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(54) A vacuum celaner rotary brush having a plurality of radial channels being rotated by an air fan

(57) A vacuum cleaner comprises a suction nozzle body, an air inlet channel and a rotary brush which is arranged to rotate in contact with a surface to be cleaned. Said suction nozzle body comprises longitudinal channel with a plurality of radially branching channels extending to the lateral surface of said rotary brush. Water introduces into said rotary brush by an intake adapter along an edge of said rotary brush. Water is discharged outwardly from said radial channels of said rotary brush being arranged to be rotated by an air fan.

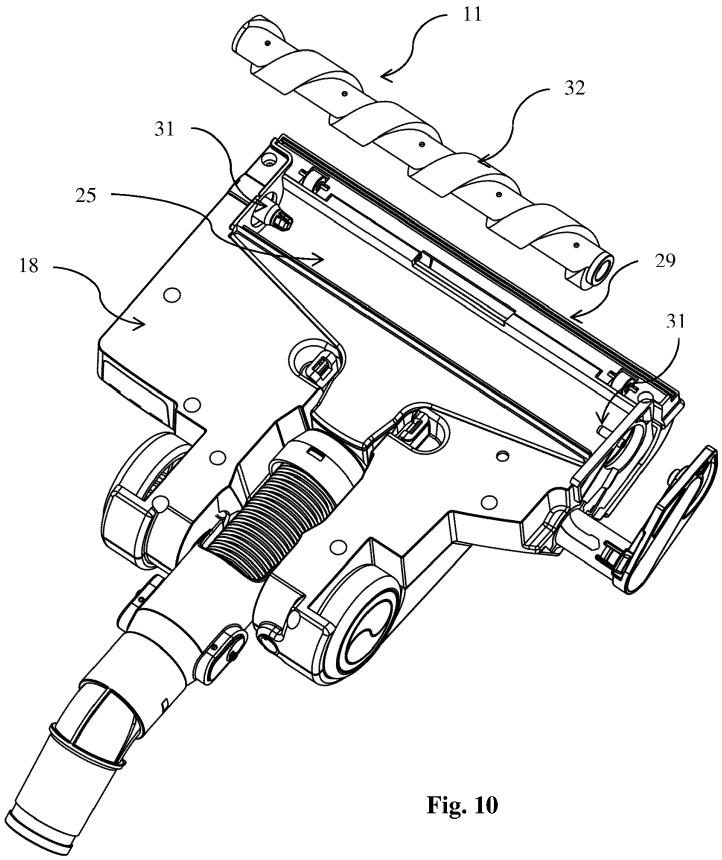

Fig. 10

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Description

Technical Field of the Invention

[0001] The present invention relates to a vacuum cleaner, more particularly, a rotary brush having a plurality of radial channels about on the surface therein, exhausts water onto the surface to be cleaned, said rotary brush being rotated about its own axis by rotational force transmitted from the air fan through the belt pulley.

Background of the Invention

[0002] The present invention relates to a suction nozzle body with a rotary brush and an air fan for a vacuum cleaner. Vacuum cleaners are known in prior art. The conventional dry vacuum cleaners have a body with an electrical motor sucking the air with the dirt to be filtered through a tube and put filtered air back into circulation. Vacuum cleaners are especially intended to clean dust in carpets and on the floor, usually containing an enormous amount of micro-level dust. The drawn air is then introduced to the filter in the form of a dust-collecting bag.

[0003] An alternative way to dry vacuuming is the use of water or a cleaning fluid solution as a wet cleaning function. These kinds of machines apply water or a cleaning fluid solution to the surface of the carpet or a hard surface to be cleaned and removed this solution by applying suction. Use of water is often more effective in removing dirt and dust from a carpet surface than dry process. At the same time rotating brush greatly increases cleaning performance of the vacuum cleaner as well.

[0004] Both wet cleaning and dry cleaning vacuum cleaners for the removal of dirt from surface have common practice to provide a motor-driven device which facilitates the collection of the dirt from the floor. A vacuum cleaner having wet cleaning function can selectively perform dry cleaning and wet cleaning. When performing wet cleaning, the vacuum cleaner exhausts water onto the surface to be cleaned, and wipes off stains from that surface using the brush, so as to draw in the exhausted water with the stains removed by the brush. Recently, various types of power brushes in which the brush roller is rotated by means of an air flow sucked into the brush body have been suggested. Document EP0313403 discloses a floor nozzle for use with a vacuum cleaner which has a brush rotatably disposed in housing and which comprises a rotor. The floor nozzle also has a turbine rotatable under a vacuum developed by the vacuum cleaner and operatively coupled to the brush for rotating the brush. Also Document US2001011404 discloses a rotating brush, a turbine operationally connected to the brush and the turbine such that the brush and the turbine are rotatably supported.

[0005] Before described vacuum cleaners have various disadvantages. They also have the tendency to untwist long filaments from the surface and to draw them out. In the absence of rotating brushes, the bristles are less efficient than the case of rotating brushes mentioned previously in the loosening of dirt. The present invention provides that circulated air used in rotating the brush is not directly on the air path through which suction is applied to the surface being cleaned. In contrast, the present invention provides that the air rotating said brush is taken from a separate path through which air suction for cleaning purposes is not effected.

[0006] The present invention comprises rotary brush and wet cleaning function at the same time. In the event of rotation process of the brush according to the invention, centrifugal force effects and forces the water to discharge out of the radial channels of the rotary brush. With this arrangement of the present invention, it is provided a better cleaning process attempting to avoid disadvantages in both wet and dry cleaning vacuum cleaners by providing radial channels formed on brush and to enable the rotation of the brush.

Objects of the Invention

[0007] Primary object of the present invention is to provide an improved rotary brush having radial channels where water is exhausted onto the surface to wipe off stains from that surface and draws in dust with sprayed water.

[0008] Another object of the present invention is to provide a rotary brush by means of an air fan coupled with a belt pulley which is adapted to be rotated by the drawn air.

[0009] Another aim of the invention is to reduce the cleaning time providing a vacuum cleaner having radial channels on the rotary brush that enables wet cleaning function.

[0010] Another object of the present invention is to provide a rotary brush being arranged to rotate in contact with said surface therefore involving simplicity, reduced noise and necessitating less man-hour work during manufacture.

Summary of the Invention

[0011] Rotary brushes can be performed in various ways. First way is electric motor with a rotatable shaft which is connected for example by means of the drive belt to the rotatable brush, so as to transmit a rotational movement to the rotatable brush. Second way provides that rotation of the rotary brush is performed by means of an air fan which is mounted generally near the opening of an air intake channel.

[0012] Using electric motor for performing rotary brush has some disadvantages. One of them is that electric power supply from the power line requires a connection between the main body and the electric motor by means of electric cables which constitutes an inconvenience for the user during use of the vacuum cleaner.

[0013] When cleaning a place with such a cleaning brush, a user first dips the brush hairs into a detergent

and then uses the brush head to brush the dirty place such as a floor or a wall face. According to the present invention an improved cleaning brush has been proposed which can easily be cleaned during operation as the brush itself when operated deep in a cleaning agent cleans off easily. The rotary brush is formed with a plurality of radial holes, whereby the water discharges out from the said radial channels.

[0014] Water spraying arrangement on the rotary brush with radial channels of the invention ensures that the suction nozzle can effectively collect dusts; waste threads and any other contaminants from a surface being cleaned, and can therefore maintain a desired high dust-collecting capability.

[0015] The air fan takes in air and expels it in a different direction, comprises frame body with straight blades and rotary fan. The frame body with stationary blades creates less wind resistance and outperforms. Said frame body with stationary blades performs as a deflector and ensures to reduce noise and increase air pressure for power saving.

[0016] The present invention proposes a vacuum cleaner having an air fan which is equipped with a belt-pulley that rotates a brush and where radial channels are formed longitudinally along said rotary brush whereby the disadvantages of earlier systems are avoided. One of the most important functions of the apparatus according to the invention is to increase the dust particle removing performance on the surface to be cleaned.

