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(54) **VACUUM CLEANER, ACCESSORY FOR A VACUUM CLEANER AND VACUUM CLEANING SYSTEM**

(57) The present invention relates to a vacuum cleaner, and accessory for a vacuum cleaner and a vacuum cleaning system. A light source and a light outlet is positioned at the top of a spout of a handheld vacuum cleaner at a distance from the front surface of the spout. The emitted light can be used to make the dirt more visible when using in dark places when the appliance is used as handheld vacuum cleaner and this light can be used to couple this light into a light guide build into an accessory like crevice nozzle or brush nozzle.

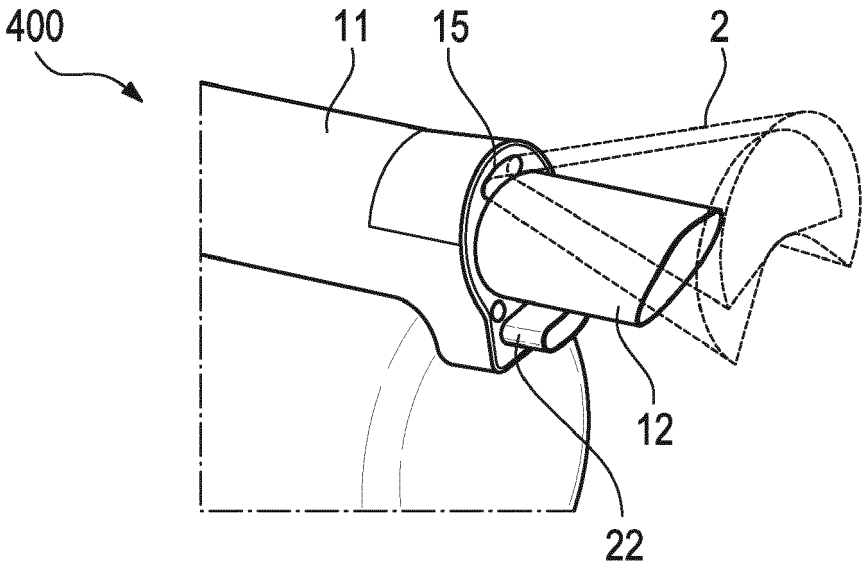

Fig. 4A

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a vacuum cleaner, an accessory for a vacuum cleaner and a vacuum cleaning system.

BACKGROUND OF THE INVENTION

[0002] Battery operated vacuum cleaners can be used in many situations and environments. Due to the ease of use of these appliances, they can be used in dark and/or narrow places. To have better vision of the dirt and on the cleaning result a light source at the spout of the vacuum cleaner is very handy. There are various vacuum cleaners available having one or more light sources at the front of the floor nozzles. Further, there are accessories available that can be connected to the handheld vacuum cleaner and that have a light source.

[0003] CN 210612012 U discloses a vacuum cleaner having multiple LEDs arranged in front surface of the main body and having light guides in the spout to guide the light from the LEDs into the spout or to the front of the spout.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a cost effective solution for a vacuum cleaner that effectively illuminates the surface area to be cleaned both with and without an accessory coupled to the vacuum cleaner.

[0005] In a first aspect of the present invention a vacuum cleaner is presented comprising:

- a spout having a cleaner dust inlet opening configured to suck in dust during operation of the vacuum cleaner,
- a light source configured to generate light, and
- a cleaner light outlet configured to emit light generated by the light source,

wherein the cleaner light outlet is arranged at or above a top surface of the outer diameter of the spout and displaced with respect to the cleaner dust inlet opening in axial direction of the spout.

[0006] In a further aspect of the present invention an accessory for a vacuum cleaner is presented, the accessory comprising:

- an accessory body having an accessory dust outlet opening configured to be coupled to or arranged next to the cleaner dust inlet opening when the accessory is coupled to the vacuum cleaner and an accessory dust inlet opening configured to suck in dust during operation of the vacuum cleaner,
- an accessory light inlet configured to be coupled to or arranged next to the cleaner light outlet when the accessory is coupled to the vacuum cleaner,
- an accessory light outlet, and
- a light guide connecting the accessory light inlet and the accessory light outlet, wherein the accessory light outlet is arranged within, at or above a top surface of the outer diameter of the accessory body and displaced with respect to the accessory dust inlet opening in axial direction of the accessory body.

[0007] In a still further aspect of the present invention a vacuum cleaning system is presented comprising a vacuum cleaner as disclosed herein and at least one accessory as disclosed herein.

[0008] Having light shining on the surface that needs to be cleaned during different cleaning jobs (e.g. cleaning of table tops, upholstery, narrow spaces, underneath furniture, etc.) is very much appreciated by users. Adding light sources not only to the vacuum cleaner but to all accessories that can be connected to the vacuum cleaner as well, is not cost effective.

[0009] The vacuum cleaner disclosed in CN 210612012 U has LEDs in the main body, but provides the light from the spout and can effectively be used only with the spout coupled to the main body. Even when used unintentionally without the spout the LEDs are not effective because they will be covered by the surface area to be cleaned since they are arranged at the front surface of the main body. Having a light source or light outlet that will be touching or very close to the surface to be cleaned is thus not useful.

