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(54) Suction nozzle

(57) The present invention is related to a suction nozzle base to be employed in vacuum devices, such base having at least one air direction channel and at least one air suction opening whereto the air vacuumed by said channel is directed, characterized in that said at least one air direction channel (11.1) has curvilinear surfaces to direct vacuumed air so that turbulence is formed within said at least one air suction opening (11.2). The present invention also relates to a suction nozzle where said vacuum nozzle base is applied, and to a vacuum cleaner comprising said suction nozzle.

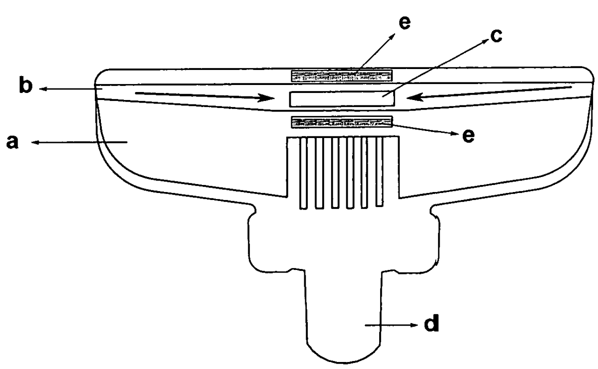

Figure 1

Prior Art

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Description

Technical Field

[0001] The present invention relates to suction nozzles and particularly to base embodiments of said suction nozzles employed in vacuum devices with characteristics as cited in the preamble part of claim 1.

Background of Invention

[0002] Vacuum devices such as vacuum cleaners are being widely used nowadays. A number of researches have been done so far in order to enhance the cleaning and specifically the vacuum efficiency of such devices. One field of those researches comprises the improvements directed towards suction nozzles, representing the part that directly contacts the surface to be cleaned. The main targets aimed with such improvements can be stated as following: high efficient dust collecting capability, 100% yarn-like materials collecting capability, low frictional resistance (resistance against forward movement) during vacuuming or cleaning surfaces of carpet-like materials to provide ease to users, robust structure and durability, minimum noise levels due to vacuuming, low cost without ignoring quality, and finally, aesthetical factors.

[0003] Once the suction nozzles of the prior art are assessed by referring to aforesaid targets, it becomes obvious that the current embodiments fail to satisfy such desired features. The current suction nozzle embodiments and the lacks thereof are discussed below.

[0004] Figure 1 gives a suction nozzle embodiment, as an example for the prior art. Accordingly, air direction channels (b) are formed longitudinally along and on the base (a) of the suction nozzle, the cross-sections of such channels being designed straightly, or linearly in general. Particles such as dust, etc. collected from carpets or parquets by means of the air direction channels (b) are transferred to a dust collection chamber of the vacuum cleaner through a bracket (d) connected to the suction nozzle (c) and other intermediate connection elements. Air direction channels of prior art can provide only a laminar air flow, as shown in Figure 1, towards the suction nozzle, due to their linear cross-section designs. It resultantly directs vacuumed particles to the vacuum channel and fails to contribute to the vacuum efficiency in other ways.

[0005] Therefore yarn collection velvets (e), manufactured from a special and costly velvet type, are employed to enhance the vacuum efficiency in cleaning yarns, dusts, etc. penetrated into the surface particularly of carpets and similar materials. Said yarn collection velvets are positioned on the base of such suction nozzles, and preferably on a front and rear portion of the suction opening (c).

[0006] Yarn particles penetrated into a carpet material, for instance, are separated by means of said velvet pieces (e) with a scratching-like action and vacuumed accordingly. If said velvet piece is not present, the yarn collection efficiency reduces, as said before, with desired outcomes unattained. Besides, when said velvet pieces are employed, the friction between the suction nozzle and surface increases while particularly carpet-like materials are cleaned, letting a user hardly move said suction nozzle.

[0007] Another disadvantage in present embodiments is related with a noisy operation, arising from the inharmonic geometrical design between the suction channel on said suction nozzle and the bracket and intermediate connection elements where said channel is linked. In other words, vacuumed air and particles during a cleaning operation encounter sudden diametric constrictions and/or twists while proceeding along an air path, which is formed as a result of assembling said elements together, so as to lead to a friction effect, raising the noise level and leading to an unpleasant circumstance for the relevant user.

[0008] In brief, a suction nozzle embodiment covering the aforesaid targets in the relevant technical field shall be a desired novelty.

