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(54) **PORTABLE HANDHELD CLEANING TOOL**

(57) The disclosure concerns a cleaning tool (2) comprising a handle portion (4), a surface cleaning portion (6), a shaft portion (8), a rotatable brush (10), and a drive-shaft (16) extending from an electric motor (14) through the shaft portion (8) to the surface cleaning portion (6). The shaft portion (8) is removable from the handle portion (4) and from the surface cleaning portion (6). The cleaning tool (2) is configured for supply of water at the surface cleaning portion (6) and comprises a water conduit (22) extending between a water supply coupling element (18) and a water outlet nozzle (20). The shaft portion (8) comprises a water channel (24) extending from a first end portion (26) of the shaft portion (8) at the handle portion (4) to a second end portion (28) of the shaft portion (8) at the surface cleaning portion (6).

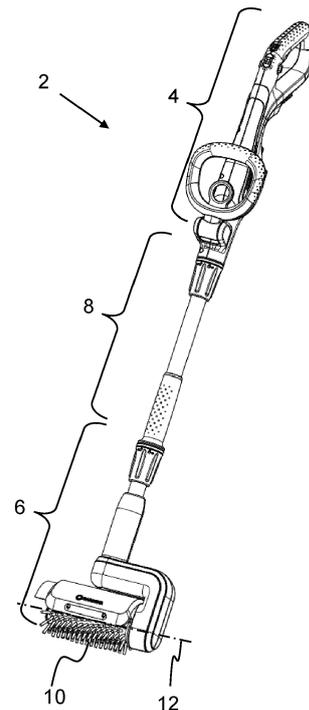


Fig. 1a

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DescriptionTECHNICAL FIELD

[0001] The invention relates to a portable handheld cleaning tool.

BACKGROUND

[0002] Handheld electrically driven cleaning tools are known. Generally, such cleaning tools include a brush rotatable by an electric motor and a handle for a user to grasp and direct the rotatable brush along or over surfaces or objects to be cleaned.

[0003] CN 206453464 U discloses a motor-driven cleaning brush. The cleaning brush comprises a brush head and a rotatory gear motor for driving a brush arranged at the brush head. A telescopic link including a handle is arranged for adjusting a length of a pole at which the brush head is arranged.

[0004] CN206836552 U discloses a cleaning brush of a similar kind.

SUMMARY

[0005] It would be advantageous to achieve an improved cleaning tool. According to one aspect, it would be desirable to provide a cleaning tool comprising a rotatable brush being devised for wet cleaning of surfaces. To better address one or more of these concerns, a portable handheld cleaning tool having the features defined in the independent claim is provided.

[0006] According to an aspect of the invention, there is provided a portable handheld cleaning tool comprising a handle portion, a surface cleaning portion, a shaft portion extending between the handle portion and the surface cleaning portion, a rotatable brush arranged in the surface cleaning portion, an electric motor arranged in the handle portion, and a driveshaft extending from the electric motor through the shaft portion to the surface cleaning portion. The shaft portion is removable from the handle portion and from the surface cleaning portion. The cleaning tool is configured for supply of water at the surface cleaning portion and comprises a water supply coupling element arranged at the handle portion, at least one water outlet nozzle arranged in the surface cleaning portion, and a water conduit extending between the water supply coupling element and the at least one water outlet nozzle. The shaft portion comprises a water channel forming part of the water conduit and extending from a first end portion of the shaft portion at the handle portion to a second end portion of the shaft portion at the surface cleaning portion.

[0007] Since the cleaning tool comprises a water supply coupling element arranged at the handle portion, at least one water outlet nozzle arranged in the surface cleaning portion, and a water conduit extending between the water supply coupling element and the at least one

water outlet nozzle, and since the shaft portion comprises a water channel forming part of the water conduit and extending from a first end portion of the shaft portion at the handle portion to a second end portion of the shaft portion at the surface cleaning portion - the cleaning tool is devised for wet cleaning.

[0008] Specifically, the cleaning tool is devised for connecting a water supply e.g., via a water hose, to the water supply coupling element at the handle portion and conducting water from the handle portion via the water channel in the shaft portion to the at least one water outlet nozzle in the surface cleaning portion for provision of the water to the surface cleaning portion and/or a surface being cleaned with the cleaning tool. Moreover, this is achieved in a cleaning tool comprising a removable shaft portion.

[0009] Further, due to the water supplying element being provided in the handle portion, during use of the cleaning tool which is configured for wet cleaning, a thereto connected water hose is arranged close to a user of the cleaning tool. The user can thus, easily reach and control the water hose.

[0010] Herein, the portable handheld cleaning tool is alternatively referred to as the cleaning tool. The cleaning tool may be a domestically or commercially utilised cleaning tool.

[0011] The portable handheld cleaning tool is portable and handheld by having a weight such that a user of the cleaning tool firstly, is able to carry the cleaning tool and secondly, handle the cleaning tool as it is being used for cleaning a surface. Optionally, the cleaning tool may be suspended from e.g., a shoulder strap or a harness worn by the user while handling the cleaning tool.

[0012] The handle portion is configured for a user to grasp. The handle portion may comprise one or two or more handles for grasping by a user when handling the cleaning tool.

[0013] The surface cleaning portion is configured for engaging with a surface to be cleaned. The surface to be cleaned may be e.g., a floor surface, a wall surface, etc. The surface to be cleaned may be e.g., an outdoor surface such as a surface of a patio, a driveway, a façade, a planking, etc. The surface to be cleaned may be a surface of an object such as of e.g., a vehicle, a piece of furniture, a garden ornament, a boat, etc.

[0014] The shaft portion extending between the handle portion and the surface cleaning portion may have a length within a range of 0.3 - 3 meters. Since the shaft portion is removable from the handle portion and from the surface cleaning portion, a first shaft portion having a first length may be replaced with a second shaft portion having a second length different from the first length. Accordingly, a suitable length shaft portion may be selected for a particular cleaning task. An alternative may be for the removable shaft portion to comprise a telescopic shaft portion, which is adjustable to a suitable length for a particular cleaning task.