[0017] According to the invention, a vacuum cleaner has a rotary brush with a plurality of radial channels for use in wet cleaning process. A first suction opening is formed in the housing bottom surface. A second suction opening is formed at the backside of the main body where the sucked air advances and rotates the air fan.

Brief Description of the Figures

[0018] Accompanying drawings are given solely for the purpose of exemplifying a vacuum cleaner whose advantages over prior art were outlined above and will be explained in detail hereinafter:

Fig. 1 demonstrates general planar views of the suction nozzle according to the present invention.

Fig. 2 demonstrates an exploded view of the suction nozzle where an air fan and belt pulley is installed according to the present invention.

Fig. 3 demonstrates another exploded view of the suction nozzle according to the present invention.

Fig. 4 demonstrates a backside perspective view of the suction nozzle according to the present invention.

Fig. 5 demonstrates a perspective view of the apparatus cut along a portion of the suction nozzle plane according to the present invention.

Fig. 6 demonstrates a perspective view of the suction nozzle body with an upper case removed to show the interior components and the water way according to the present invention.

Fig. 7 demonstrates a perspective view of the rotary brush equipped with air fan and turnable bent coupling according to the present invention.

Fig. 8a demonstrates a perspective view of the suction nozzle where the intake adapter is partly removed according to the present invention.

Fig. 8b demonstrates a perspective view of the suction nozzle according to the present invention.

Fig. 9a demonstrates a backside perspective view of the suction nozzle according to the present invention.

Fig. 9b demonstrates a backside perspective view of the suction nozzle where the intake adapter is removed according to the present invention.

Fig. 10 demonstrates a backside perspective view of the suction nozzle where the rotary brush is removed according to the present invention.

Fig. 11 demonstrates a backside perspective view of the suction nozzle where the lower case is removed according to the present invention.

Fig. 12a demonstrates a perspective view of the suction nozzle with an upper case removed to show the interior components according to the present invention.

Fig. 12b demonstrates a perspective view of the suction nozzle with an upper case removed to show the interior components according to an alternate embodiment of the present invention.

Fig. 13a demonstrates a perspective view of the air fan according to the present invention.

Fig.13b demonstrates a perspective view of an air fan according to an alternative embodiment of the present invention.

Detailed Description of the Invention

[0019] Referring now to the figures outlined above, the present invention proposes an improved suction nozzle for a vacuum cleaner which is referred to in accordance with the following numerals throughout this description.

10	Suction nozzle body
11	Rotary brush
12	Upper case
13	Air inlet channel
14	Hose
15a	Backside wheel
15b	Frontside wheel
16	Air fan
17	Belt pulley
18	Lower case
19	Air guiding fin
20	Brush case
21	Water injection channel
22	Turnable bent coupling
23	Radial channels
24	Intake adapter
25	Suction chamber
29	Suction guide wall
30	Suction opening
31	Rotation support member
32	Bristle
33	Rotary transmission part

[0020] The present invention provides a suction nozzle body for a vacuum cleaner, which includes upper and lower cases (12 and 18) combined in a contacting manner with each other. Especially figs. 8 to 11 show the suction nozzle body (10) of a vacuum cleaner. According to the present invention, the cleaner mainly comprises a rotary brush (11); a belt pulley (17) incorporating an air fan (16) in which rotating process is carried out by sucked air and an air inlet channel (13) formed at the back lower end partition of said suction nozzle body (10). As shown in Fig 12, the suction chamber (25) has a lower opening where the rotary brush (11) is present.

[0021] Said suction nozzle body (26) according to the present invention essentially comprises an air inlet channel (13) where sucked air is firstly introduced into said suction nozzle body (10). When vacuum cleaner is in operation, an air flow passes firstly through air intake channel (13) and strikes the vanes of the air fan (16), as shown in fig. 5. This causes to rotate vanes of said air fan (16) and a rotational force is created. The air fan (16) transmits created rotary movement to the brush (11) through said belt-pulley (17) so as to rotate said brush (11) with its bristles (32) passing over the surface to be cleaned, removing dust and the rubbish which are sucked up by the air flow generated by the vacuum cleaner. In the event of rotation of said brush (11), water or cleaning fluid solution is introduced into said rotary brush (11) by an intake adapter (24)

[0022] Fig 6, (an upper case (12) removed to show the interior components) shows the path of the water before advancing to the radial channels (23) formed on said rotary brush (11). Preferably, the arrangement of the invention provides that users are provided with an optional wet cleaning function. To that end, a user may activate wet cleaning by pushing a switch allowing water flow to said water path. In this manner, water is discharged through said plurality of radials channels (23) formed circumferentially along the longitude of said rotary brush (11).

[0023] When said rotary brush (11) is rotated, as shown in Fig 6, water is introduced into said rotary brush (11) and goes along the longitudinal axis of said rotary brush (11). Due to the centrifugal force, water is then discharged radially outwardly out of the outer surface holes in association with said radial channels (11), which are formed to be radially branching and extending to the surface of said rotary brush (11). At this very instant, dust particles are rubbed by bristles (32), the latter being attached to the surface of said brush (11).

[0024] As the rotating brush (11) greatly increases cleaning performance, use of water as a cleaning fluid solution increases effectiveness in removing dirt and dust. As shown in Fig. 5, drawn air flows from a suction opening (30) rotating said rotary brush (11) while at the same time synergically removing stains. Drawn air continues along the hose (14) under suction force generated by the vacuum cleaner.

[0025] Besides, as described above, the radial channels (23), where the water discharges due to the centrifugal force, are provided along the longitude of said rotary brush (11) in a spaced manner serving to the purpose of preventing filamentary dust particle being entangled around said rotary brush (11). To this end, the present invention substantially contributes to a longer operational efficiency of the brush (11) as its surface is maintained operational in terms of preventing accumulation of filaments.

[0026] As described above, water or cleaning fluid solution is sprayed over the surface under the effects of centrifugal force from said radial channels (23) formed on the rotary brush (11). Drawn air after passing through air intake channel (13) is directed first to the air fan (16).

Said air fan (16) is rotatably supported in the suction nozzle main body (26) housing and operatively coupled to a pulley (17). Therefore said rotary brush (11) is rotated about its axis by rotation power transmitted from the air fan (16) through said belt (17). Rotation of said air fan vanes (16) is supported by sucking air which is created by vacuum cleaner motor. Drawn air firstly enters into said main body (10) through air inlet (13) and then moves forward to said air fan (16) Air guiding fins (19) extend from the upper case (12) to the lower case (18) within an interior space of said suction nozzle body (10)

[0027] As shown in fig. 4, a rotatably bent coupling (22) is secured in the rear side of said main body (26).The front part of the main body (26) comprises a brush case (20) in which rotary brush (11) is situated. Said brush case (20) is provided with an opening facing downward, where said rotary brush (11) comprises a plurality of radial channels (23) receiving water from the intake adapter (24). Said rotary brush (11) is mounted thereon by means of a rotation support member (31) formed at the lateral ends of said intake adapter (24) and said rotary transmission part (33)

[0028] The suction hose (14) is introduced into brush case (20) on the backside of the main body (10). Said suction hose (14) directly leads drawn air to the vacuum cleaner.

[0029] As shown in Fig. 8a and 8b separately, said intake adapter (24) which is formed on lateral side of the main body (10) also allows users to remove the rotary brush (11). Said rotary brush (11) according to the present invention is designed to be seated on the underlying brush case (20) to be easily removable therefrom. Said rotary brush (11) is rotatably supported by rotation support member (31) formed at opposite ends of said brush case (20). The suction nozzle body (10) is movable on wheels (15a) located at the backside thereof. Relatively smaller wheels (15b) are formed at the front portion of the suction nozzle body (10).

[0030] Fig. 12b shows a suction nozzle body (10) according to the present invention. To this end, drawn air firstly enters the suction nozzle body (10) and directly strikes the vanes of said air fan (16), as shown in 13b; that enables simpler manufacture, however, leads to increasing of noise level.