Brief Description of Invention

[0009] The present invention relates to a novel suction nozzle base employable in vacuum devices such as vacuum cleaners, to a suction nozzle where said base is employed, and to a vacuum device comprising said suction nozzle in order to overcome the entire drawbacks as stated hereinabove.

[0010] Regarding the known status of prior art, the main object of the present invention is to substantially enhance the cleaning efficiency of a vacuum cleaning device by realizing certain arrangements on suction nozzles, but without raising the vacuum power thereof.

[0011] In relation to the foregoing, the present invention provides a suction nozzle base employed in vacuum devices having at least one air direction channel and at least one air suction opening the air vacuumed by said channel is directed thereto, characterized by comprising said at least one air direction channel having curvilinear surfaces to direct vacuumed air so that turbulence is obtained within said at least one air suction opening.

[0012] Emphasizing this target, the present invention provides a suction nozzle with aforesaid base embodiment to be employed in vacuum devices.

[0013] In this context, the present invention further provides a vacuum cleaning device, and preferably a vacuum cleaner, where said suction nozzle embodiment is employed.

[0014] In brief, with the present improvement the collection rate of especially yarn-like materials and dusts is enhanced, thereby the need towards the use of elements such as yarn-like materials collecting velvet pieces are eliminated.

[0015] Also since no friction-enhancing elements such as said velvet pieces are used in said suction nozzle, the suction nozzle is made to easily move on a cleaned surface without subjected to resistance.

[0016] Another advantage of the present invention is that the instant suction nozzle embodiment is of low cost, and easily repaired, assembled, and disassembled.

[0017] Thanks to the turbulence effect, the present suction nozzle provides a more efficient suction effect with fewer elements, as compared to similar embodiments of the prior art.

[0018] The targets, features, and advantages of the present invention shall be made clearer by describing an exemplary embodiment shown in annexed figures.

Brief Description of Figures

[0019]

Figure 1 is a view of an exemplary suction nozzle of the prior art.

Figure 2 is a disassembled view of the suction nozzle embodiment of the present invention.

Figure 3 is a base view of the suction nozzle embodiment of the present invention.

Figure 4 is a side interior view of the suction nozzle embodiment of the present invention.

Figure 5 is a base view of an alternative suction nozzle embodiment.

Reference Numbers

[0020]

1. Upper body;
2. knob;
3. director;
4. segment;
5. impeller;
6. bristle groups;
7. spring;
8. rear wheel pin;
9. rear wheel;
10. front wheel group;
11. lower body;

11.1 air direction channel;

Detailed Description of Invention

[0021] An application of the present invention shall be given below with only illustration purposes and without imposing restrictions thereon. Although it is assumed that the present suction nozzle is employed on a vacuum cleaner, the present invention can also be used readily and efficiently on other cleaning devices in alternative applications operating with vacuuming principles.

[0022] The assembly of the present invention as given with a disassembled sketch in Figure 2 is disclosed as following to make clearer the layout of elements making up the novelty.

11.1.1 upper linear surface;
11.1.2 upper parabolic surface;
11.1.3 upper circular surface;
11.1.4 lower linear surface;
11.1.5 lower parabolic surface;
11.1.6 lower circular surface;
11.1.7 airflow path;
11.1.8 air passage openings;
11.1.9 turbulence winglets;
11.1.10 turbulence paths;
11.2 air suction opening;
11.3 bristle groups opening;
11.4 lower body front side;
11.5 lower body rear side;
12. throat bracket;
12.1 location housing;
13. extension part;
13.1 location surface;
14. bracket; and
15. connection screws.

[0023] Accordingly, rear wheel pins (8) are positioned into the housings on the lower body (11) so that their hats face inwards and the rear wheels (9) are fastened to the ends of said pins (8) during assembly. 2 springs (7) are settled to their housings in the lower body (11), then the tips of the bristle groups (6) are positioned in their place in the lower body (11) so as to reach the centers of the springs (7). Then the impeller (5) is positioned thereon and this group is fastened to the lower body (11) together with the segments (4). The extension part (13) and the bracket (14) are engaged to each other and connected to the throat bracket (12) by means of said extension part (13), and this group is placed into the housing on the channel outlet of the lower body (11). Then the director (3) is fastened to its place on the impeller (5) and the knob (2) is fastened to its position on the upper body (1) by means of clicks. After all these steps are taken, the upper body (1) is placed on the lower body (11) and connection screws (15) are inserted and tightened through four screw slots on the lower body (11) in order to fix the upper body (1). Finally, the front wheel group (10) is fastened properly on the lower body (11). Thus the assembly of the present suction nozzle is completed.