[0015] The rotatable brush that is arranged in the sur-

face cleaning portion is configured for engaging with a surface to be cleaned. The rotatable brush or the entire surface cleaning portion may be exchangeable.

[0016] The rotatable brush may have a rotational axis arranged to extend substantially perpendicularly to a surface to be cleaned or a rotational axis arranged to extend substantially in parallel with a surface to be cleaned.

[0017] The surface cleaning portion may comprise more than one rotatable brush.

[0018] Different surface cleaning portions may comprise rotatable brushes of different kinds. Thus, a suitable surface cleaning portion may be selected from a set of different surface cleaning portions and be connected to the shaft portion for a particular surface cleaning task.

[0019] The electric motor may be powered by a battery arranged in the cleaning tool or carried by a user of the cleaning tool e.g., in a backpack or at a belt around the waist of the user. Alternatively, the electric motor may be powered by mains power via a power cord.

[0020] Since the electric motor is arranged in the handle portion and the driveshaft extends through the shaft portion to the surface cleaning portion, a good weight distribution within the cleaning tool is ensured for holding and handling the cleaning tool e.g., in comparison with prior art cleaning tools having the electric motor arranged close to the rotatable brush. Moreover, a cost-efficient solution is provided for changing between different surface cleaning portions. Namely, since one and the same electric motor arranged in the handle portion can be utilised for driving the rotatable brush of different exchangeable surface cleaning portions, not each surface cleaning portion requires its own electric motor.

[0021] The driveshaft may be journaled in the shaft portion.

[0022] The water supply coupling element may comprise a quick coupling for connecting e.g., a garden hose thereto, also referred to as quick-connect garden hose coupling.

[0023] The at least one water outlet nozzle arranged in the surface cleaning portion may be directed to distribute water over the rotatable brush and/or the surface to be cleaned.

[0024] The water channel comprised in the shaft portion is connectable to a portion of the water conduit in the handle portion and to a portion of the water conduit in the surface cleaning portion. When the handle portion is removed from the shaft portion, the water channel is uncoupled from the portion of the water conduit in the handle portion. When the surface cleaning portion is removed from the shaft portion, the water channel is uncoupled from the portion of the water conduit in the surface cleaning portion.

[0025] According to embodiments, the shaft portion may comprise a duct through which the driveshaft extends, wherein at least part of the shaft portion may comprise a tube made from extruded material, and wherein at least part of the water channel and at least part of the duct are formed by the extruded material in one piece,

as portions of the tube. In this manner, a shaft portion that can be cost efficiently manufacture may be provided.

[0026] According to embodiments, the cleaning tool may comprise a first water conduit interface between the handle portion and the shaft portion, wherein the first water conduit interface comprises a first socket arranged in the shaft portion or in the handle portion and a first protruding tube end portion arranged in the other of the shaft portion and the handle portion, and wherein the first protruding tube end portion fits into the first socket. In this manner, there may be provided for the water conduit to be separated when the shaft portion is removed from the handle portion. Namely, the first water conduit interface forms part of the water conduit and provides a releasable connection between the water channel in the shaft portion and the portion of the water conduit in the handle portion.

[0027] According to embodiments, the shaft portion at its first end portion may comprise a first bearing for the driveshaft. In this manner, the driveshaft may be journaled in the shaft portion to ensure reliable rotation of the driveshaft and accordingly, of the rotatable brush during use of the cleaning tool.

[0028] According to embodiments, the cleaning tool may comprise a second water conduit interface between the shaft portion and the surface cleaning portion, wherein the second water conduit interface comprises a second socket arranged in the shaft portion or in the surface cleaning portion and a second protruding tube end portion arranged in the other of the shaft portion and the surface cleaning portion, and wherein the second protruding tube end portion fits into the second socket. In this manner, there may be provided for the water conduit to be separated when the surface cleaning portion is removed from the shaft portion. Namely, the second water conduit interface forms part of the water conduit and provides a releasable connection between a portion of the water conduit in the surface cleaning portion and the water channel in the shaft portion.

[0029] According to embodiments, the shaft portion at its second end portion may comprise a second bearing for the driveshaft. In this manner, the driveshaft may be journaled in the shaft portion to ensure reliable operation of the driveshaft and accordingly, of the rotatable brush during use of the cleaning tool.

[0030] According to embodiments, the surface cleaning portion may comprise a transmission arranged between the driveshaft and the rotatable brush. In this manner, the rotational axis of the rotatable brush may be arranged at an angle to the driveshaft.

[0031] According to embodiments, the at least one water outlet nozzle may be arranged at a proximity of the rotatable brush, wherein a water conduit portion in the surface cleaning portion may extend past at least a portion of the transmission from a region of the surface cleaning portion positioned at the shaft portion to the at least one water outlet nozzle. In this manner, during cleaning, water may be directed to the rotatable brush and/or to

the surface to be cleaned at a proximity of the rotatable brush. This may be achieved despite the surface cleaning portion comprising a transmission.

[0032] According to embodiments, the cleaning tool may comprise a flow controlling valve arranged downstream of the water supply coupling element. In this manner, the flow of water to the rotatable brush and/or the surface to be cleaned may be regulated by a user of the cleaning tool.

[0033] According to embodiments, the shaft portion may be provided with first internal or external threads at its first end portion, and the handle portion may be provided with external or internal threads configured to mate with the first internal or external threads. In this manner, a reliable connection may be provided between the shaft portion and the handle portion.

[0034] According to embodiments, the surface engaging portion may be provided with second external or internal threads, and the shaft portion, at its second end portion, may be provided with internal or external threads configured to mate with the second internal or external threads. In this manner, a reliable connection may be provided between the shaft portion and the surface cleaning portion.

[0035] According to embodiments, the cleaning tool may comprise a first driveshaft interface between the handle portion and the shaft portion, wherein the handle portion comprises a hollow end portion, wherein the first driveshaft interface is recessed from an end of the handle portion within the hollow end portion, and wherein the first end portion of the shaft portion is configured to extend into the hollow end portion of the handle portion for engagement of the first driveshaft interface. In this manner, a reliable connection may be provided between the shaft portion and the handle portion.