[0031] When the suction nozzle (10) is moved with regard to the desired cleaning surface at the forth direction, a solid large-sized dust may be swept by a suction guide wall (29), which is projected below the bottom face of the suction nozzle body (10). The rotary brush (11) is rotated by the air fan (16) and thereupon a suction force is generated. Said suction guide wall (29) prevents to draw large solid pieces directly to vacuum cleaner. If the distance in between a lowermost point of said brush (11) and the surface being cleaned is increased by said suction guide wall (29) such that a greater distance perpendicular to the floor surface is formed in between said lowermost point of said brush (11) and the surface, air drawn from the suction chamber (25) increases to the degree that air drawn from the air inlet channel (13) is not sufficient to effect rotation of said brush(11).

Claims

1. A vacuum cleaner comprising a suction nozzle body (10), an air inlet channel (13), a rotary brush (11) being arranged to rotate in contact with a surface to be cleaned, said suction nozzle body (10) having a longitudinal channel with a plurality of radially branching channels (23) extending to the lateral surface of said rotary brush (11), water being introduced into said rotary brush (11) by an intake adapter (24) along an edge of said rotary brush and being discharged outwardly from said radial channels of said rotary brush (11), said rotary brush (11) being arranged to be rotated by an air fan (16).

2. . A vacuum cleaner as set forth in Claim 1 wherein said air fan (16) is equipped with a belt pulley (17) mounted by the opening of said air intake channel (13).

3. A vacuum cleaner as set forth in Claim 2 wherein said belt pulley (17) is fixedly mounted onto a rotary transmission part (33).

4. A vacuum cleaner as set forth in Claim 1 wherein at least one air circuit guiding fin (19) extending from an upper case (12) to a lower case (18) within an interior space of said suction nozzle body (10).

5. A vacuum cleaner as set forth in Claim 1 wherein said rotary brush (11) is designed to be seated on underlying a brush case (20).

6. A vacuum cleaner as set forth in Claim 1 wherein said suction nozzle body (10) comprises a suction opening (30), in which exhausted water and air passes through a suction chamber (25) and continues along said a hose (14).

7. A vacuum cleaner as set forth in Claim 1 wherein said suction nozzle body (10) is movable on wheels (15a) located at both sides of the rear part of said suction nozzle body (10), said wheels (15a) being relatively larger in terms of diameter with regards to wheels (15b) formed at both sides of the front part of said suction nozzle body (10).

8. A vacuum cleaner as set forth in Claim 1 wherein said suction nozzle body (10) comprises a suction guide wall (29) which is projected below the bottom face of said suction nozzle body (10).

9. A vacuum cleaner as set forth in Claim 8 wherein the distance in between a point on said suction guide

wall (29), said point being projected from a line taken from the lowermost point of said brush (11) in parallel to the floor surface, and said floor surface is less than 5 mm.