[0010] The vacuum cleaner according to the present invention, in contrast, comprises one or more light sources at a position of the spout where the light is functional when used without accessories and where this same light can be coupled into a light guide of an accessory. The light outlet of vacuum cleaner (called cleaner light outlet) and the light outlet of accessory (called accessory light outlet) are arranged such that the light emitted from the respective outlet is not covered by the surface that needs to be cleaned. In particular, the respective light outlets are not arranged at the front surface of the respective part (i.e. of the spout and the accessory body, respectively), but they are arranged at the top surface or above the top surface of the outer diameter of the respective part and displaced with respect to the dust inlet opening of the respective part in axial direction. In other words, the light outlets are not arranged at the front surface of the respective part, like in the vacuum cleaner disclosed in CN 210612012 U, but they are displaced by a certain distance from the front surface of the respective part. A cost effective solution requiring a light source only in the vacuum cleaner but not in the accessory/accessories is thus presented that ensures an effective illumination of the surface to be cleaned both without or with the accessory coupled to the vacuum cleaner.

[0011] It shall be noted that the present invention is preferably used in a handheld or battery-driven vacuum cleaner, but may generally also be used in other types

of vacuum cleaners, such as canister or drum-type vacuum cleaners, where various accessories can be attached to the telescopic wand instead of the floor brush. The one or more light sources and the cleaner light outlet may be arranged at the top surface or above the top surface of the outer diameter of the telescopic wand (representing the spout of the vacuum cleaner in such an embodiment).

[0012] In an embodiment of the vacuum cleaner, the cleaner light outlet is configured to emit the light into the direction of the cleaner dust inlet opening, in particular to create a spotlight on a surface to be cleaned. This may e.g. be achieved by an appropriate optical element(s), such as a lens or focusing means, at the cleaner light outlet, or by designing the cleaner light outlet such that the light is emitted / focused into the desired direction.

[0013] In another embodiment of the vacuum cleaner, the cleaner light outlet is displaced with respect to the cleaner dust inlet opening by a displacement of at least 5 mm, in particular by a displacement of at least 10 mm or at least 20 mm or in the range of 5 mm to 100 mm or in the range of 10 mm to 50 mm. The dimension of the displacement generally depends on the design of the spout and the cleaner light outlet and may be different for different models of vacuum cleaners.

[0014] In another embodiment of the vacuum cleaner the light source comprises at least one LED, in particular two or more LEDs. The number and other parameters (e.g. color, temperature, power, light intensity, etc.) of the light source generally depends on the particular design and application of the vacuum cleaner outlet and may be different for different models of vacuum cleaners. The light intensity shall generally be sufficient to illuminate the area to be cleaned, but may generally be chosen by the manufacturer. In other embodiments the light intensity (and/or other parameters like focal range, temperature, color, etc.) may be made selectable for the user, e.g. by appropriate button(s), touchscreen or other user interface.

[0015] In another embodiment the vacuum cleaner further comprises a cleaner mechanical coupling portion configured to mechanically couple an accessory to the vacuum cleaner, wherein the cleaner mechanical coupling portion is displaced with respect to the cleaner dust inlet opening in axial direction of the spout. For instance, the cleaner mechanical coupling portion is displaced with respect to the cleaner dust inlet opening by substantially the same displacement as the cleaner light outlet. This enables a good and functional construction of both the mechanical coupling and the light coupling between the vacuum cleaner and the accessory. For instance, the accessory mechanical coupling portion and the accessory light inlet (for receiving the light from the clear light outlet when the accessory is coupled to the vacuum cleaner) may then be arranged, in an embodiment, in a common plane at the rear surface of the accessory.

[0016] In an embodiment of the accessory, the accessory light outlet is configured to emit the light into the direction of the accessory dust inlet opening, in particular to create a spotlight on a surface to be cleaned. Like in the vacuum cleaner, this may e.g. be achieved by an appropriate optical element(s), such as a lens or focusing means, at the accessory light outlet, or by designing the accessory light outlet such that the light is emitted / focused into the desired direction.

[0017] In another embodiment of the accessory, the accessory light outlet is displaced with respect to the accessory dust inlet opening by a displacement of at least 5 mm, in particular by a displacement of at least 10 mm or at least 20 mm or in the range of 5 mm to 100 mm or in the range of 10 mm to 50 mm. Like in the vacuum cleaner, the dimension of the displacement generally depends on the design of the accessory main body and the accessory light outlet and may be different for different accessories.

[0018] In another embodiment the accessory further comprises an accessory mechanical coupling portion configured to mechanically couple the accessory to the vacuum cleaner. For instance, the accessory mechanical coupling portion is configured to end at the rear end of the accessory body in the same plane as the accessory light inlet. The enables a good and functional construction of both the mechanical coupling and the light coupling between the vacuum cleaner and the accessory.

[0019] In another embodiment of the accessory, the light guide is a straight element without bends or curves. This enables a cost-effective and reliable implementation of the light guide.

[0020] In another embodiment of the accessory, the light guide comprises fiber optics, which may be bent or straight opening more options for the construction and arrangement of the light guide.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter. In the following drawings

Fig. 1 shows a first example of a vacuum cleaner with a non-desired arrangement of a light source.

Fig. 2 shows a second example of a vacuum cleaner with another non-desired arrangement of a light source.

Fig. 3 shows a first embodiment of a vacuum cleaner according to the present invention with a desired arrangement of the light source.

Fig. 4 shows a second embodiment of a vacuum cleaner according to the present invention with a desired arrangement of the light source.

Fig. 5 shows a first embodiment of an accessory according to the present invention.

Fig. 6 shows a third embodiment of a vacuum cleaner according to the present invention with a desired arrangement of the light source.

Fig. 7 shows an embodiment of a vacuum cleaning system according to the present invention.