[0036] According to embodiments, the cleaning tool may comprise a second driveshaft interface between the surface cleaning portion and the shaft portion, wherein the second driveshaft interface is recessed within the second end portion of the shaft portion, and wherein an end portion of the surface cleaning portion is configured to extend into the second end portion of the shaft portion for engagement of the second driveshaft interface. In this manner, a reliable connection may be provided between the shaft portion and the surface cleaning portion.

[0037] According to embodiments, the cleaning tool may comprise a battery arranged to power the electric motor. In this manner, an internal power supply of the cleaning tool may be provided.

[0038] According to embodiments, the rotatable brush may have a rotational axis extending substantially perpendicularly to the driveshaft, and the rotatable brush may comprise a brush roll arranged to engage with a surface to be cleaned tangentially to a rotational direction of the brush roll. In this manner, there may be provided a cleaning tool with a rotatable brush that has a rotational axis configured to extend in parallel with a surface to be cleaned.

[0039] According to embodiments, at least part of the transmission and part of the brush roll may be aligned along an extension of the shaft portion, and wherein the transmission extends laterally of the brush roll to drive the brush roll from an axial end of the brush roll. In this manner, there may be provided a cleaning tool with a transmission configured for driving a rotatable brush that has a rotational axis configured to extend in parallel with a surface to be cleaned.

[0040] According to embodiments, the splashguard may be secured to a housing of the surface cleaning portion laterally of the brush roll and at an axial centre portion of the brush roll. In this manner, the splashguard may be configured for stabilising at least part of the surface cleaning portion comprising a rotatable brush in the form of a brush roll.

[0041] According to embodiments, the rotatable brush may have a rotational axis extending at an angle > 90 degrees to the driveshaft, and the rotatable brush may comprise a circular brush, an entire surface engaging end of the circular brush being arranged to engage continuously with a surface to be cleaned. In this manner, there may be provided a cleaning tool with a rotatable brush having a rotational axis that extends perpendicularly to a surface to be cleaned.

[0042] According to embodiments, the handle portion may comprise a first handle arranged at an end of the cleaning tool and a second handle arranged at an end portion of the handle portion close to the shaft portion. In this manner, the cleaning tool may be configured for a user to precisely control the rotatable brush arranged at the opposite end of the shaft portion.

[0043] According to embodiments, the second handle may be pivotable about a pivot axis and may comprise a locking mechanism configured for releasably locking the second handle in relation to the pivot axis. In this manner, the second handle may be positioned in a manner best suited for a particular cleaning task and/or for the physical constitution of a user of the cleaning tool.

[0044] Again, with an aim of achieving an improved cleaning tool, according to further aspects, it would be desirable to enable a cleaning tool comprising a rotatable brush being devised for one or more of:

- Ensuring a reliable operation of a driveshaft in the shaft portion of the cleaning tool.
- Providing a rotational axis of the rotatable brush that is arranged at an angle to the driveshaft.
- Providing a reliable connection between the shaft portion and the handle portion.
- Providing a reliable connection between the shaft portion and the surface cleaning portion.
- Providing an internal power supply of the cleaning tool.
- Providing a cleaning tool with a rotatable brush that has a rotational axis configured to extend in parallel with a surface to be cleaned.
- Providing a cleaning tool with a rotatable brush that

has a rotational axis configured to extend perpendicularly to a surface to be cleaned.

- Providing a cleaning tool that is configured for a user to precisely control the rotatable brush.
- Positioning a second handle of the handle portion in a manner best suited for a particular cleaning task and/or for the physical constitution of a user of the cleaning tool.

[0045] Each of these aspects independently, or in various combinations, may be implemented in a cleaning tool being devised for wet cleaning of surfaces. Alternatively, each of these aspects may be implemented in a cleaning tool that lacks a functionality of wet cleaning.

[0046] Accordingly, each such further aspect may be implemented in a cleaning tool comprising at least the following common denominators: a handle portion, a surface cleaning portion, a shaft portion extending between the handle portion and the surface cleaning portion, a rotatable brush arranged in the surface cleaning portion, an electric motor arranged in the handle portion, and a driveshaft extending from the electric motor through the shaft portion to the surface cleaning portion. According to some embodiments, the shaft portion may be removable from the handle portion and from the surface cleaning portion.

[0047] To better address one or more of these concerns, the portable handheld cleaning tool with these common denominators comprises one or more of the features defined in one or more of the appended dependent claims.

[0048] Further features of, and advantages with, the invention will become apparent when studying the appended claims and the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049] Various aspects and/or embodiments of the invention, including its particular features and advantages, will be readily understood from the example embodiments discussed in the following detailed description and the accompanying drawings, in which:

Figs. 1a and 1b illustrate embodiments of a portable handheld cleaning tool,

Figs. 2a - 2c illustrate partial cross sections through portions of a cleaning tool according to embodiments,

Figs. 3a - 3e illustrate partial cross sections through portions of a cleaning tool according to embodiments,

Figs. 4a and 4b illustrate partial cross sections of a surface cleaning portion according to embodiments, and

Figs. 5a and 5b illustrate embodiments of a surface cleaning portion of a cleaning tool.

DETAILED DESCRIPTION

[0050] Aspects and/or embodiments of the invention will now be described more fully. Like numbers refer to like elements throughout. Well-known functions or constructions will not necessarily be described in detail for brevity and/or clarity.

[0051] Figs. 1a and 1b illustrate embodiments of a portable handheld cleaning tool 2. In each of Figs. 1a and 1b the cleaning tool 2 is provided with a different surface cleaning portion, see further below.

[0052] The cleaning tool 2 comprising a handle portion 4, a surface cleaning portion 6, and a shaft portion 8 extending between the handle portion 4 and the surface cleaning portion 6.

[0053] A rotatable brush 10 is arranged in the surface cleaning portion 6. As can be seen in Figs. 1a and 1b, surface cleaning portions 8 of different kinds may be provided. Such surface cleaning portions 8 of different kinds may be exchangeable. One and the same handle portion 4 and shaft portion 8 may thus, be provided with different surface cleaning portions 6 e.g., depending on what kind of surface is to be cleaned.