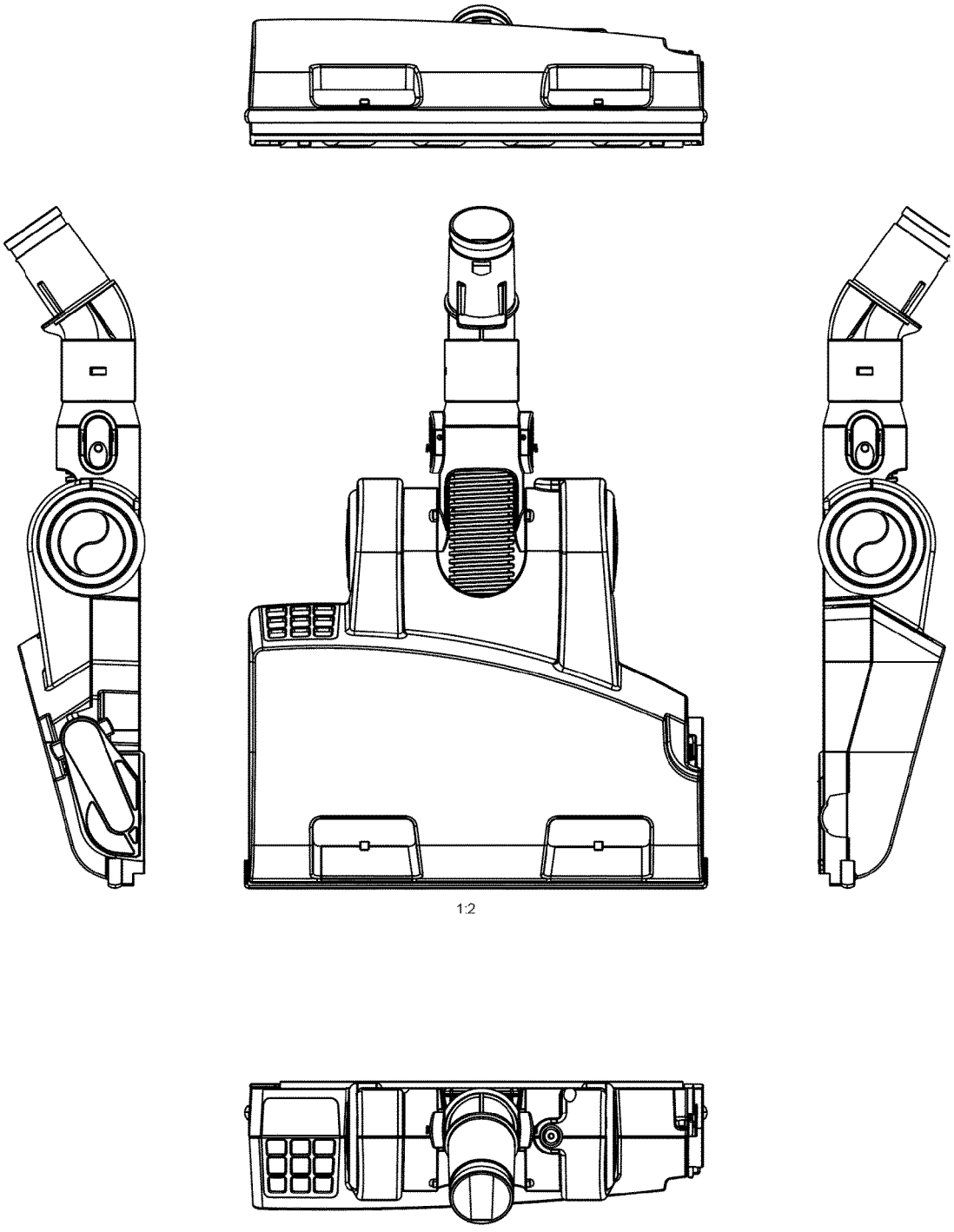

Fig. 1

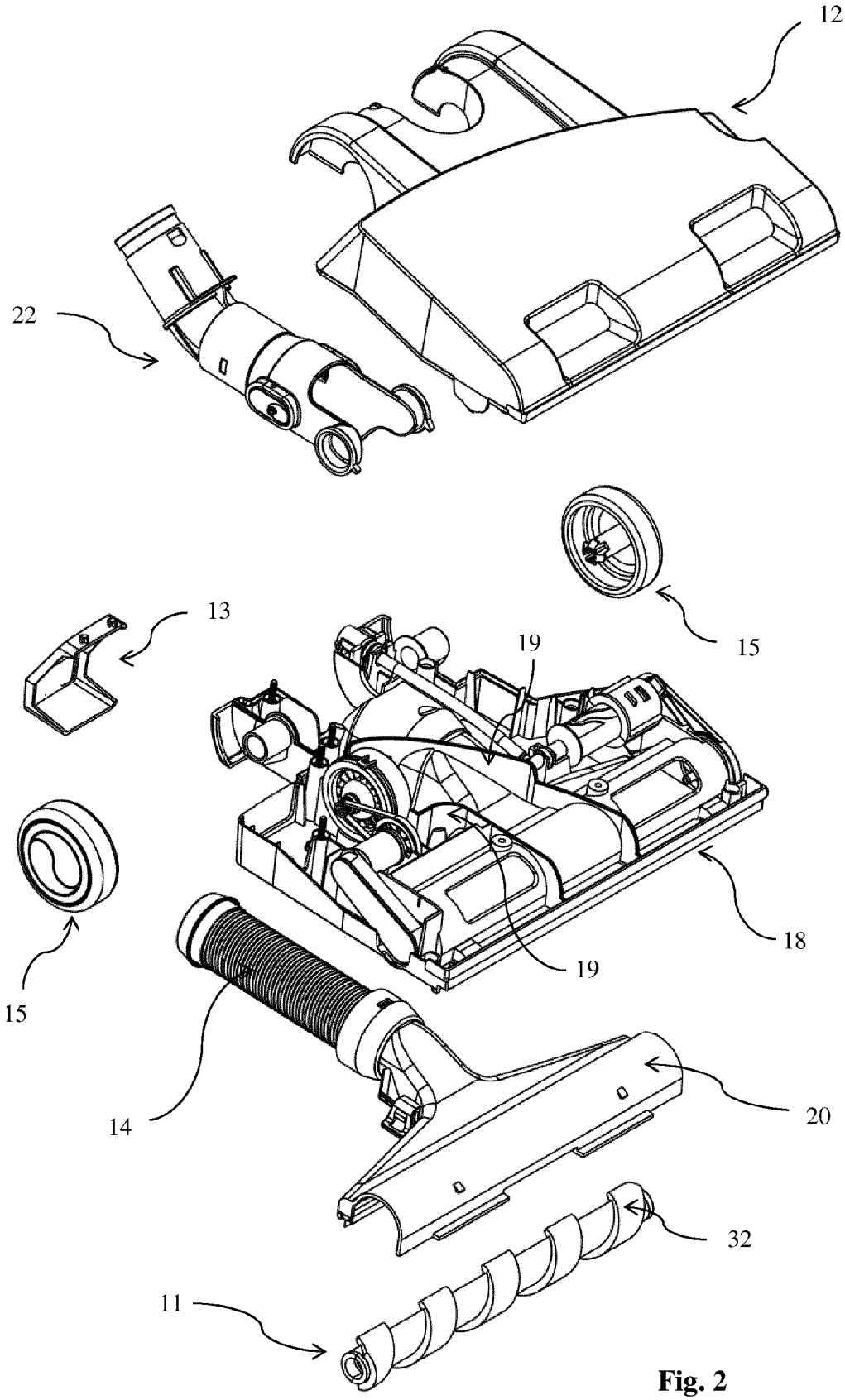

Fig. 2

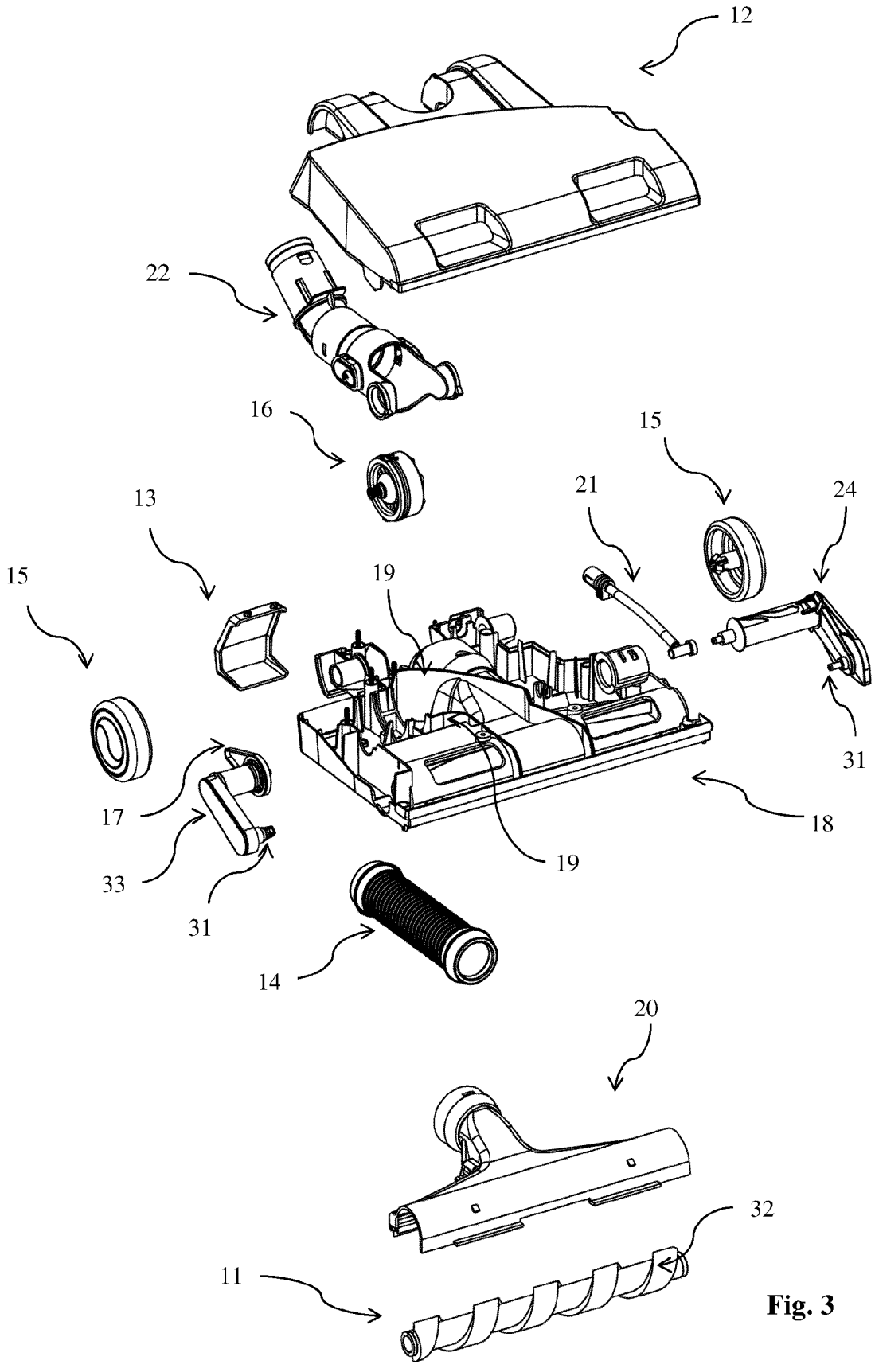

Fig. 3

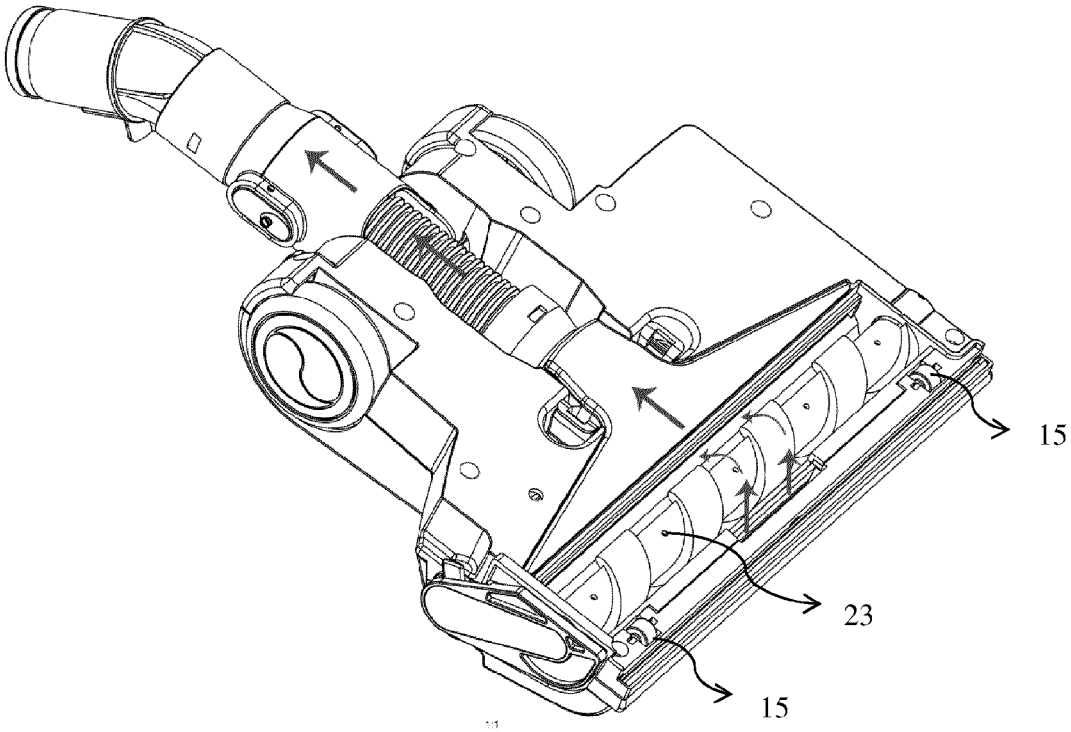

Fig. 4

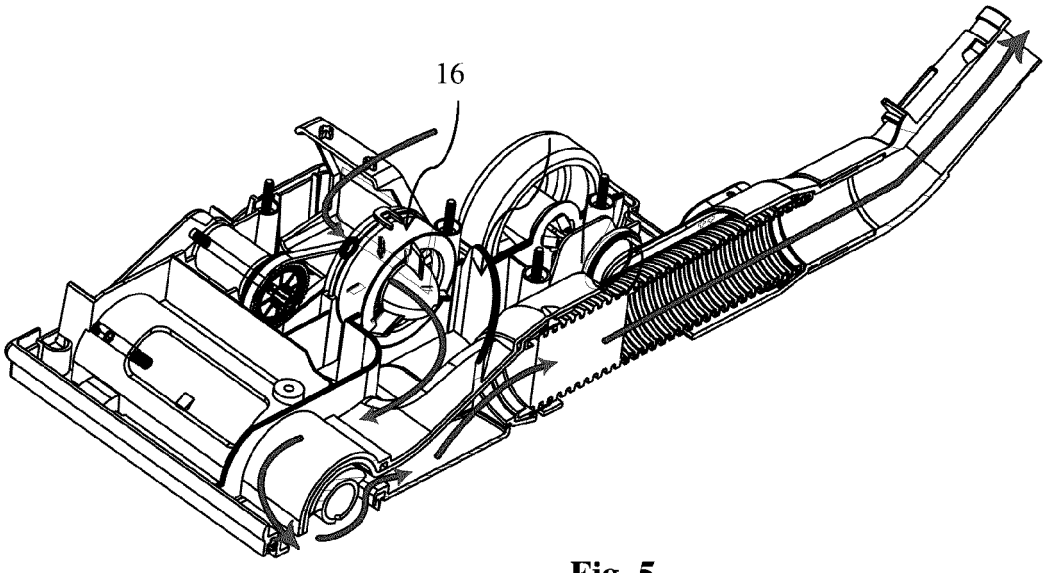

Fig. 5

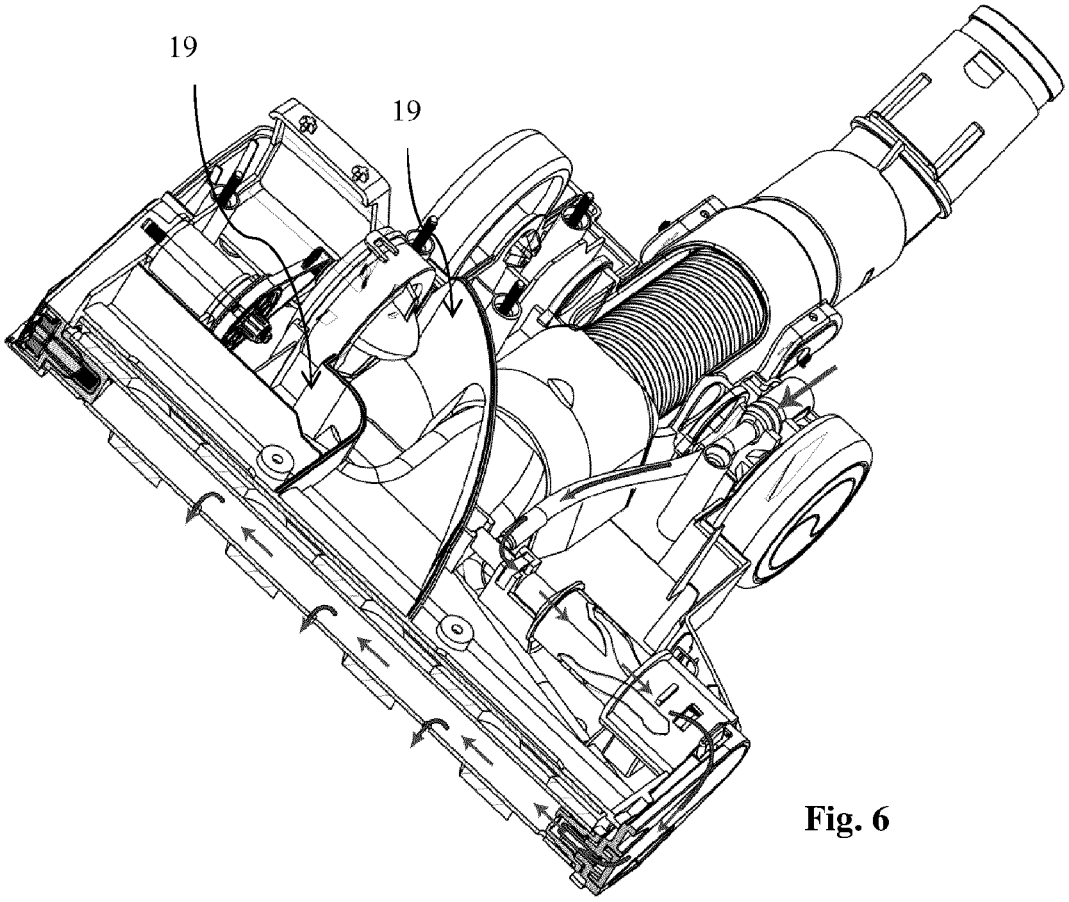

Fig. 6

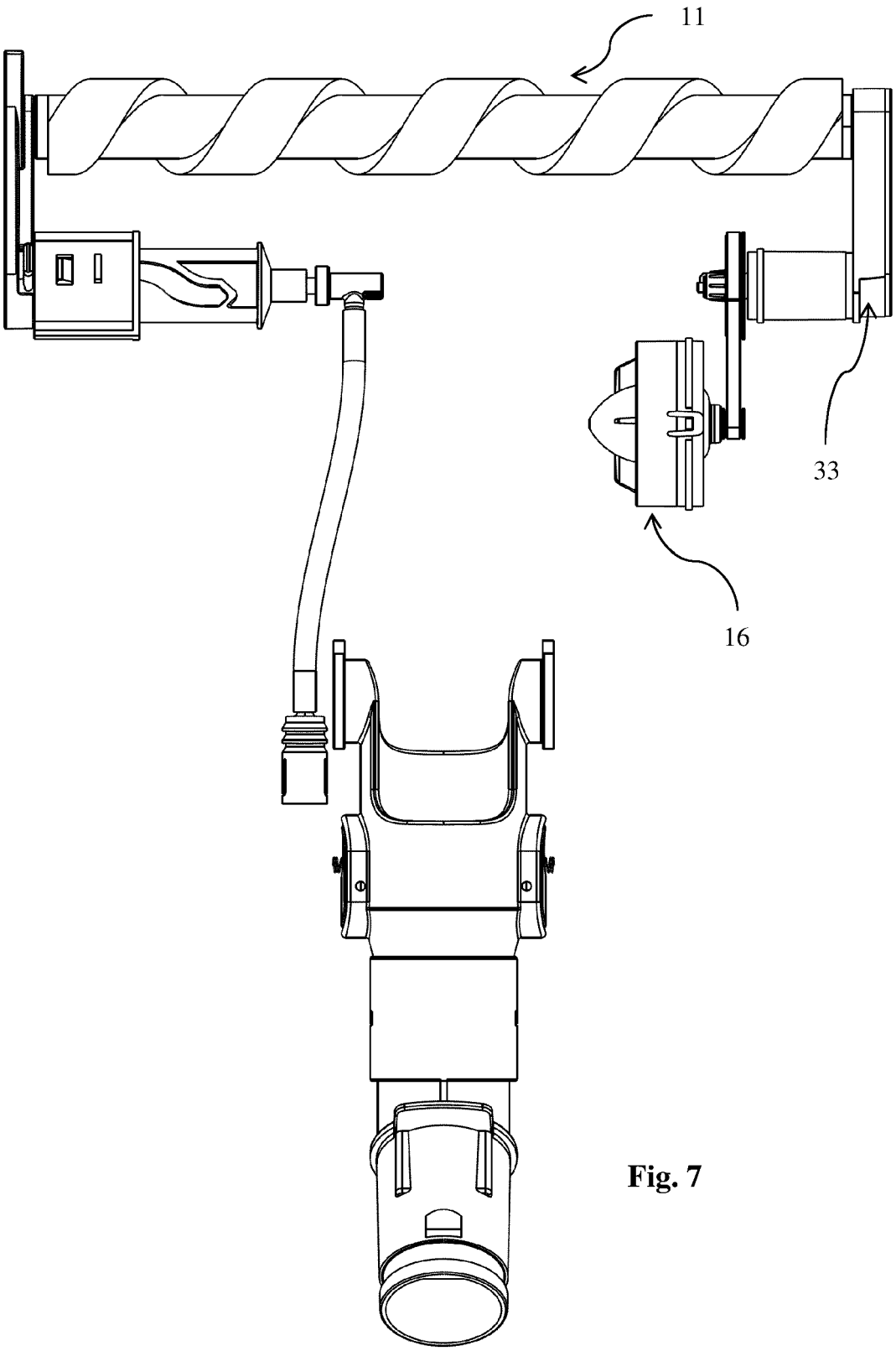

Fig. 7

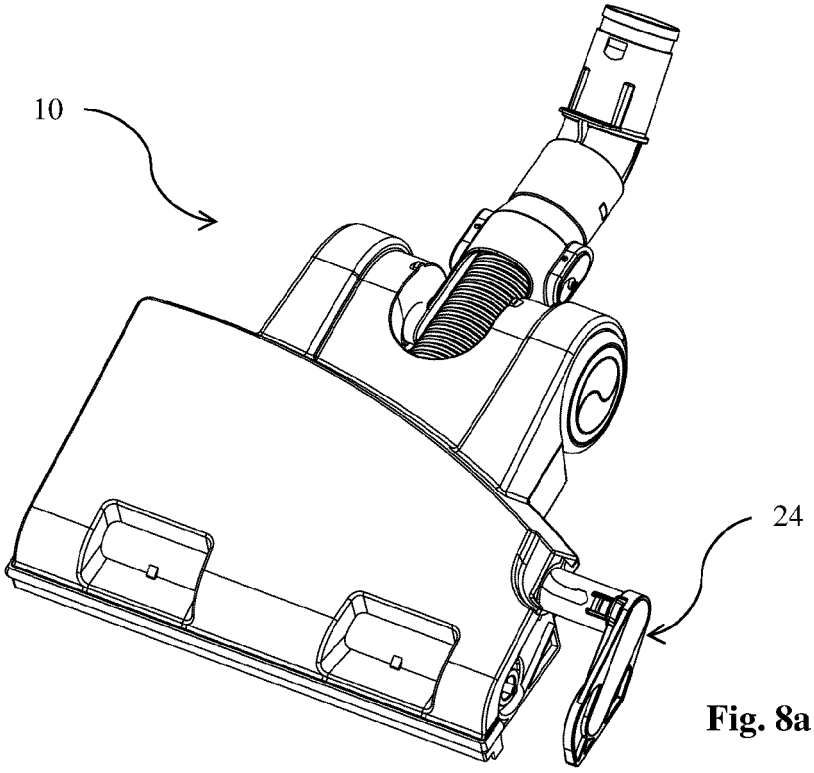

Fig. 8a