[0024] The appearance of the base of the lower body (11) shown in Figure 3 clearly discloses the novelty of the present invention. As can be seen from this Figure, an air direction channel (11.1) is formed on the base of the lower body (11) contacting a surface to be cleaned. This air direction channel (11.1) differs from the linear-type direction channel embodiments of the prior art in that it comprises along the lower body's base an airflow path (11.1.7) with properly configured curvilinear surfaces and a certain depth. An air suction opening (11.2) embodied preferably on the center of this channel is provided with a geometric shape to complement said curvilinear surfaces. More detailed, said air direction channel (11.1) is composed of two channel sections, each such section commencing from a lateral side of the lower body (11), extending up to and joining at said air suction opening (11.2). The first channel section comprises at least one apiece curvilinear surface that direct the air first at the air suction opening to the front, and then to the rear of said lower body, and from the rear, to the front of said lower body; whereas the second channel section likewise contains at least one apiece curvilinear surface that direct the air first at the air suction opening to the rear, and then to the front of said lower body, and from the front, to the rear of said lower body.

[0025] In alternative embodiments of the present invention, there may be embodied more than one air direction channel (11.1) and/or air suction opening (11.2) in the types indicated on the base of the lower body (11), whereas each such air direction channel (11.1) can be formed with the logic under this description so as to form turbulence at the air suction opening (11.2). In this or another alternative embodiment, the number of said curvilinear surfaces can also be more than one to obtain the required turbulence effect without harming the suction efficiency.

[0026] As a result, the normally laminar flow of vacuumed air is amended and turbulence is formed on the base of the lower body (11), thanks to the specifically determined relative positions of said curvilinear surfaces. The suction efficiency is extremely enhanced with such turbulence and tornado-like effects formed during vacuuming by this structure. This embodiment is described more detailed hereunder.

[0027] As can be seen in Figure 3, the air suction opening (11.2) preferably with a circular geometry is positioned on the center of said air direction channel (11.1). The form of the air suction opening can be in a different form such as an ellipse or a rectangle in alternative embodiments, provided that the turbulence formation efficiency is not reduced. Looking back to this Figure, an upper linear surface (11.1.1) is formed on the left part of the air suction opening (11.2) of the air direction channei (11.1), this surface (11.1.1) extending from the left lateral side of the lower body's base to an upper point of the air suction opening (11.2) so as to approach the front of the lower body (11.4). Opposite to the air suction path (11.1.7), a lower parabolic surface (11.1.5) is embodied bending towards the rear side of the lower body (11.5). Also an upper circular surface (11.1.3) is formed extending as the upper linear surface's (11.1.1) extension and partly surrounding the upper region of the air suction opening (11.2). Said upper circular surface (11.1.3) extends along the quarter of the air suction opening (11.2) by starting from the point the upper linear surface (11.1.1) ends, and extending towards the front (11.4) from the lower body's rear (11.5).

[0028] On the other hand, a lower linear surface (11.1.4) is formed on the right part of the air suction opening (11.2) of the air direction channel (11.1), this surface (11.1.4) extending from the right lateral side of the lower body's (11) base (in line with Figure 2) to a lower point of the air suction opening (11.2) so as to preferably approach the rear of the lower body (11.5). Opposite to the air suction path (11.1.7) at this region, an upper parabolic surface (11.1.2) is embodied bending towards the front side of the lower body (11.4). Also a lower circular surface (11.1.6) is formed extending as the lower linear surface's (11.1.4) extension and partly surrounding the lower region of the air suction opening (11.2). Said lower circular surface (11.1.6) is exactly opposite to said upper circular surface (11.1.3), and extends along the quarter of the air suction opening (11.2) by starting from the point the lower linear surface (11.1.4) ends, and extending towards the rear (11.5) from the lower body's front (11.4).

[0029] Referring back to Figure 3, two air passage openings (11.1.8) are defined between upper and lower circular surfaces (11.1.3, 11.1.6) extending partly along the air suction nozzle's (11.2) periphery.