[0054] As can be seen in Fig. 1a, according to some embodiments, the rotatable brush 10 can have a rotational axis 12 that extends in parallel with a surface to be cleaned. As can be seen in Fig. 1b, according to some embodiments, the rotatable brush 10 can have a rotational axis 12 that extends perpendicularly to a surface to be cleaned.

[0055] The cleaning tool 2 is configured for supply of water at the surface cleaning portion 6. The cleaning tool 2 is thus, arranged for connection of a water supply, such as a garden hose to the handle portion and for conducting water through the shaft portion 8 and to the surface cleaning portion 6. At the surface cleaning portion 6, water is directed to the rotatable brush 10 and/or to the surface to be cleaned. See further below inter alia with reference to Figs. 2a - 2c and 4a, 4b.

[0056] Mentioned purely as an example, the portable handheld cleaning tool 2 may have a weight within a range of 2 - 15 kg, excluding the weight of a battery.

[0057] Figs. 2a - 2c illustrate partial cross sections through respective of a handle portion 4, a shaft portion 8, and a surface cleaning portion 6 of a cleaning tool according to embodiments.

[0058] The cleaning tool may be a cleaning tool 2 as discussed above with reference to Figs. 1a and 1b. Accordingly, in the following reference is also made to Figs. 1a and 1b.

[0059] An electric motor 14 is arranged in the handle portion 6. A driveshaft 16 extends from the electric motor 14 through the shaft portion 8 to the surface cleaning portion 6.

[0060] The shaft portion 8 is removable from the handle portion 4 and from the surface cleaning portion 6. Accordingly, the cleaning tool 2 may be taken apart into three separate parts. Each of the shaft portion 8, the han-

dle portion 4, and the surface cleaning portion 6 form a separate part.

[0061] As mentioned above, the cleaning tool 2 is configured for supply of water at the surface cleaning portion 6. Thus, the cleaning tool 2 comprises a water supply coupling element 18 arranged at the handle portion 4, at least one water outlet nozzle 20 arranged in the surface cleaning portion 6, and a water conduit 22 extending between the water supply coupling element 18 and the at least one water outlet nozzle 20.

[0062] The surface cleaning portion 6 in these embodiments comprises two water outlet nozzles 20.

[0063] The shaft portion 8 comprises a water channel 24 that forms part of the water conduit 22 and that extends from a first end portion 26 of the shaft portion 8 at the handle portion 4 to a second end portion 28 of the shaft portion 8 at the surface cleaning portion 6.

[0064] In the illustrated embodiments, the cleaning tool 2 comprises a flow controlling valve 25 arranged downstream of the water supply coupling element 18. Thus, a user of the cleaning tool 2, at the handle portion 4, may control the flow of water to the rotatable brush 10 and/or to the surface to be cleaned by setting the flow controlling valve 25 at a desired flow setting.

[0065] The cleaning tool 2 may comprise a battery 19 arranged to power the electric motor 14.

[0066] The battery 19 is schematically indicated in the handle portion 4. Such a battery 19 is suitably rechargeable.

[0067] As an alternative, the electric motor 14 may be powered by mains power via an electric cord.

[0068] The handle portion 4 comprises a first handle 27 arranged at an end of the cleaning tool 2 and a second handle 29 arranged at an end portion of the handle portion 4 close to the shaft portion 8.

[0069] A user of the cleaning tool 2 grasps each of the first and second handles 27, 29 to control the cleaning tool 2 and to move the rotatable brush 10 over the surface to be cleaned.

[0070] In connection with the first handle 27, user operated control means may be provided, such as a push-button for starting and stopping the electric motor 14.

[0071] The second handle 29 is pivotable about a pivot axis 31 and comprises a locking mechanism 33 configured for releasably locking the second handle 29 in relation to the pivot axis 31. Thus, the second handle 29 may be arranged in one out of at least two different pivotal positions for a user of the cleaning tool to grasp.

[0072] The locking mechanism 33 may be any suitable locking mechanism that securely locks the rotation of the second handle 29 in relation to the pivot axis 31. For instance, the locking mechanism 33 may comprise a fixed cog wheel arranged in a body of the handle portion 4 and a movable pin arranged at the second handle 29, which movable pin is arranged to releasably engage with the cogs of the fixed cog wheel.

[0073] **Figs. 3a - 3e** illustrate partial cross sections through portions of a cleaning tool according to embod-

iments. More specifically, **Fig. 3a** illustrates a partial cross section through part of a handle portion 4, **Figs. 3b - 3d** illustrate partial cross sections through a shaft portion 8 and through end portions 26, 28 of the shaft portion 8, and **Fig. 3e** illustrates a partial cross section through part of a surface cleaning portion 6.

[0074] The cleaning tool may be a cleaning tool 2 as discussed above with reference to **Figs. 1a - 2c**. Accordingly, in the following reference is also made to **Figs. 1a - 2c**.

[0075] Again, the cleaning tool comprises a water conduit 22 extending between a water supply coupling element arranged in the handle portion 4 and at least one water outlet nozzle arranged in the surface cleaning portion 6. The shaft portion 8 comprises a water channel 24 that forms part of the water conduit 22 and that extends from a first end portion 26 of the shaft portion 8 at the handle portion 4 to a second end portion 28 of the shaft portion 8 at the surface cleaning portion 6.

[0076] Accordingly, the water conduit 22 comprises a portion 21 of the water conduit 22 in the handle portion 4, the water channel 24 comprised in the shaft portion 8, and a portion 23 of the water conduit 22 in the surface cleaning portion 6.

[0077] Since the shaft portion 8 is removable from the handle portion 4 and from the surface cleaning portion 6, the portion 21 of the water conduit 22 in the handle portion 4 is releasably connected to the water channel 24 and the portion 23 of the water conduit 22 in the surface cleaning portion 6 is releasably connected to the water channel 24.

[0078] The shaft portion 8 comprises a duct 30 through which the driveshaft 16 extends. Within the duct 30, the driveshaft 16 is free to rotate. That is, there is a distance between the driveshaft 16 and inner delimiting surfaces of the duct 30.

[0079] At least part of the shaft portion 8 comprises a tube 32 made from extruded material. For instance, the tube 32 may be made from aluminium or other extrudable material. That is, the tube 32 is formed in an extrusion process.