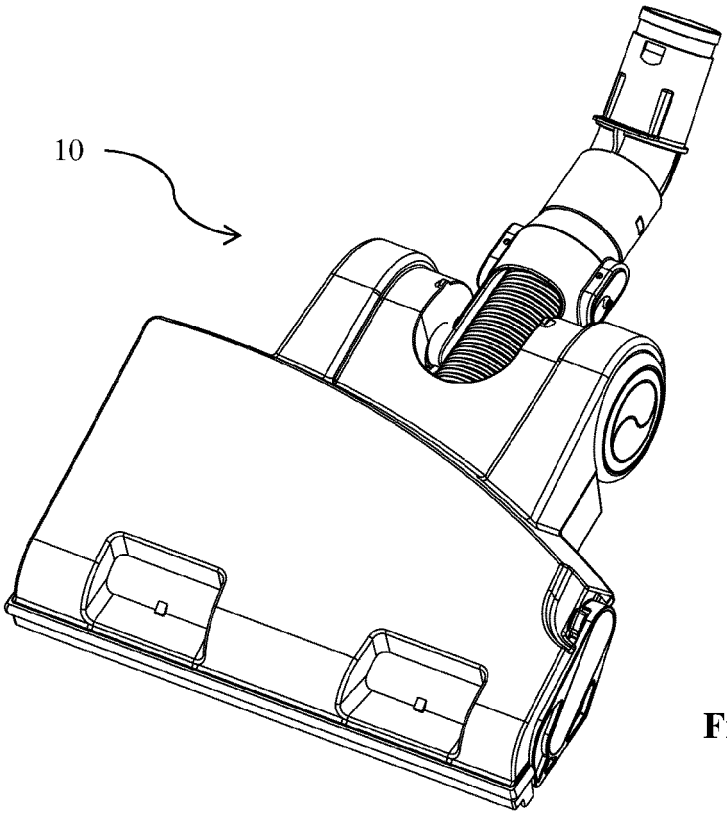

Fig. 8b

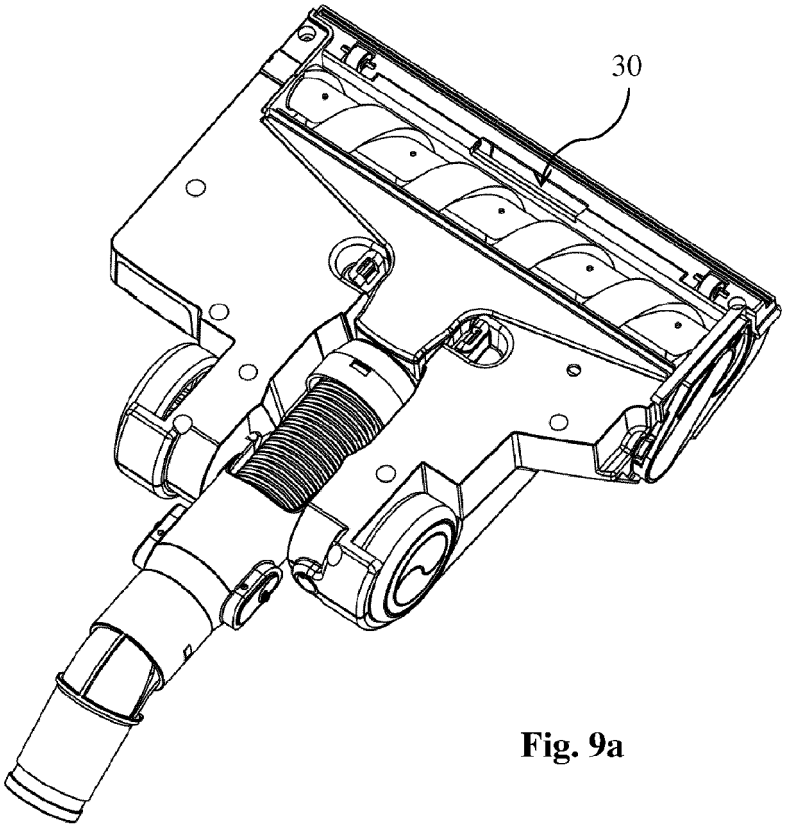

Fig. 9a

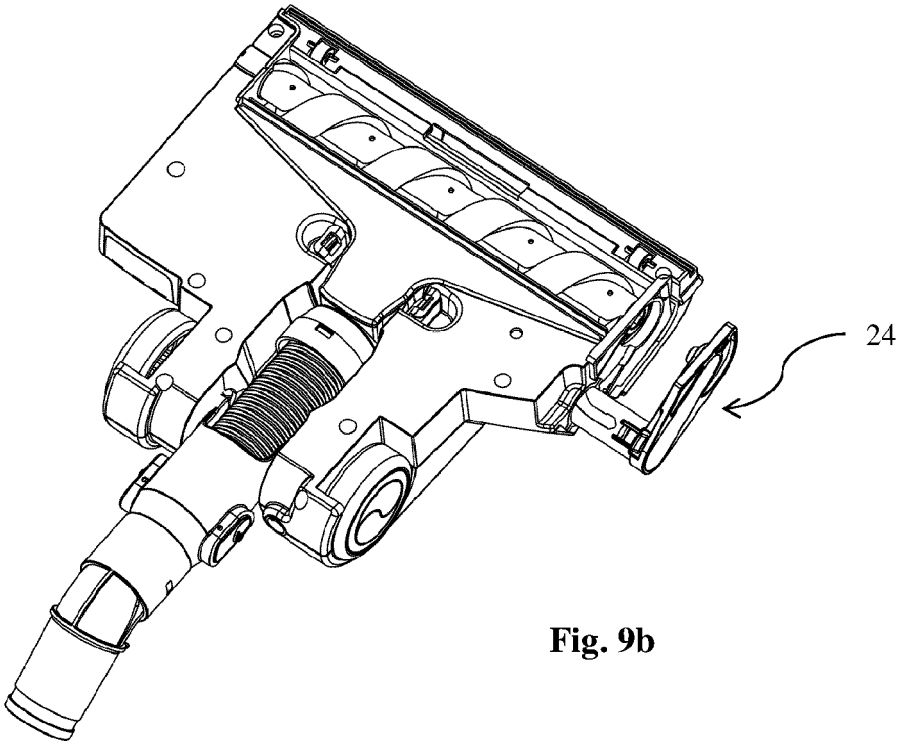

Fig. 9b

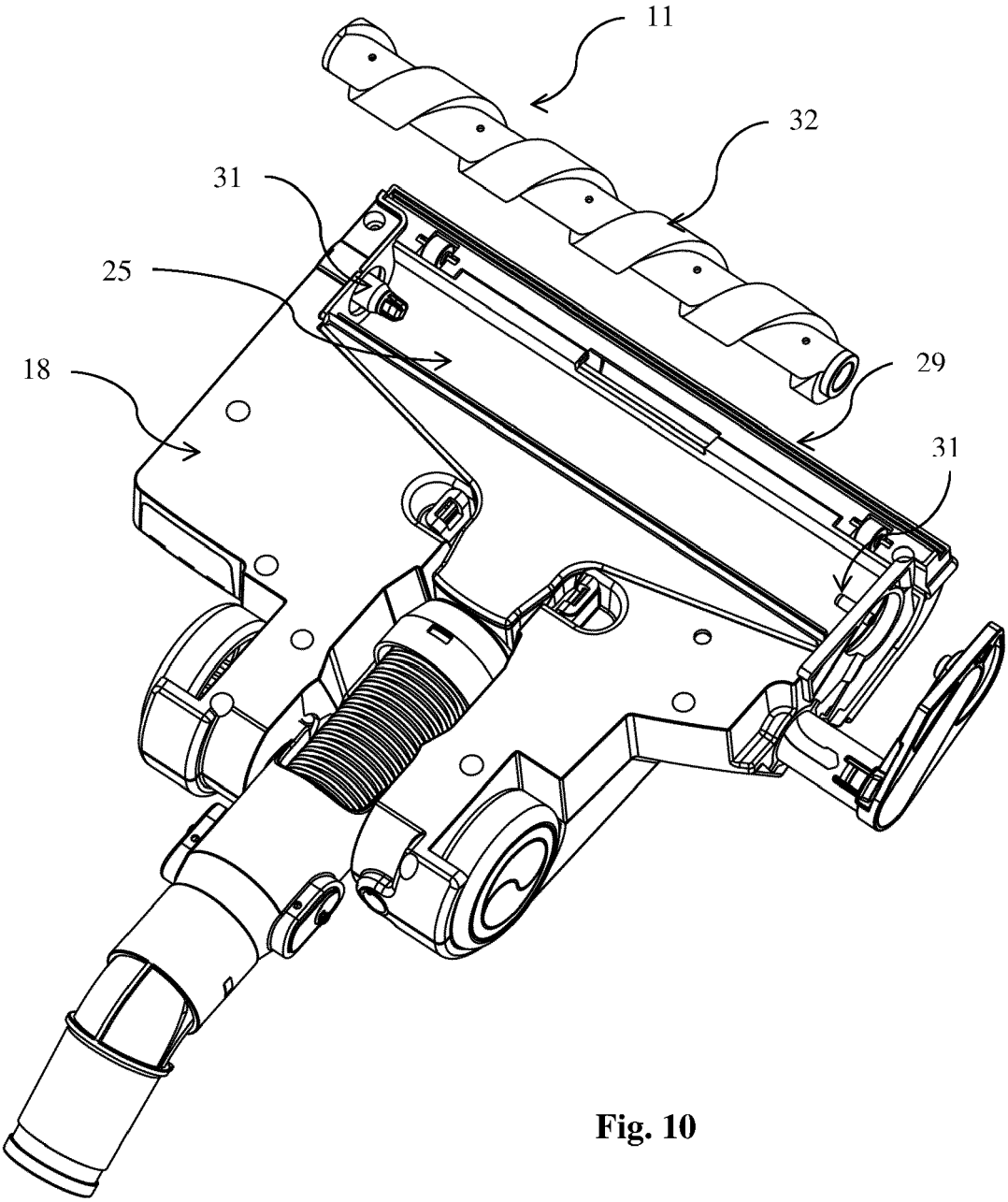

Fig. 10

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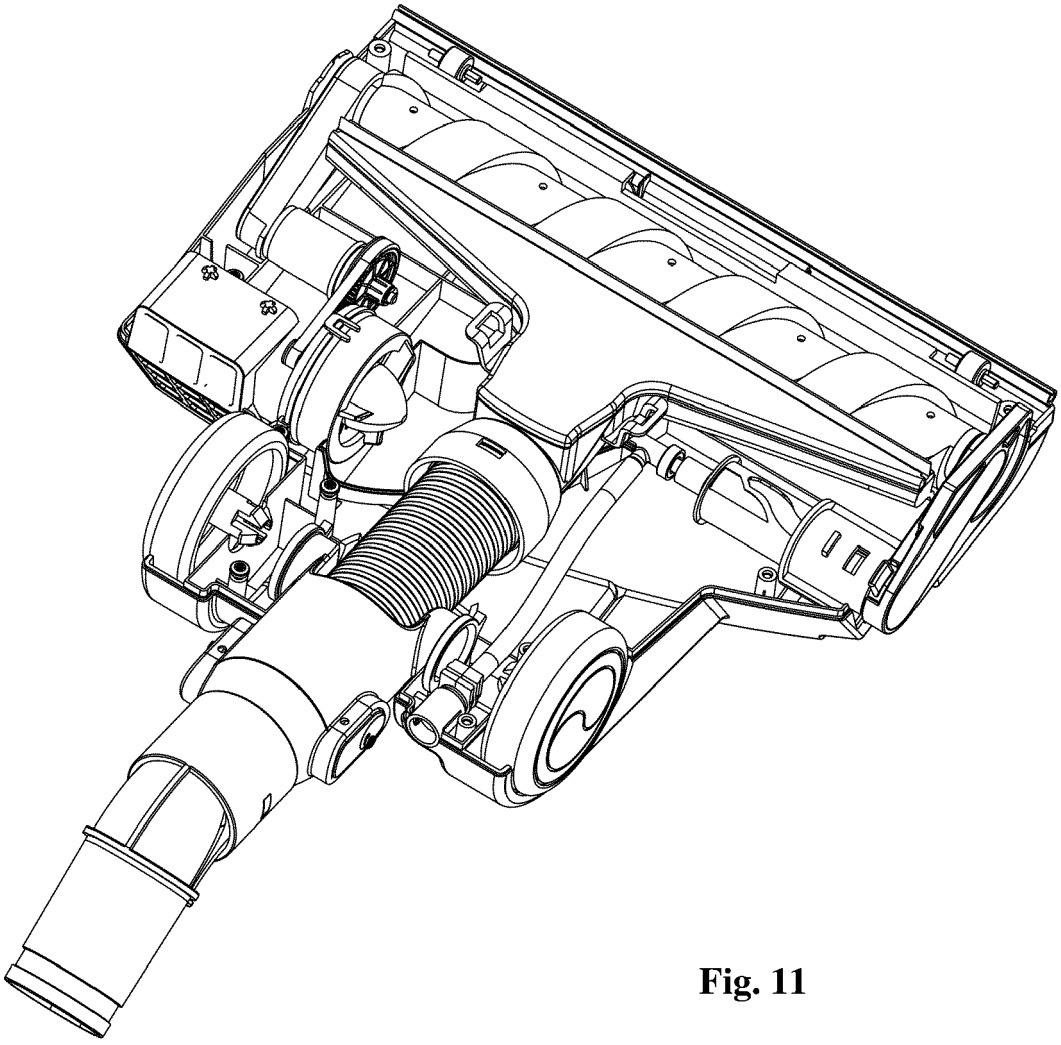

Fig. 11

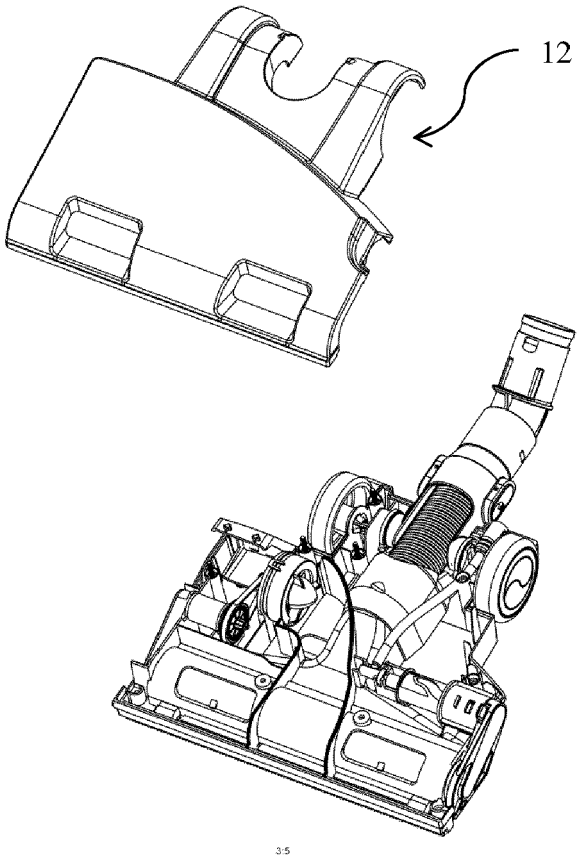

Fig. 12a

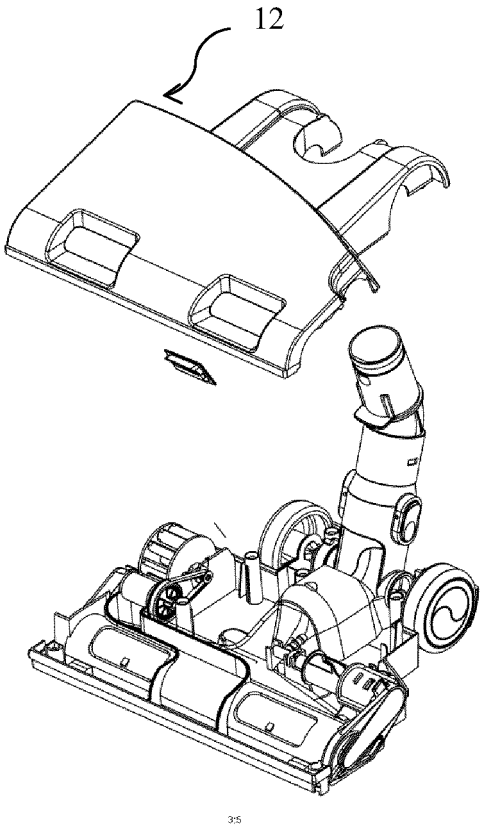

Fig. 12b