[0030] Thanks to this embodiment, once the present suction nozzle embodiment is positioned on a surface to be cleaned and vacuuming started, vacuumed air is guided to the opening (11.1.8) from both parts of the air direction channel (11.1) around the air passage opening (11.1.8), as indicated with arrows in Figure 2. More detailed, vacuumed air proceeding on the direction of Arrow A on the air suction path (11.1.7) first hits the lower parabolic surface (11.1.5) and is directed towards the front of the lower body (11) as indicated with Arrow B, it then hits the upper circular surface (11.1.3) and passes through the air passage opening (11.1.8) in this side to rotationally proceed into the air suction opening (11.2), as shown with Arrow C. Likewise, opposite to the air suction opening (11.2), vacuumed air proceeding on the direction of Arrow D on the air suction path (11.1.7) first hits the upper parabolic surface (11.1.2) and is directed towards the rear of the lower body (11) as indicated with Arrow E. Then it passes through the air passage opening (11.1.8) on this side and hits the lower circular surface (11.1.6) to rotationally proceed into the air suction opening (11.2), as shown with Arrow F, but now in a direction opposite to the air from the other side. Thereby turbulence and a small-scaled tornado are formed at the air suction opening.

[0031] Figure 3 further shows the bristle groups opening (11.3) longitudinally formed on the base of lower body (11) and the bristle group (6) positioned into this opening.

[0032] As an alternative to the preferred embodiment under Figure 3, the geometry and number of said upper and lower parabolic surfaces can be changed, and parabolic surfaces with proper curves can be employed in place of straight surfaces, provided that the desired turbulence effect is achieved.

[0033] Figure 4 shows the path that the air vacuumed into suction nozzle follows between the air suction opening (11.2) and the vacuum cleaner's hose connected to the dust chamber thereof. As seen, this path is composed a throat bracket (12), an extension part (13), and bracket (14), engaged properly together without diameter losses. More detailed, a location housing (12.1) with a cylindrical form preferably and with a size larger than the bracket's inner volume is embodied on the outfacing side of the throat bracket, as shown in Figure 2. On the other hand, the extension part's (13) location surface (13.1) located in the throat bracket (12) is embodied with a circular form so as to fit to said location housing (12.1). Thus, said location surface (13.1) fits nicely to said location housing (12.1) during assembly, allowing the connection between said elements (12, 13) to occur without any diametric reductions, opposite to the embodiments of prior art.

[0034] As a result, problems related to high noise levels occurring as vacuumed air and particles hit the points with reduced diameters on said pathway of prior art embodiments are eliminated with the present embodiment. In other words, vacuumed air and particles can proceed from the suction opening (11.2) to the outlet of the upper bracket (14) without meeting any obstructs, allowing the present suction nozzle embodiment to cause to lower noise levels, as compared with similar embodiments of the prior art.

[0035] An alternative model of the present suction nozzle embodiment is shown in Figure 5. As can be seen from this Figure, the air direction channel (11.1) comprises two channel sections starting from both lateral sides of the lower body (11) to extend towards the point of air suction opening in an expanding manner, as different from the content in Figure 3, and also straight surfaces to conform to this structure. A number of turbulence winglets (11.1.9) are embodied in this air direction channel (11.1) in order to bring the air in turbulence. Referring back to Figure 5, said turbulence winglets (11.1.9) start from both sides of the air suction opening (11.2), extends to both sides of the lower body (11) so as to form a curvilinear line, and terminates at a certain point. Said winglets (11.1.9) extending this way define the turbulence paths (11.1.10) on both sides of the suction opening (11.2). Regarding this preferred embodiment, said turbulence paths (11.1.10) are disposed in 3 apiece groups in both sides. One group on one side of the suction opening directs the air from the front to the rear of the lower body, while the other group on the opposite of the suction opening performs the opposite, namely, it directs the air from the rear to the front of the lower body. Thanks to this embodiment, three points are provided with turbulence effect within the suction opening (11.2), differing from the embodiment under Figure 3, which operates with a single turbulence region in the center. The number and geometry of said turbulence winglets can be changed in alternative embodiments of the present invention, provided that an adequate turbulence effect is ensured.

[0036] Although the present invention has been shown and described in terms of a preferred embodiment, it will be appreciated that changes and modifications will be evident to those skilled in the art from knowledge of the teachings of the present invention. Such changes and modifications, which do not depart from the spirit, scope and teachings herein, are deemed to fall within the purview of the invention as set forth in the appended claims.

Claims

1. A suction nozzle base employed in vacuum devices having at least one air direction channel and at least one air suction opening the air vacuumed by said channel is directed thereto, **characterized in that** said at least one air direction channel (11.1) comprises curvilinear surfaces to direct vacuumed air so that turbulence is obtained within said at least one air suction opening (11.2).