[0080] At least part of the water channel 24 and at least part of the duct 30 are formed by the extruded material in one piece as portions of the tube 32. That is, tube 32 forms two inner elongated spaces, one of which forms the duct 30 and the other forming the water channel 24.

[0081] A first water conduit interface 34 between the handle portion 4 and the shaft portion 8 is provided. The first water conduit interface 34 comprises a first socket 36 arranged in the shaft portion 8 or in the handle portion 4 and a first protruding tube end portion 38 arranged in the other of the shaft portion 8 and the handle portion 4. The first protruding tube end portion 38 fits into the first socket 36.

[0082] The first water conduit interface 34 forms part of the water conduit 22 and provides a releasable connection between the water channel 24 at the first end portion 26 of the shaft portion 8 and the portion 21 of the

water conduit 22 in the handle portion 4.

[0083] In the illustrated embodiments, the first water conduit interface 34 comprises the first socket 36 arranged in the shaft portion 8 and the first protruding tube end portion 38 arranged in the handle portion 4. For instance, a portion of the water channel 24 may form a portion of the first socket 36 and the first protruding end portion 38 may form part of the portion 21 of the water conduit 22 in the handle portion 4.

[0084] A second water conduit interface 40 between the shaft portion 8 and the surface cleaning portion 6 is provided. The second water conduit interface 40 comprises a second socket 42 arranged in the shaft portion 8 or in the surface cleaning portion 6 and a second protruding tube end portion 44 arranged in the other of the shaft portion 8 and the surface cleaning portion 6. The second protruding tube end portion 44 fits into the second socket 42.

[0085] The second water conduit interface 40 forms part of the water conduit 22 and provides a releasable connection between the water channel 24 at the second end portion 28 of the shaft portion 8 and the portion 23 of the water conduit 22 in the surface cleaning portion 6.

[0086] In the illustrated embodiments, the second water conduit interface 40 comprises the second socket 42 arranged in the surface cleaning portion 6 and the second protruding tube end portion 44 arranged in the shaft portion 8. For instance, a portion of the water channel 24 may extend through the second protruding tube end portion 44 and the second socket 42 may form part of the portion 23 of the water conduit 22 in the surface cleaning portion 6.

[0087] According to some embodiments, the first protruding tube end portion 38 may be of the same kind as the second protruding tube end portion 44 and the first socket 36 may be of the same kind as the second socket 42.

[0088] According to such embodiments, the first protruding tube end portion 38 fits into the second socket 42 or the second protruding tube end portion 44 fits into the first socket 36 when the shaft portion 8 is removed from the cleaning tool. In this manner, the cleaning tool may be used with the surface cleaning portion 6 connected directly to the handle portion 4. A shorter cleaning tool thus, may be provided and which may be utilised for cleaning tasks where the user of the cleaning tool may want to closely observe the rotatable brush and the surface to be cleaned.

[0089] The driveshaft 16 is journaled within the cleaning tool in order to ensure a vibration free rotation or at least a low vibration rotation of the driveshaft 16 and/or a reliable rotation of the rotatable brush 10. One or more bearings may be provided for journaling the driveshaft 16. Such bearings may be arranged in one or more of the handle portion 4, the shaft portion 8, and the surface cleaning portion 6. Such bearings may comprise e.g., one or more plain bearings or ball bearings.

[0090] According to some embodiments, such as the

illustrated embodiments, the shaft portion 8 at its first end portion 26 comprises a first bearing 46 for the driveshaft 16.

[0091] According to embodiments, the first bearing 46 and either at least part of the first socket 36 or the first protruding tube end portion 38 are formed in one single first element 48 and the first element 48 being at least partially inserted into the tube 32 made from extruded material at the first end portion 26 of the shaft portion 8. In this manner, journaling of the driveshaft 16 and part of the first water conduit interface 34 are efficiently provided.

[0092] More specifically, depending on whether the first end portion 26 of the shaft portion 8 comprises the first socket 36 or the first protruding tube end portion 38, the first element 48 comprises the first socket 36 or the first protruding tube end portion 38.

[0093] According to some embodiments, such as the illustrated embodiments, the shaft portion 8 at its second end portion 28 comprises a second bearing 50 for the driveshaft 16.

[0094] According to embodiments, the second bearing 50 and either at least part of the second socket 42 or the second protruding tube end portion 44 are formed in one single second element 52 and the second element 52 being at least partially inserted into the tube 32 made from extruded material at the second end portion 28 of the shaft portion 8. In this manner, journaling of the driveshaft 16 and part of the second water conduit interface 40 are efficiently provided.

[0095] Depending on whether the second end portion 28 of the shaft portion 8 comprises the second socket 42 or the second protruding tube end portion 44, the second element 52 comprises the second socket 42 or the second protruding tube end portion 44.

[0096] The first element 48 and the second element 52 may be made from a plastic material, such as nylon, PTFE, Polyoxymethylene (POM).

[0097] The first and second elements 48, 52 may each from part of separate plain bearings. The driveshaft 16 may be directly journaled in the first and second elements 48, 52. Alternatively, the driveshaft 16 may be indirectly journaled in the first and second elements 48, 52 i.e., further elements may be associated with the driveshaft 16, which further elements are journaled in the first and second elements 48, 52.

[0098] Since the shaft portion 8 is removable from the handle portion 4 and from the surface cleaning portion 6, the driveshaft 16 comprises at least three separable portions. One portion of the driveshaft 16 is connected to the electric motor 14. One portion of the driveshaft 16 extends through the shaft portion 8. One portion of the driveshaft 16 extends in the surface cleaning portion 6.

[0099] A first driveshaft interface 54 may be provided for separating the driveshaft 16 between the handle portion 4 and the shaft portion 8. A second driveshaft interface 56 may be provided for separating the driveshaft 16 between the shaft portion 8 and the surface cleaning por-

tion 6.