Fig. 8 shows a second embodiment of an accessory according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Fig. 1 shows a first example of a vacuum cleaner 100 with a non-desired arrangement of a light source in an overall view (Fig. 1A) and an enlarged view of the front part (Fig. 1B). The vacuum cleaner 10 comprises a cleaner body 11 having a spout 12, which has a cleaner dust inlet opening 13 configured to suck in dust during operation of the vacuum cleaner 10, e.g. when the user moves the vacuum cleaner over a surface 1. The vacuum cleaner further comprises a light source 14, e.g. one or more LEDs, that is configured to generate light 2. The generated light 2 is emitted from a cleaner light outlet 15. In this first example the light source 14 and the cleaner light outlet 15 are arranged at the front surface 16 of the spout 12 so that the light 2 is emitted from the front surface 16 towards the surface 1 to be cleaned. This arrangement has, however, the disadvantage that at least part of the cleaner light outlet 15 is covered by the surface 2 since typically the front surface 16 of the spout 12 is brought in contact with the surface 2 when cleaning the surface 2. Thus, a substantial amount of the emitted light 2 does actually not shine onto the part of the surface 2 to be cleaned, but is lost.

[0023] Fig. 2 shows a second example of a vacuum cleaner 200 with another non-desired arrangement of a light source in an overall view (Fig. 2A) and an enlarged view of the front part (Fig. 2B). In this example the cleaner light outlet 14 is arranged at a lower surface 17 of the spout 12. This arrangement has, however, the disadvantage that shadows (indicated by dots 3) are created which hamper the sight towards the surface to be cleaned.

[0024] Fig. 3 shows a first embodiment of a vacuum cleaner 300 according to the present invention with a desired arrangement of the light source in an overall view (Fig. 3A) and an enlarged view of the front part (Fig. 3B). In this embodiment the cleaner light outlet 15 is arranged at or above the top surface 18 of the outer diameter of the spout 12. Further, the cleaner light outlet 15 is displaced with respect to the cleaner dust inlet opening 13 in axial direction 19 of the spout 12, i.e. it is not arranged at the front surface 16 of the spout 12, but at a distance 20 behind this surface 16. The light source 14, e.g. one or more LEDs, may be arranged at or above the top surface of the spout 12.

[0025] The light 2 is thus emitted from the spout from above onto the part of the surface 1 to be cleaned next when the vacuum cleaner is moved in a forward movement (to the right in Fig. 3). Compared to the examples 100 and 200 of the vacuum cleaner, this embodiment 300 of the vacuum cleaner provides the advantage that the light 2 is emitted from the vacuum cleaner at a position of the spout 12 where it is functional when used without accessory and where this same light 2 can be coupled into a light guide of an accessory, as will be explained below. Thus, neither are large parts of the emitted light lost even if the front surface of the spout 12 directly contact or slides over the surface 1 to be cleaned, nor are essential shadows created on the part of the surface that shall be cleaned.

[0026] Fig. 4 shows another embodiment of a vacuum cleaner 400 according to the present invention as partial perspective view (Fig. 4A) and as partial side view (Fig. 4B). It shows the arrangement of the cleaner light outlet 15 and of the light sources 14, in this embodiment e.g. two LEDs arranged side by side, on top of the spout 12. The light generated by the light sources 14 is e.g. focused by two optical elements (e.g. lenses) as cleaner light outlet 15 into the light beams 2 towards the upper front part of the spout 12. Preferably, the spout 12 may be transparent so that the light 2 is even shining through the spout 12 towards the are directly in front of the cleaner dust inlet 13.

[0027] Fig. 4 further shows a cleaner mechanical coupling portion 22 configured to mechanically couple an accessory to the vacuum cleaner 400. In this embodiment, the cleaner mechanical coupling portion 22, e.g. a protruding rod or part, is displaced with respect to the cleaner dust inlet opening 13 in axial direction 19 of the spout 12, i.e. it is arranged behind the front surface 16 of the spout. Preferably, the cleaner mechanical coupling portion 22 is displaced with respect to the cleaner dust inlet opening 13 by substantially the same displacement as the cleaner light outlet 15, i.e. the cleaner mechanical coupling portion 22 is arranged in substantially the same plane (that is perpendicular to the axial direction 19) as the cleaner light outlet 15. In other embodiments no such cleaner mechanical coupling portion 22 is provided, but the accessory is simply plugged over the spout 12 without additional coupling means.

[0028] In this embodiment the cleaner light outlet 15 is arranged at a distance 20 behind the front surface 16 of the spout. This distance 20 may be in the range of at least 5 mm, in particular of at least 10 mm or at least 20 mm or in the range of 5 mm to 100 mm or in the range of 10 mm to 50 mm. Further, the cleaner light outlet 15 is arranged at a somewhat elevated position above the upper surface 18 of the spout 12, i.e., with a distance 21 between the upper surface 18 of the spout 12 and the cleaner light outlet 15. This distance 21 may be in the range of at least 0.5 mm, in particular of at least 1 mm or at least 2 mm or in the range of 0.5 mm to 10 mm or in the range of 1 mm to 5 mm. In another embodiment, the distance 21 may even be zero or almost zero. The actual distances 20 and 21 may be chosen based on the design of the spout and the kind of mounting of the light source 14 and/or the cleaner light outlet 15.

[0029] Fig. 5 shows a first embodiment of an accessory 500 according to the present invention for a vacuum cleaner as disclosed herein. In this example the accessory 500 is a crevice nozzle that can be coupled to the

spout of the vacuum cleaner, e.g. the vacuum cleaner 300 or 400 illustrated in Figs. 3 and 4.