2. A suction nozzle base according to claim 1, **characterized in that** said air direction channel (11.1) is composed of two channel sections, each said section commencing from a lateral side of the lower body (11), extending up to and joining at said air suction opening (11.2).

3. A suction nozzle base according to claim 2, **characterized in that** the first channel section comprises at least one apiece curvilinear surfaces that firstly direct the air from the lower body front side (11.4) to the lower body rear side (11.5) before the air suction opening (11.2) and then from the lower body rear side (11.5) to the lower body front side (11.4) at the air suction opening (11.2), and that the second channel section comprises at least one apiece curvilinear surface that that firstly direct the air from the lower body rear side (11.5) to the lower body front side (11.4) before the air suction opening (11.2) and then from the lower body front side (11.4) to the lower body rear side (11.5) at the air suction opening (11.2)

4. A suction nozzle base according to Claim 2, **characterized in that** said air suction opening (11.2) has a circular geometry and is embodied on the center of the air direction channel (11.1).

5. A suction nozzle base according to claims 3 and 4, **characterized in that** said first channel section comprises an upper linear surface (11.1.1) starting from one lateral side of the lower body base and

extending to the upper part of the air suction opening (11.2), a lower parabolic surface (11.1.5) on an opposite point to the airflow path (11.1.7) of this region, bending towards the rear side of the lower body (11.5), and an upper circular surface (11.1.3) extending as said upper linear surface's (11.1.1) extension and partly surrounding the upper region of the air suction opening (11.2); and **in that** said second channel section comprises a lower linear surface (11.1.4) starting from the opposite lateral end of the lower body (1) base and extending to the lower part of the air suction opening (11.2), an upper parabolic surface (11.1.2) on an opposite point to the airflow path (11.1.7) in this region, bending towards the lower body front side (11.4), and a lower circular surface (11.1.6) extending as said lower linear surface's (11.1.4) extension and partly surrounding the lower region of the air suction opening (11.2).

6. A suction nozzle base according to Claim 1, **characterized in that** a number of turbulence winglets (11.1.9) and turbulence paths (11.1.10) defined by said turbulence winglets (11.1.9) are embodied on an airflow path (11.1.7), being at least on one side of said air suction opening (11.2), of said air direction channel (11.1) in order to create extra turbulence points in the air suction opening (11.2).

7. A suction nozzle base according to Claim 6, **characterized in that** said air direction channel (11.1) comprises two channel sections and conforming linear surfaces, such channel sections starting from both sides of the lower body (11) and continuing in an expanding manner towards the point of the air suction opening (11.2).

8. A suction nozzle for vacuum devices comprising said suction nozzle base according to any of preceding claims.

9. A suction nozzle according to claim 8, **characterized by** comprising an air path formed between said air suction opening (11.2) and the hose of a vacuum device; said air path comprising a throat bracket (12) in contact with said air suction opening, an extension part (13) connected to said throat bracket (12) without creating reductions in diameter, and an upper bracket (14) engaged to said extension part (13).