[0100] The cleaning tool 2 comprises a first driveshaft interface 54 between the handle portion 4 and the shaft portion 8. The handle portion 4 comprises a hollow end portion 58. The first driveshaft interface 54 is recessed from an end 60 of the handle portion 4 within the hollow end portion 58. The first end portion 26 of the shaft portion 8 is configured to extend into the hollow end portion 58 of the handle portion 4 for engagement of the first driveshaft interface 54. Thus, the first end portion 26 of the shaft portion 8 is guided by the hollow end portion 58 of the handle portion 4 when the shaft portion 8 is joined with the handle portion 4. Thus, the parts of the first driveshaft interface 54 are aligned and a reliable connection is provided between the shaft portion 8 and the handle portion 4.

[0101] The first driveshaft interface 54 forms a separable interface of the driveshaft 16 between a portion of the driveshaft 16 in the handle portion 4 and a portion of the driveshaft 16 in the shaft portion 8. For instance, one of the portion of the driveshaft 16 in the handle portion 4 and the portion of the driveshaft 16 in the shaft portion 8 may comprise a socket, which is configured for rotationally locked engagement with a protrusion of the other of the portion of the driveshaft 16 in the handle portion 4 and the portion of the driveshaft 16 in the shaft portion 8.

[0102] The cleaning tool 2 comprise a second driveshaft interface 56 between the surface cleaning portion 6 and the shaft portion 8. The second driveshaft interface 56 is recessed within the second end portion 28 of the shaft portion 8. An end portion 62 of the surface cleaning portion 6 is configured to extend into the second end portion 28 of the shaft portion 8 for engagement of the second driveshaft interface 56. Thus, the end portion 62 of the surface cleaning portion 6 is guided within the recessed second end portion 28 of the shaft portion 8 when the surface cleaning portion 6 is joined with the shaft portion 8. Thus, the parts of the second driveshaft interface 56 are aligned and a reliable connection is provided between the shaft portion 8 and the surface cleaning portion 6.

[0103] The second driveshaft interface 56 forms a separable interface of the driveshaft 16 between a portion of the driveshaft 16 in the surface cleaning portion 6 and a portion of the driveshaft 16 in the shaft portion 8. For instance, one of the portion of the driveshaft 16 in the surface cleaning portion 6 and the portion of the driveshaft 16 in the shaft portion 8 may comprise a socket, which is configured for rotationally locked engagement with a protrusion of the other of the portion of the driveshaft 16 in the surface cleaning portion 6 and the portion of the driveshaft 16 in the shaft portion 8.

[0104] According to some embodiments, the first driveshaft interface 54 may be of the same kind as the second driveshaft interface 56. Thus, the surface cleaning portion 6 may be directly connected to the handle portion 4 when the shaft portion 8 is removed from the cleaning tool.

[0105] The cleaning tool 2 is configured for on the one hand to securely and releasably hold the shaft portion 8 to the handle portion 4 and on the other hand to securely and releasably hold the surface cleaning portion 6 to the shaft portion 8.

[0106] According to some embodiments, such as the illustrated embodiments, the shaft portion 8 is provided with first internal or external threads 64 at its first end portion 26 and the handle portion 4 is provided with external or internal threads 66 configured to mate with the first internal or external threads 64. Thus, a reliable releasable connection may be provided between the shaft portion 8 and the handle portion 4.

[0107] According to embodiments, such as the illustrated embodiments, the surface engaging portion 6 is provided with second external or internal threads 68 and the shaft portion 8, at its second end portion 28, is provided with internal or external threads 70 configured to mate with the second internal or external threads 68. Thus, a reliable releasable connection may be provided between the shaft portion 8 and the surface cleaning portion 6.

[0108] According to some embodiments, the first internal or external threads 64 at the first end portion 26 of the shaft portion 8 may be of the same kind as the second internal or external threads 68 of the surface cleaning portion 6. Thus, the surface cleaning portion 6 may be directly connected to the handle portion 4 when the shaft portion 8 is removed from the cleaning tool.

[0109] **Figs. 4a and 4b** illustrate partial cross sections of a surface cleaning portion 6 according to embodiments. The surface cleaning portion 6 is a surface cleaning portion of a cleaning tool such as a cleaning tool 2 as discussed above with reference to **Figs. 1a and 2a - 3e**. Accordingly, in the following reference is also made to **Figs. 1a and 2a - 3e**.

[0110] Again, the cleaning tool is configured for supply of water at the surface cleaning portion 6 to be supplied to, or at, the rotatable brush 10, via at least one water outlet nozzle 20. In these embodiments, the rotatable brush 10 has a rotational axis 12 that extends in parallel with a surface to be cleaned.

[0111] Accordingly, the rotatable brush 10 has a rotational axis 12 extending substantially perpendicularly to the driveshaft 16. The rotatable brush 10 comprises a brush roll 72 arranged to engage with a surface to be cleaned tangentially to a rotational direction of the brush roll 72.

[0112] Again, a driveshaft 16 is arranged to transmit a rotation of an electric motor in the handle portion of the cleaning tool for driving/rotating of the rotatable brush 10.

[0113] The surface cleaning portion 6 comprises a transmission 74 arranged between the driveshaft 16 and the rotatable brush 10. Thus, the rotation of the driveshaft 16 may be transferred to the rotatable brush 10 despite its rotational axis 12 not being aligned with the driveshaft 16.

[0114] In these embodiments, the transmission 74

comprises a first portion 76 comprising a bevel gear for transmitting/directing the rotation of the driveshaft 16 perpendicularly to the driveshaft 16 and a second portion 78 comprising a cog belt and two cog wheels.

[0115] Accordingly, at least part of the transmission, such as the first portion 76 of the transmission 74 and part of the brush roll 72 are aligned along an extension of the shaft portion i.e., along an extension of the driveshaft 16. Moreover, the transmission 74 extends laterally of the brush roll 72, i.e., the second portion 78 of the transmission 74, to drive the brush roll 72 from an axial end of the brush roll 72.

[0116] The at least one water outlet nozzle 20 is arranged at a proximity of the rotatable brush 10. A water conduit portion 80 in the surface cleaning portion 6 extends past at least a portion of the transmission 74 from a region 82 of the surface cleaning portion 8 positioned at the shaft portion to the at least one water outlet nozzle 20. Thus, during use of the cleaning tool, water may be directed through the surface cleaning portion 6 past the transmission 74, such as past the first portion 76 of the transmission 74, to the at least one water outlet nozzle 20.

