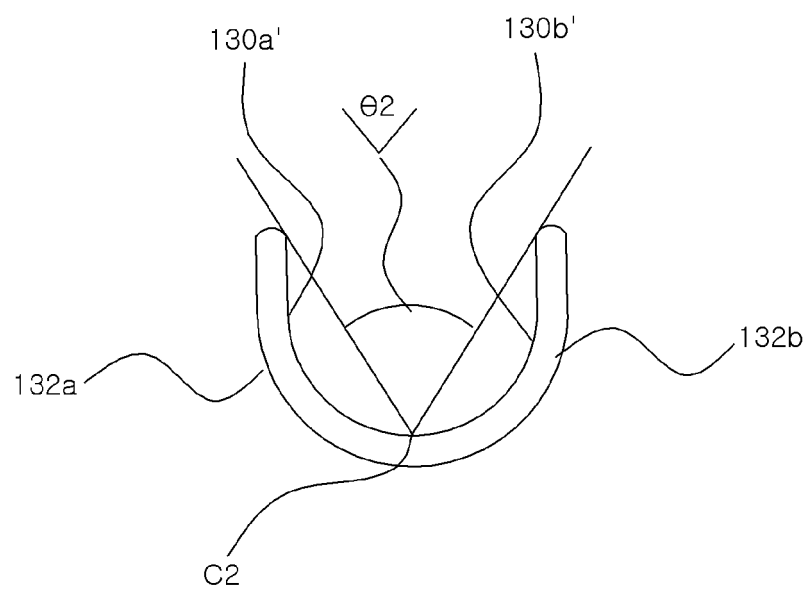
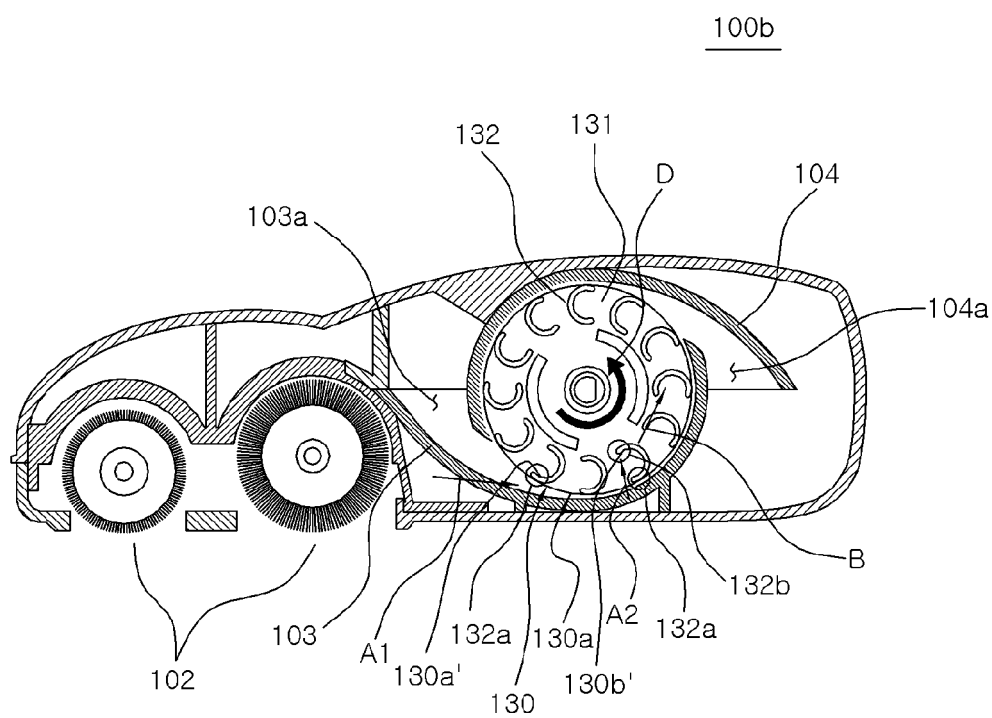


FIG. 8





EUROPEAN SEARCH REPORT

Application Number
EP 10 16 3958

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 338 780 A2 (MATSUSHITA ELECTRIC IND CO LTD [JP]; NAT TIRE COMPANY LTD [JP]) 25 October 1989 (1989-10-25)	1-3,6-8, 10	INV. A47L9/04
Y	* figure 3 *	1-3,6-8, 10	
A		4,5,9,11	
X	DE 196 02 406 C1 (WESSEL WERK GMBH [DE]) 23 January 1997 (1997-01-23)	1-3,6-8, 10	
Y	* figure 4 *	1-3,6-8, 10	
A		4,5,9,11	
X	EP 1 621 125 A2 (LG ELECTRONICS INC [KR]) 1 February 2006 (2006-02-01)	1-3,6-8, 10	
Y	* figure 7 *	1-3,6-8, 10	
A		4,5,9,11	
X	US 3 044 100 A (ZAIDAN JOSEPH P) 17 July 1962 (1962-07-17)	1-3,6-8, 10	TECHNICAL FIELDS SEARCHED (IPC)
Y	* figure 4 *	1-3,6-8, 10	A47L
A		4,5,9,11	
Y	DE 19 44 013 U (SIEMENS ELEKTROGERAETE GMBH [DE]) 11 August 1966 (1966-08-11)	1-3,6-8, 10	
A	* figures *	4,5,9,11	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 September 2010	Examiner Eckenschwiller, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 16 3958

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-09-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0338780	A2	25-10-1989	DE 68911572 D1	03-02-1994
			DE 68911572 T2	09-06-1994
			ES 2047671 T3	01-03-1994
			JP 1268528 A	26-10-1989
			JP 2583958 B2	19-02-1997
			US 4901394 A	20-02-1990

DE 19602406	C1	23-01-1997	SE 510999 C2	19-07-1999
			SE 9700019 A	25-07-1997

EP 1621125	A2	01-02-2006	KR 20060011528 A	03-02-2006
			RU 2300303 C2	10-06-2007
			US 2006021185 A1	02-02-2006

US 3044100	A	17-07-1962	NONE	

DE 1944013	U	11-08-1966	NONE	