10. A vacuum device comprising said suction nozzle of any of the claims 8 or 9 applied thereto.

11. Said vacuum device of claim 10 being a vacuum cleaner.

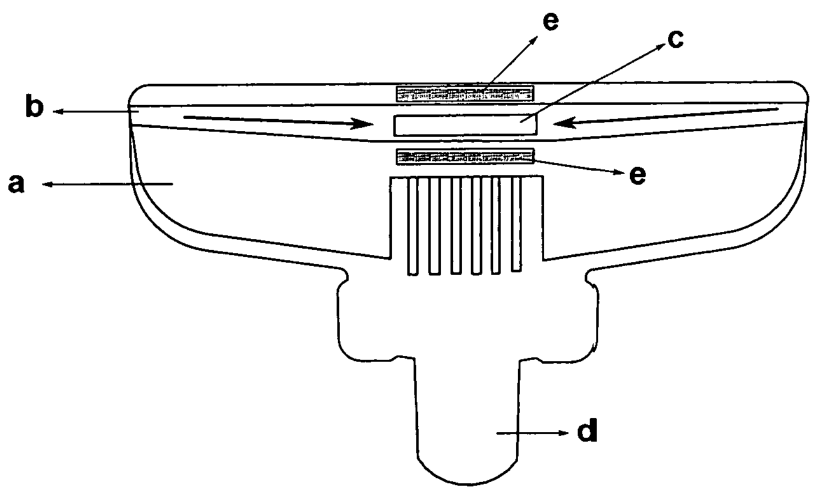

Figure 1

Prior Art

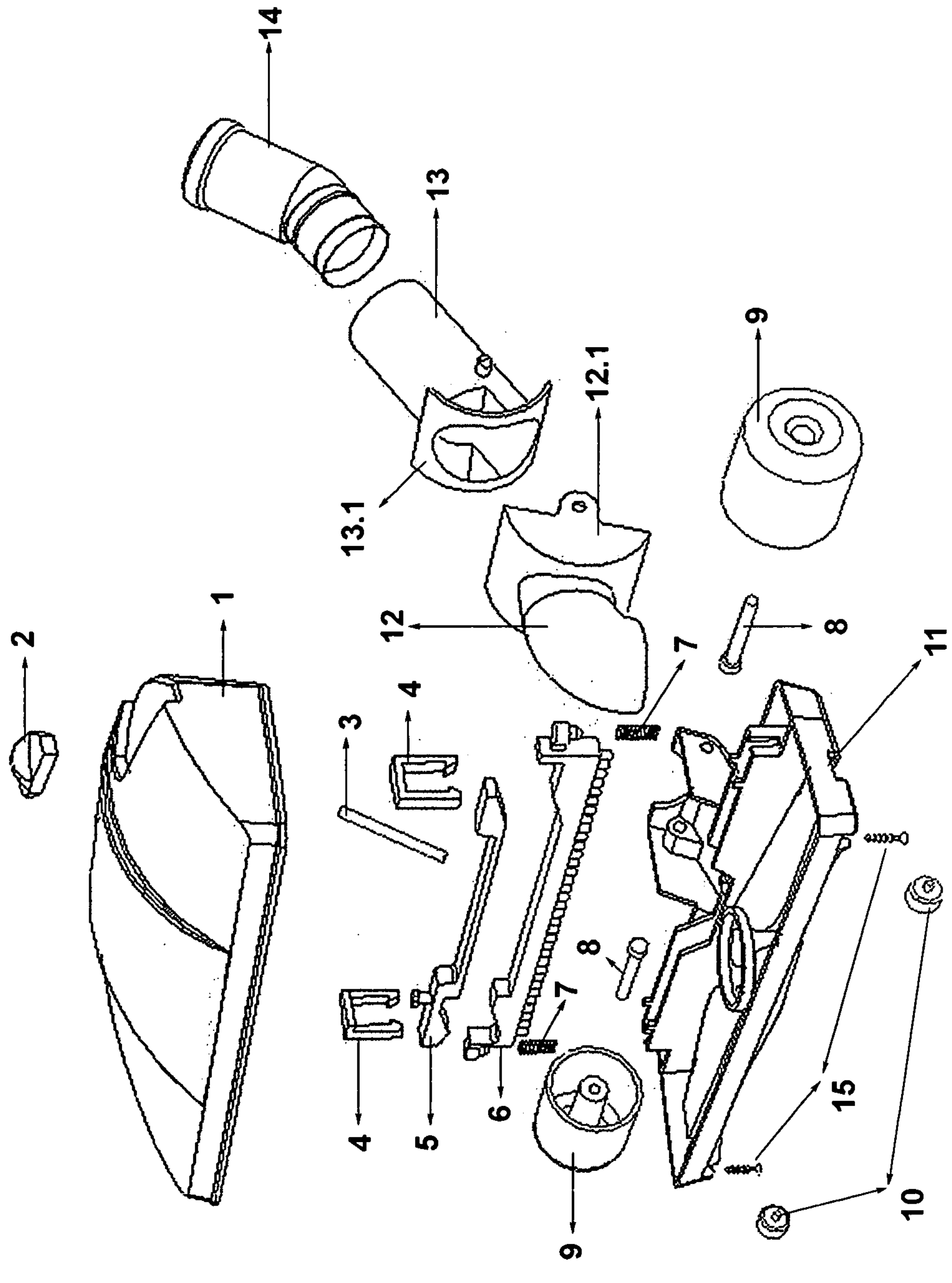

Figure 2

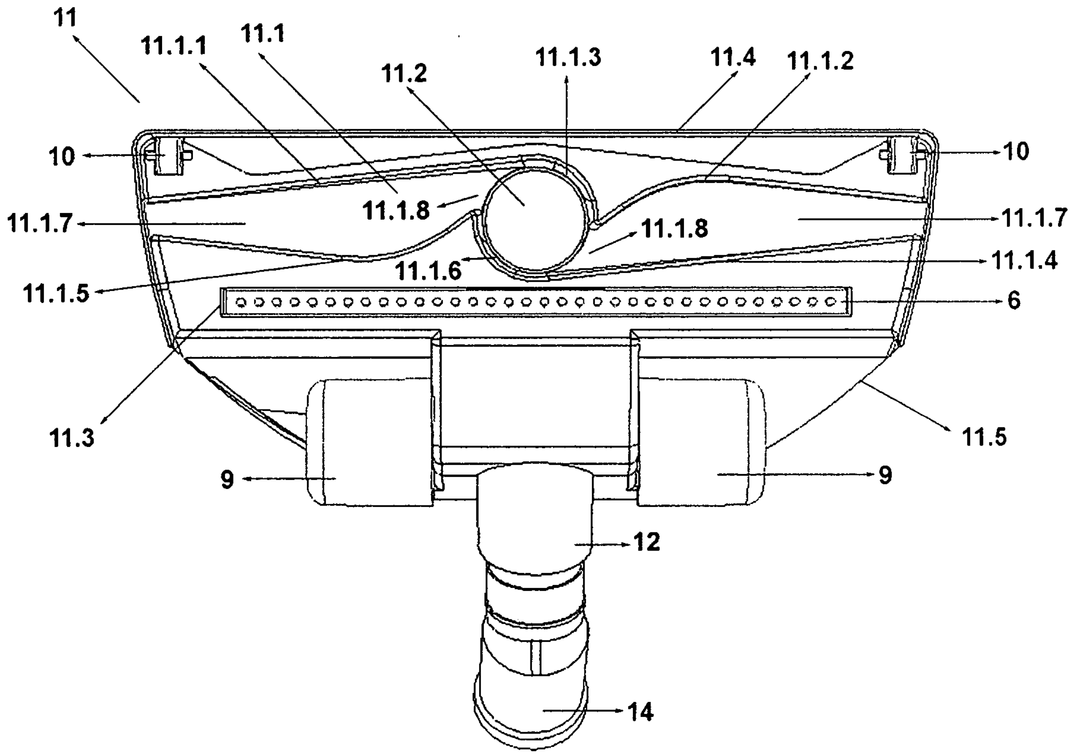