[0030] The accessory 500 comprises an accessory body 51 having an accessory dust outlet opening 52 configured to be coupled to or arranged next to the cleaner dust inlet opening 13 of the vacuum cleaner when the accessory 500 is coupled to the vacuum cleaner and an accessory dust inlet opening 53 configured to suck in dust during operation of the vacuum cleaner. An accessory light inlet 54 is configured to be coupled to or arranged next to the cleaner light outlet 15 of the vacuum cleaner when the accessory 500 is coupled to the vacuum cleaner. The accessory 500 further comprises an accessory light outlet 55 and a light guide 56 connecting the accessory light inlet 54 and the accessory light outlet 55. For coupling with the cleaner coupling portion (22 in Fig. 4) an accessory mechanical coupling portion 50 is provided.

[0031] The accessory light outlet 55 is arranged within, at or above a top surface 57 of the outer diameter of the accessory body 51 and displaced with respect to the accessory dust inlet opening 53 in axial direction 58 of the accessory body 51, i.e., the accessory light outlet 55 is arranged on top of or over the accessory body 51 and behind the front surface 59 of the accessory body 51, in a similar way as the clear light outlet 15 is arranged with respect to the spout 12 of the vacuum cleaner.

[0032] Generally, the light guide in the accessory may comprise bends/curves, e.g. if the light guide is formed by an optical fiber. However, bends/curves in the light guide may reduce the effectiveness of the output light. By placing the cleaner light outlet 15 in the vacuum cleaner on or above the top surface 18 of the spout 12 creates the most freedom to develop different accessories with a straight light guide 56 as shown in Fig. 5. The light guide 56 may then be used to create an ambient light and/or a spotlight to show the dirt on the surface 1 to be cleaned.

[0033] The present invention thus provides a cost effective solution by having the light source only in the handheld (i.e. the vacuum cleaner) and having only light guides without any light sources in the different accessories. These light guides can be used in all kind of accessories like crevice nozzles or brush nozzles. It is even possible to have light guides over longer lengths, like over the full length of a tube or wand. To this tube other accessories can be connected, which again may have a corresponding light guide.

[0034] Fig. 6 shows another embodiment of a vacuum cleaner 600 according to the present invention as partial perspective view. In this embodiment two LEDs 61, e.g. two SMD LEDs, are arranged on top of the spout 12 at a distance from each other, at a distance from the upper surface 18 of the spout 12 and at a distance from the front surface 13 of the spout 12.

[0035] The light emitted on top of the spout 12 of the vacuum cleaner can be coupled into the light guide 56 which is positioned on top of the accessory 500. This light guide guides the light towards the tip of the accessory, e.g. a spout of the accessory. This is illustrated in Fig. 7 showing an embodiment of a vacuum cleaning system 700 comprising a vacuum cleaner 701 and multiply accessories 702, 703, 704, wherein each accessory can be coupled to the vacuum cleaner and, optionally and partially, to each other.

[0036] Fig. 8 shows another embodiment of an accessory 800. Preferably, a spotlight 801 is emitted from the tip 802 of the accessory. In addition, the light guide 803 is configured to emit light 804 and thus lighten up the environment. This can e.g. be achieved by making the light guide transparent or by providing light outlets in the light guide. In a similar way, the spout of the vacuum cleaner may be configured accordingly in an embodiment.

[0037] In summary, according to the present invention a light source and a light outlet is positioned at the top of a spout of a handheld vacuum cleaner at a distance from the front surface of the spout. The emitted light can be used to make the dirt more visible when using in dark places when the appliance is used as handheld vacuum cleaner and this light can be used to couple this light into a light guide build into an accessory like crevice nozzle or brush nozzle.

[0038] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims.

[0039] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single element or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0040] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. Vacuum cleaner (300, 400, 600, 701) comprising:

- a spout (12) having a cleaner dust inlet opening (13) configured to suck in dust during operation of the vacuum cleaner,
- a light source (14) configured to generate light, and
- a cleaner light outlet (15) configured to emit light generated by the light source, wherein the cleaner light outlet (15) is arranged at or above a top surface (18) of the outer diameter of the

spout (12) and displaced with respect to the cleaner dust inlet opening (13) in axial direction of the spout (12).

2. Vacuum cleaner as claimed in claim 1, wherein the cleaner light outlet (15) is configured to emit the light into the direction of the cleaner dust inlet opening (13), in particular to create a spotlight on a surface (1) to be cleaned.

3. Vacuum cleaner as claimed in any one of the preceding claims, wherein the cleaner light outlet (14) is displaced with respect to the cleaner dust inlet opening (13) by a displacement of at least 5 mm, in particular by a displacement of at least 10 mm or at least 20 mm or in the range of 5 mm to 100 mm or in the range of 10 mm to 50 mm.

4. Vacuum cleaner as claimed in any one of the preceding claims, wherein the light source (14) comprises at least one LED, in particular two or more LEDs.

5. Vacuum cleaner as claimed in any one of the preceding claims, further comprising a cleaner mechanical coupling portion (22) configured to mechanically couple an accessory (500, 702, 703, 704, 800) to the vacuum cleaner, wherein the cleaner mechanical coupling portion (22) is displaced with respect to the cleaner dust inlet opening (13) in axial direction of the spout (12).

6. Vacuum cleaner as claimed in claim 5, wherein the cleaner mechanical coupling portion (22) is displaced with respect to the cleaner dust inlet opening (13) by substantially the same displacement as the cleaner light outlet (15).