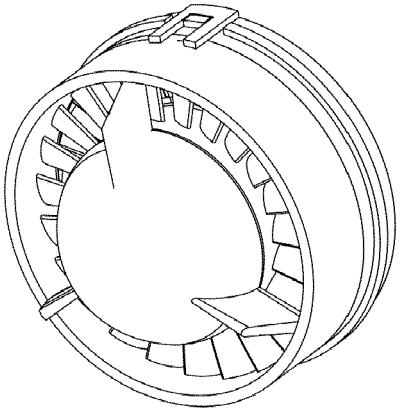

Fig. 13a

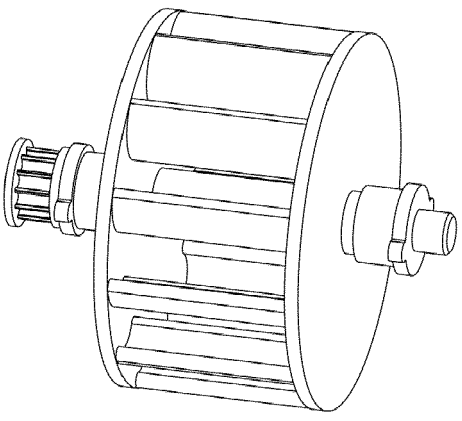

Fig. 13b

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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 1224

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	US 7 849 556 B1 (JANSEN JOHN L [CN]) 14 December 2010 (2010-12-14) * page 6, line 11 - page 7, line 24; figures 1-3,6 *	1-9	INV. A47L9/04 A47L11/34 A47L11/40 A47L11/08
A	WO 2008/004956 A1 (ELECTROLUX AB [SE]; MIEFALK HAAKAN [SE]; ZITA JOHANN [SE]; POHL ANDREA) 10 January 2008 (2008-01-10) * figures *	1-9	

TECHNICAL FIELDS SEARCHED (IPC)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 May 2012	Masset, Markus

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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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
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02-05-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7849556 B1	14-12-2010	NONE	
WO 2008004956 A1	10-01-2008	CN 101484061 A	15-07-2009
		EP 2043495 A1	08-04-2009
		SE 0601487 A	07-01-2008
		WO 2008004956 A1	10-01-2008

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- EP 0313403 A **[0004]**
- US 2001011404 A **[0004]**