[0117] The water conduit portion 80 forms part of the portion 23 of the water conduit 22 in the surface cleaning portion 6. In **Fig. 4b**, the bevelled gears of the first portion 76 of the transmission 74 have been omitted to clearly show the water conduit portion 80.

[0118] According to some embodiments, such as the illustrated embodiments, the surface cleaning portion 8 comprises a splashguard 84 arranged at the rotatable brush 10. The at least one water outlet nozzle 20 is arranged on the splashguard 84. In this manner, during use of the cleaning tool, water may be conveniently directed onto the surface to be cleaned close to the rotatable brush 10 and/or onto the rotatable brush 10.

[0119] According to some embodiments, such as the illustrated embodiments, the splashguard 84 is secured to a housing 86 of the surface cleaning portion 6 laterally of the brush roll 72 and at an axial centre portion of the brush roll 72. Thus, the splashguard 84 forms a connection between the housing 86 laterally of the brush roll 72 and the housing 86 centrally of the brush roll 72. The surface cleaning portion 8 and the brush roll 72 mounted therein are thus, stabilised.

[0120] For instance, the splashguard 84 may be secured to the housing 86 via screws 87, see **Fig. 4b**.

[0121] **Figs. 5a and 5b** illustrate embodiments of a surface cleaning portion 6 of a cleaning tool. **Fig. 5a** shows a side view of the surface cleaning portion 6 and **Fig. 5b** show a cross section through the surface cleaning portion 6. The cleaning tool may be a cleaning tool 2 as discussed above with reference to **Figs. 1 b - 3e**. Accordingly, in the following reference is also made to **Figs. 1 b - 3e**.

[0122] Again, the cleaning tool is configured for supply of water at the surface cleaning portion 6 to be supplied to, or at, the rotatable brush 10, via at least one water outlet nozzle 20. In these embodiments, the rotatable brush 10 has a rotational axis 12 that extends perpen-

dicularly to a surface to be cleaned.

[0123] Accordingly, the rotatable brush 10 has a rotational axis 12 extending at an angle > 90 degrees to the driveshaft 16. The rotatable brush 10 comprises a circular brush 88, an entire surface engaging end 90 of the circular brush 88 is arranged to engage continuously with the surface to be cleaned.

[0124] Again, a driveshaft 16 is arranged to transmit a rotation of an electric motor in the handle portion of the cleaning tool for driving/rotating of the rotatable brush 10.

[0125] The surface cleaning portion 6 comprises a transmission 74 arranged between the driveshaft 16 and the rotatable brush 10. Thus, the rotation of the driveshaft 16 may be transferred to the rotatable brush 10 despite its rotational axis 12 not being aligned with the driveshaft 16.

[0126] In these embodiments, the transmission 74 comprises a bevel gear for transmitting/directing the rotation of the driveshaft 16 to the rotational axis 12 of the rotatable brush 10 at an angle > 90 degrees to the driveshaft 16.

[0127] The at least one water outlet nozzle 20 is arranged at a proximity of the rotatable brush 10. Again, a water conduit portion 80 in the surface cleaning portion 6 extends past at least a portion of the transmission 74 to the at least one water outlet nozzle 20. Thus, during use of the cleaning tool, water may be directed through the surface cleaning portion 6 past the transmission 74 to the at least one water outlet nozzle 20.

[0128] The water conduit portion 80 forms part of and the portion 23 of the water conduit 22 in the surface cleaning portion 6.

[0129] Generally, in **Figs. 5a and 5b**, the surface cleaning portion 6 is shown connected to the shaft portion 8. Accordingly, in the cross section of **Fig. 5b**, the second driveshaft interface 56 is engaged, the second water conduit interface 40 is engaged, and the second external or internal threads 68 of the surface engaging portion 6 are engaged with the internal or external threads 70 at the second end portion 28 of the shaft portion 8.

[0130] It is to be understood that the foregoing is illustrative of various example embodiments and that the invention is defined only by the appended claims. A person skilled in the art will realize that the example embodiments may be modified, and that different features of the example embodiments may be combined to create embodiments other than those described herein, without departing from the scope of the invention, as defined by the appended claims. For instance, the driveshaft interfaces 54, 56, the internal and external threads 64, 66, 68, 70 for connecting the handle portion 4 with the shaft portion 8 and the shaft portion 8 with the surface cleaning portion 6, the transmission 74, the first and second handles 27, 29, the pivotable and lockable second handle 29, the battery 19 may be provided in a cleaning tool that is not specifically devised for wet cleaning. Accordingly, features related to one or more of these aspects may be defined in combination with a cleaning tool that is not

limited to features related to wet cleaning, such as e.g., the water conduit, the water outlet nozzle, the water coupling element, etc.

Claims

1. A portable handheld cleaning tool (2) comprising a handle portion (4), a surface cleaning portion (6), a shaft portion (8) extending between the handle portion (4) and the surface cleaning portion (6), a rotatable brush (10) arranged in the surface cleaning portion (6), an electric motor (14) arranged in the handle portion (4), and a driveshaft (16) extending from the electric motor (14) through the shaft portion (8) to the surface cleaning portion (6), wherein

the shaft portion (8) is removable from the handle portion (4) and from the surface cleaning portion (6), wherein

the cleaning tool (2) is configured for supply of water at the surface cleaning portion (6) and comprises a water supply coupling element (18) arranged at the handle portion (4), at least one water outlet nozzle (20) arranged in the surface cleaning portion (6), and a water conduit (22) extending between the water supply coupling element (18) and the at least one water outlet nozzle (20), and wherein

the shaft portion (8) comprises a water channel (24), forming part of the water conduit (22) and extending from a first end portion (26) of the shaft portion (8) at the handle portion (4) to a second end portion (28) of the shaft portion (8) at the surface cleaning portion (6).