7. Accessory (500, 702, 703, 704, 800) for a vacuum cleaner as claimed in any one of the preceding claims, the accessory comprising:

- an accessory body (51) having an accessory dust outlet opening (52) configured to be coupled to or arranged next to the cleaner dust inlet opening (13) when the accessory is coupled to the vacuum cleaner and an accessory dust inlet opening (53) configured to suck in dust during operation of the vacuum cleaner,
- an accessory light inlet (54) configured to be coupled to or arranged next to the cleaner light outlet (15) when the accessory is coupled to the vacuum cleaner,
- an accessory light outlet (55), and
- a light guide (56) connecting the accessory light inlet (54) and the accessory light outlet (55),

wherein the accessory light outlet (55) is arranged within, at or above a top surface (57) of the outer diameter of the accessory body (51) and displaced with respect to the accessory dust inlet opening (53) in axial direction of the accessory body (51).

8. Accessory as claimed in claim 7, wherein the accessory light outlet (55) is configured to emit the light into the direction of the accessory dust inlet opening (53), in particular to create a spotlight on a surface (1) to be cleaned.

9. Accessory as claimed in any one of claims 7 to 8, wherein the accessory light outlet (55) is displaced with respect to the accessory dust inlet opening (53) by a displacement of at least 5 mm, in particular by a displacement of at least 10 mm or at least 20 mm or in the range of 5 mm to 100 mm or in the range of 10 mm to 50 mm.

10. Accessory as claimed in any one of claims 7 to 9, further comprising an accessory mechanical coupling portion (50) configured to mechanically couple the accessory to the vacuum cleaner.

11. Accessory as claimed in claim 10, wherein the accessory mechanical coupling portion (50) is configured to end at the rear end of the accessory body (51) in the same plane as the accessory light inlet (54).

12. Accessory as claimed in any one of claims 7 to 11, wherein the light guide (56) is a straight element without bends or curves.

13. Accessory as claimed in any one of claims 7 to 12, wherein the light guide (56) comprises one or more fiber optics.

14. Vacuum cleaning system (700) comprising:

- a vacuum cleaner (701) as claimed in any one of claims 1 to 7 and
- at least one accessory (702, 703, 704) as claimed in any one of claims 8 to 13.

15. Vacuum cleaning system as claimed in claim 14, wherein the vacuum cleaner is configured to be usable for a cleaning operation with or without the at least one accessory.