Figure 3

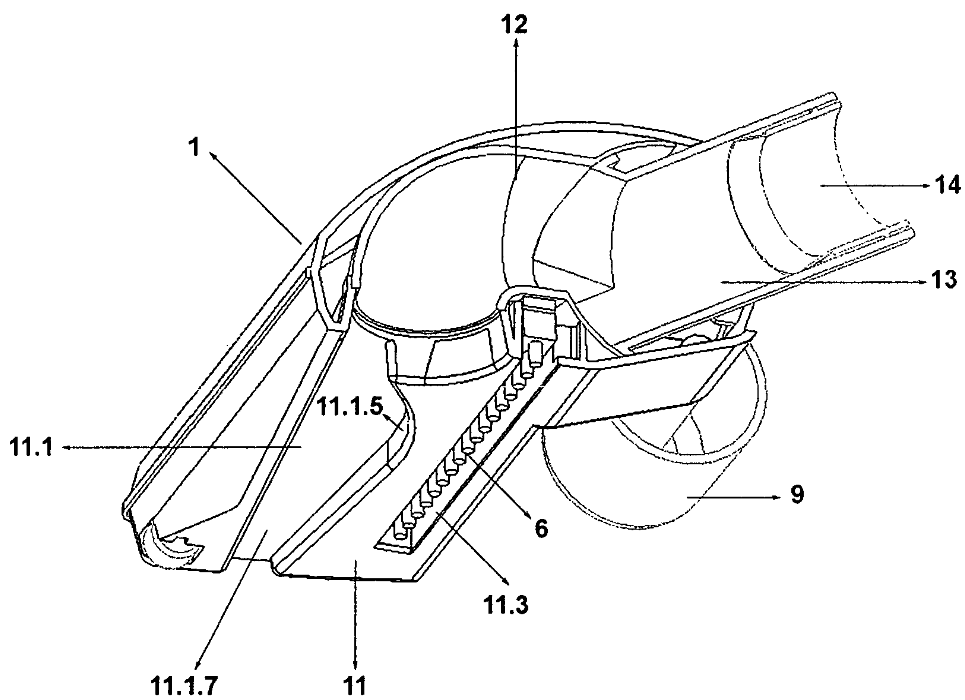

Figure 4

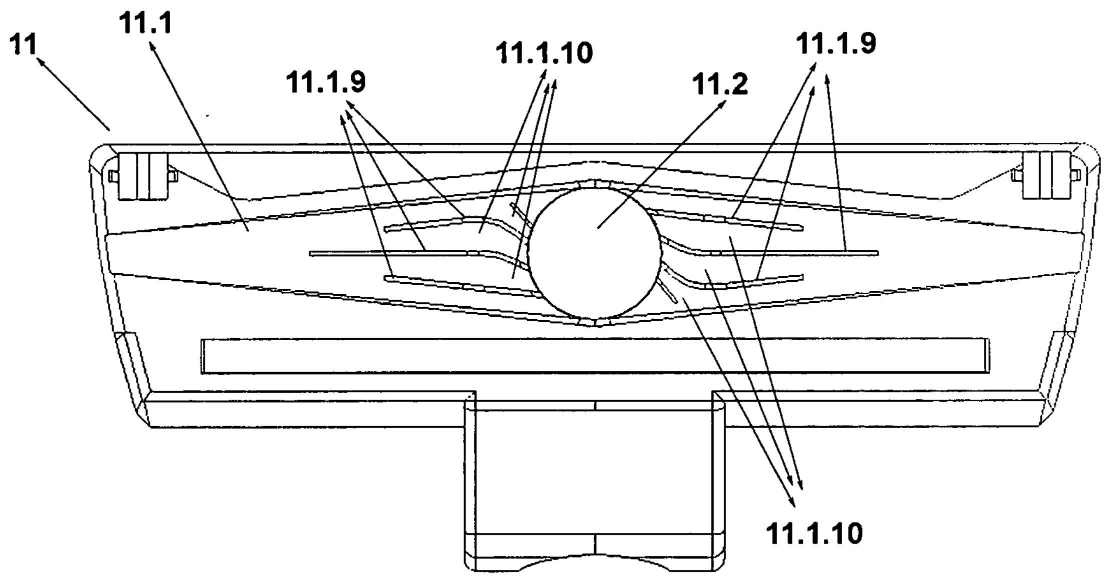

Figure 5

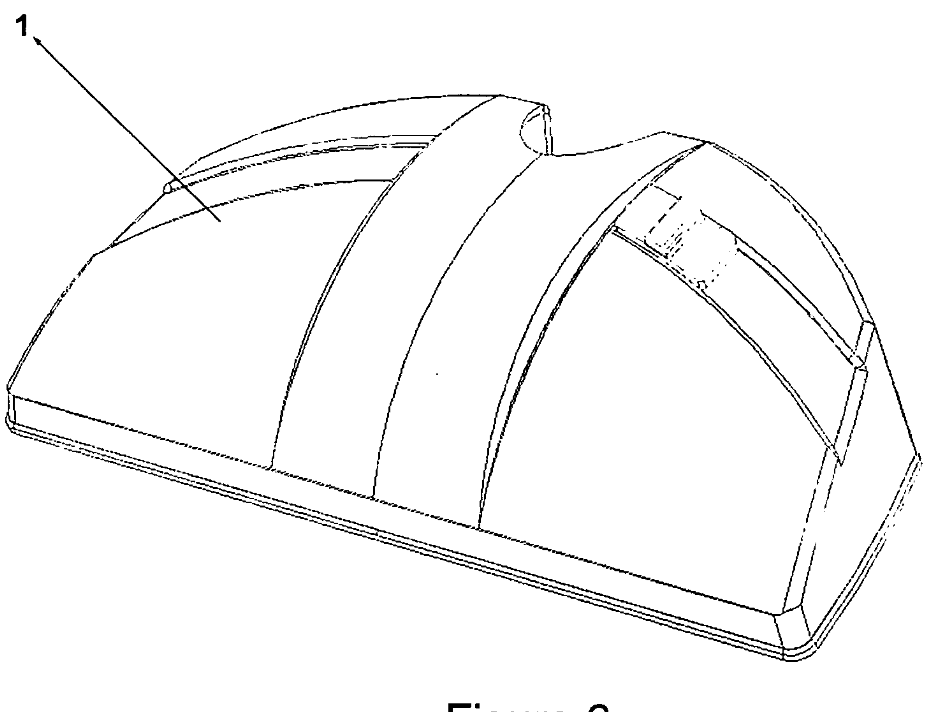

Figure 6