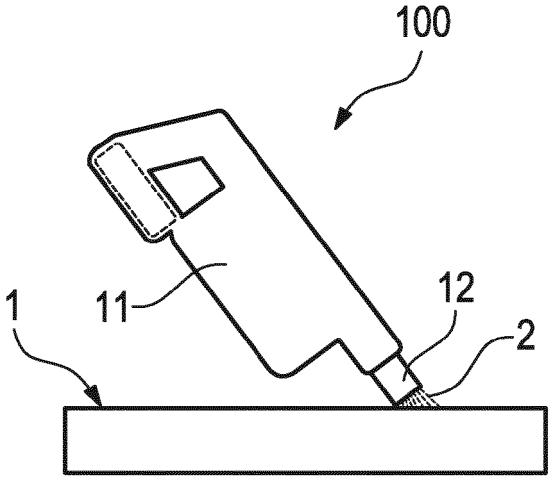

Fig. 1A

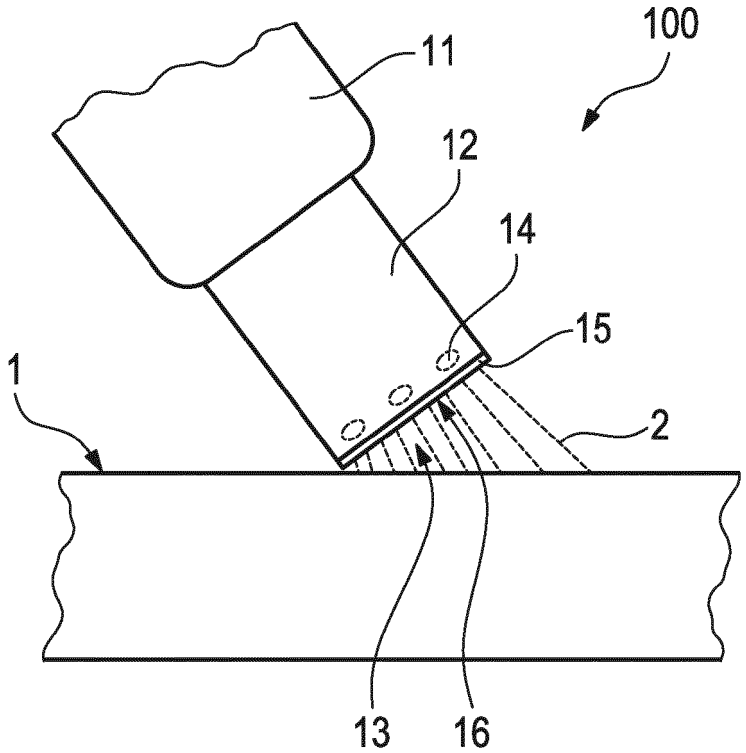

Fig. 1B

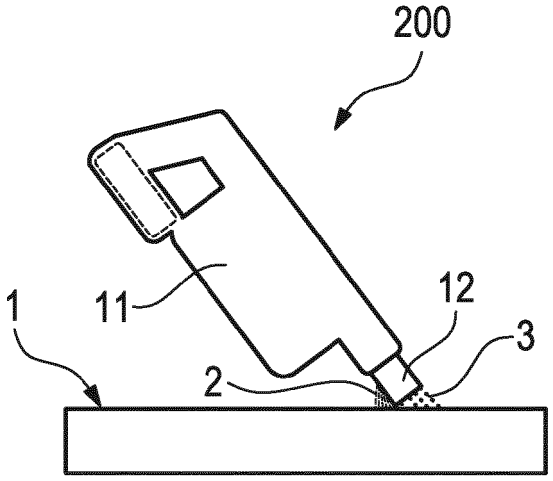

Fig. 2A

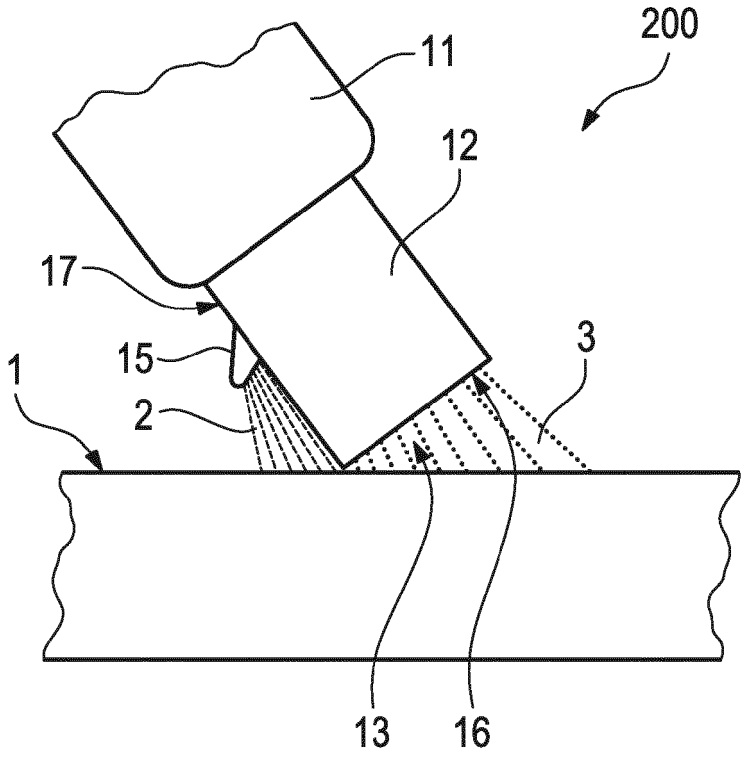

Fig. 2B

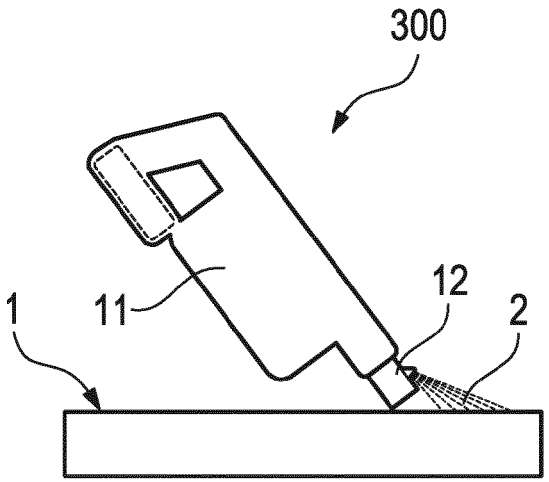

Fig. 3A

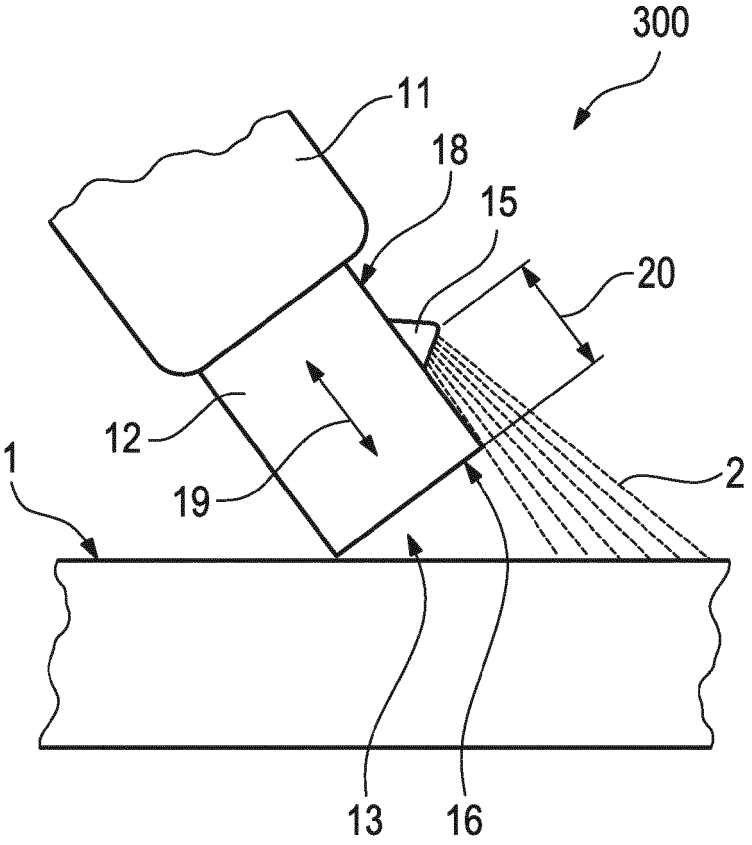

Fig. 3B

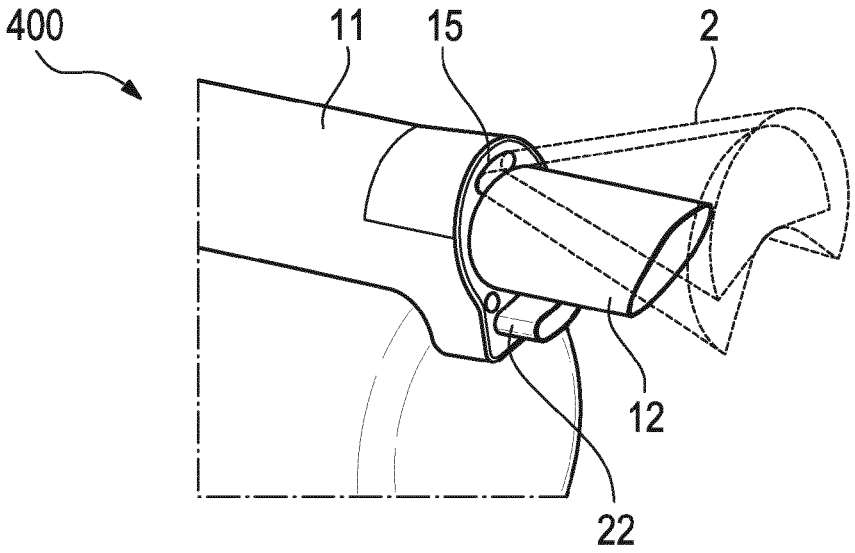

Fig. 4A

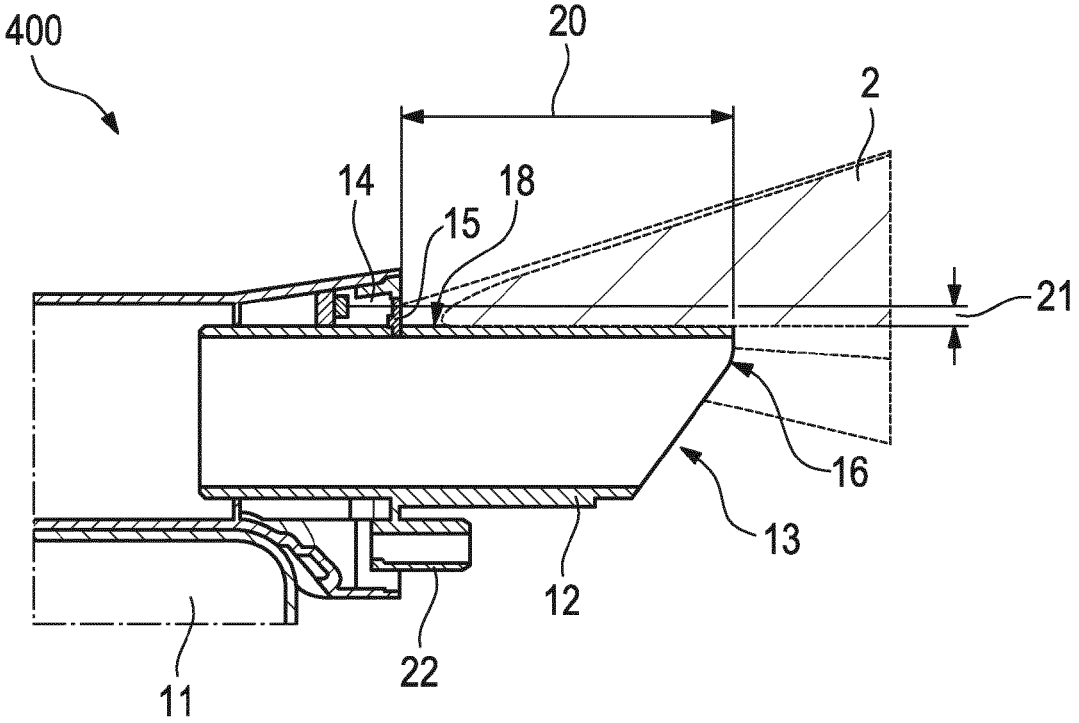

Fig. 4B

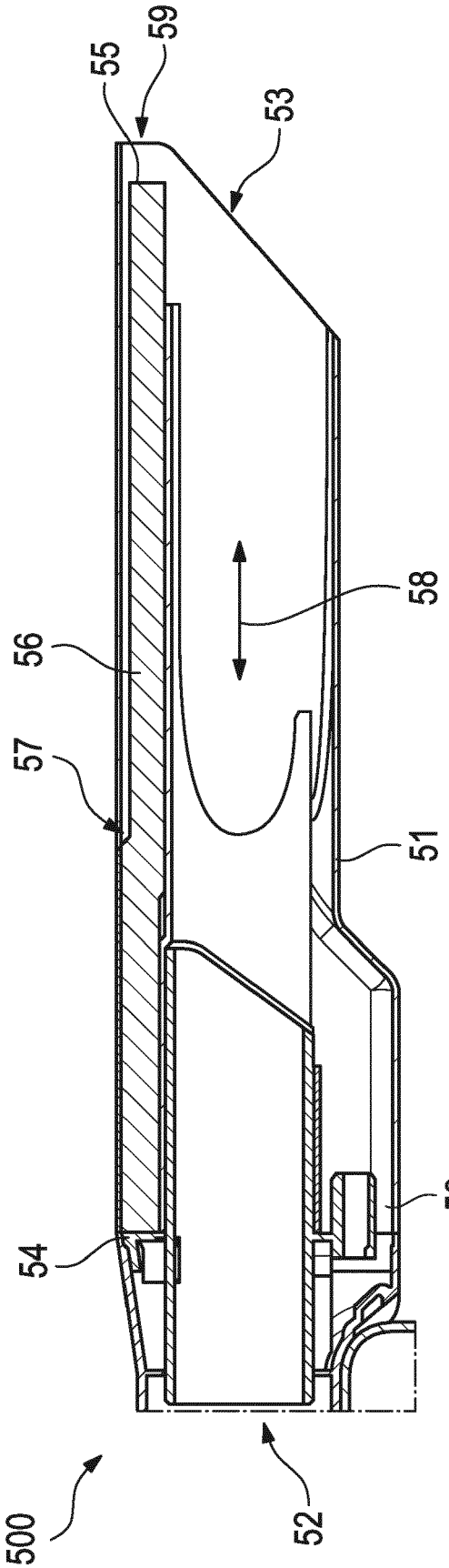

Fig. 5

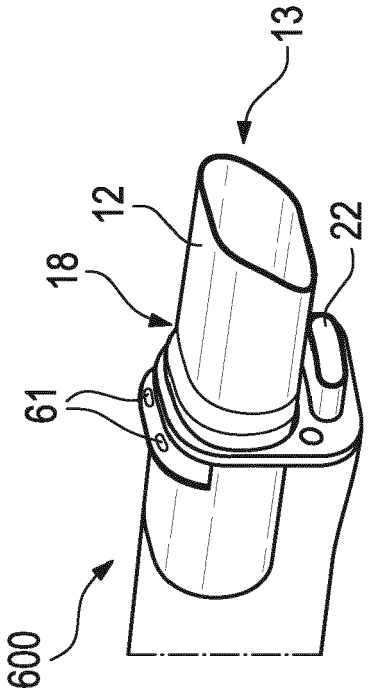

Fig. 6

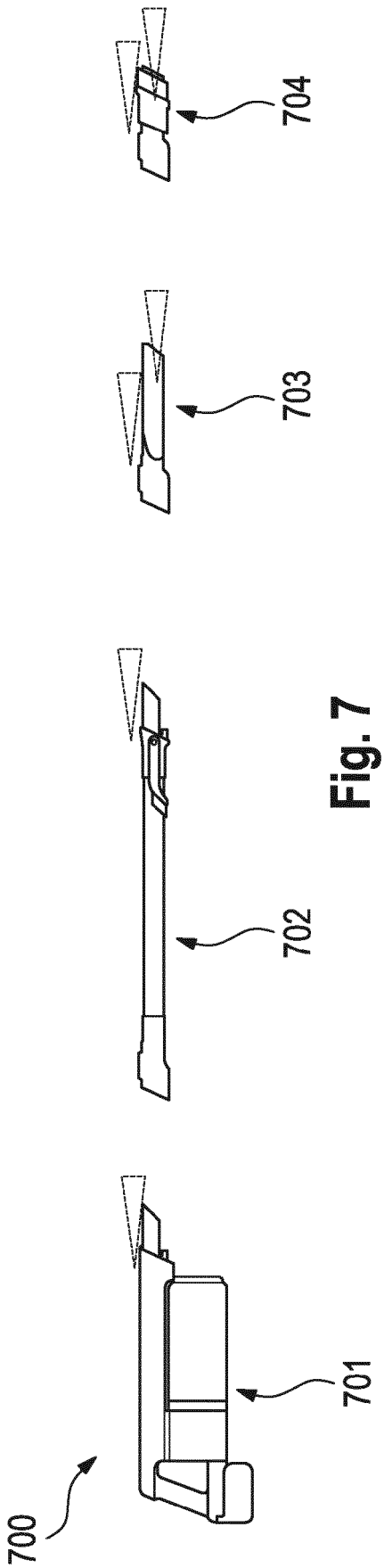

Fig. 7

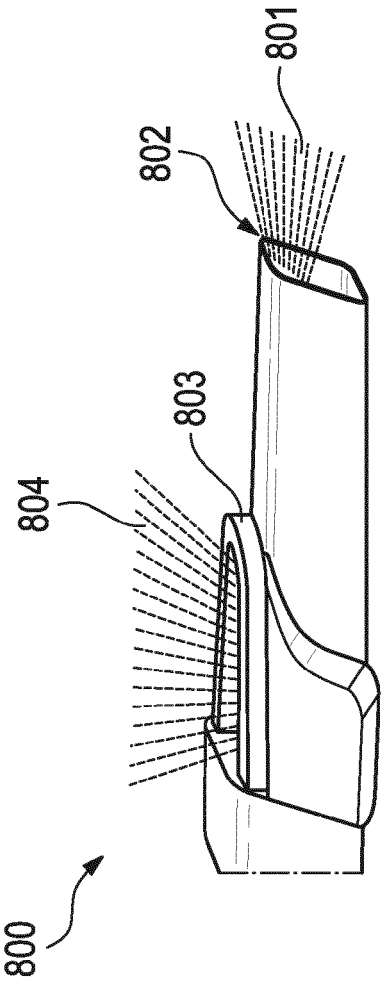

Fig. 8

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 5619

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
Munich	8 July 2022	Hubrich, Klaus

CATEGORY OF CITED DOCUMENTS

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