2. The cleaning tool (2) according to claim 1, wherein the shaft portion (8) comprises a duct (30) through which the driveshaft (16) extends, wherein at least part of the shaft portion (8) comprises a tube (32) made from extruded material, and wherein at least part of the water channel (24) and at least part of the duct (30) are formed by the extruded material in one piece as portions of the tube (32).
3. The cleaning tool (2) according to claim 1 or 2, comprising a first water conduit interface (34) between the handle portion (4) and the shaft portion (8), wherein the first water conduit interface (34) comprises a first socket (36) arranged in the shaft portion (8) or in the handle portion (4) and a first protruding tube end portion (38) arranged in the other of the shaft portion (8) and the handle portion (4), and wherein the first protruding tube end portion (38) fits into the first socket (36).
4. The cleaning tool (2) according to any one of the preceding claims, wherein the shaft portion (8) at its

first end portion (26) comprises a first bearing (46) for the driveshaft (16).

5. The cleaning tool (2) according to claims 2 - 4, wherein the first bearing (46) and either at least part of the first socket (36) or the first protruding tube end portion (38) are formed in one single first element (48) and the first element (48) being at least partially inserted into the tube (32) made from extruded material at the first end portion (26) of the shaft portion (8).
6. The cleaning tool (2) according to any one of the preceding claims, comprising a second water conduit interface (40) between the shaft portion (8) and the surface cleaning portion (6), wherein the second water conduit interface (40) comprises a second socket (42) arranged in the shaft portion (8) or in the surface cleaning portion (6) and a second protruding tube end portion (44) arranged in the other of the shaft portion (8) and the surface cleaning portion (6), and wherein the second protruding tube end portion (44) fits into the second socket (42).
7. The cleaning tool (2) according to claim 6 and any one of claim 3 or 5, wherein the first protruding tube end portion (38) fits into the second socket (42) or the second protruding tube end portion (44) fits into the first socket (36) when the shaft portion (8) is removed from the cleaning tool (2).
8. The cleaning tool (2) according to any one of the preceding claims, wherein the shaft portion (8) at its second end portion (28) comprises a second bearing (50) for the driveshaft (16).
9. The cleaning tool (2) according to claims 2 and 6 and 8, wherein the second bearing (50) and either at least part of the second socket (42) or the second protruding tube end portion (44) are formed in one single second element (52) and the second element (52) being at least partially inserted into the tube (32) made from extruded material at the second end portion (28) of the shaft portion (8).
10. The cleaning tool (2) according to any one of the preceding claims, wherein the surface cleaning portion (6) comprises a transmission (74) arranged between the driveshaft (16) and the rotatable brush (10).
11. The cleaning tool (2) according to claim 10, wherein the at least one water outlet nozzle (20) is arranged at a proximity of the rotatable brush (10), and wherein a water conduit portion (80) in the surface cleaning portion (6) extends past at least a portion of the transmission from a region (82) of the surface cleaning portion (6) positioned at the shaft portion (8) to the at least one water outlet nozzle (20).

12. The cleaning tool (2) according to any one of the preceding claims, wherein the surface cleaning portion (6) comprises a splashguard (84) arranged at the rotatable brush (10), and wherein the at least one water outlet nozzle (20) is arranged on the splashguard (84). 5
13. The cleaning tool (2) according to any one of the preceding claims, comprising a flow controlling valve (25) arranged downstream of the water supply coupling element (18). 10
14. The cleaning tool (2) according to any one of the preceding claims, comprising a first driveshaft interface (54) between the handle portion (4) and the shaft portion (8), wherein the handle portion (4) comprises a hollow end portion (58), wherein the first driveshaft interface (54) is recessed from an end (60) of the handle portion (4) within the hollow end portion (58), and wherein the first end portion (26) of the shaft portion (8) is configured to extend into the hollow end portion (58) of the handle portion (4) for engagement of the first driveshaft interface (54). 15 20
15. The cleaning tool (2) according to any one of the preceding claims, comprising a second driveshaft interface (56) between the surface cleaning portion (6) and the shaft portion (8), wherein the second driveshaft interface (56) is recessed within the second end portion (28) of the shaft portion (8), and wherein an end portion (62) of the surface cleaning portion (6) is configured to extend into the second end portion (28) of the shaft portion (8) for engagement of the second driveshaft interface (56). 25 30

Amended claims in accordance with Rule 137(2) EPC.

1. A portable handheld cleaning tool (2) comprising a handle portion (4), a surface cleaning portion (6), a shaft portion (8) extending between the handle portion (4) and the surface cleaning portion (6), a rotatable brush (10) arranged in the surface cleaning portion (6), an electric motor (14) arranged in the handle portion (4), and a driveshaft (16) extending from the electric motor (14) through the shaft portion (8) to the surface cleaning portion (6), wherein 40
- the shaft portion (8) is removable from the handle portion (4) and from the surface cleaning portion (6), wherein 50
- the cleaning tool (2) is configured for supply of water at the surface cleaning portion (6) and comprises a water supply coupling element (18) arranged at the handle portion (4), at least one water outlet nozzle (20) arranged in the surface cleaning portion (6), and a water conduit (22) 55

extending between the water supply coupling element (18) and the at least one water outlet nozzle (20), and wherein the shaft portion (8) comprises a water channel (24), forming part of the water conduit (22) and extending from a first end portion (26) of the shaft portion (8) at the handle portion (4) to a second end portion (28) of the shaft portion (8) at the surface cleaning portion (6), wherein the shaft portion (8) comprises a duct (30) through which the driveshaft (16) extends,

characterized in that,

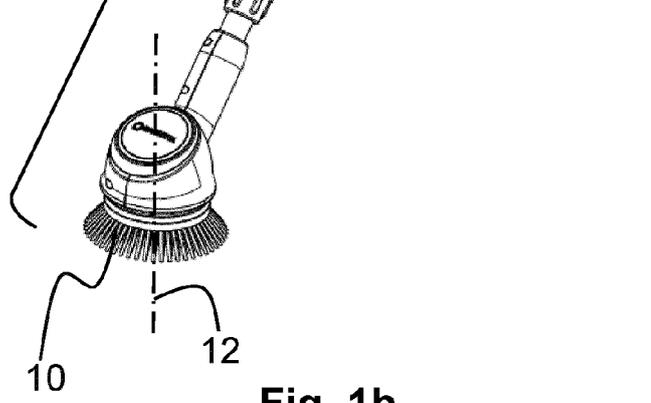
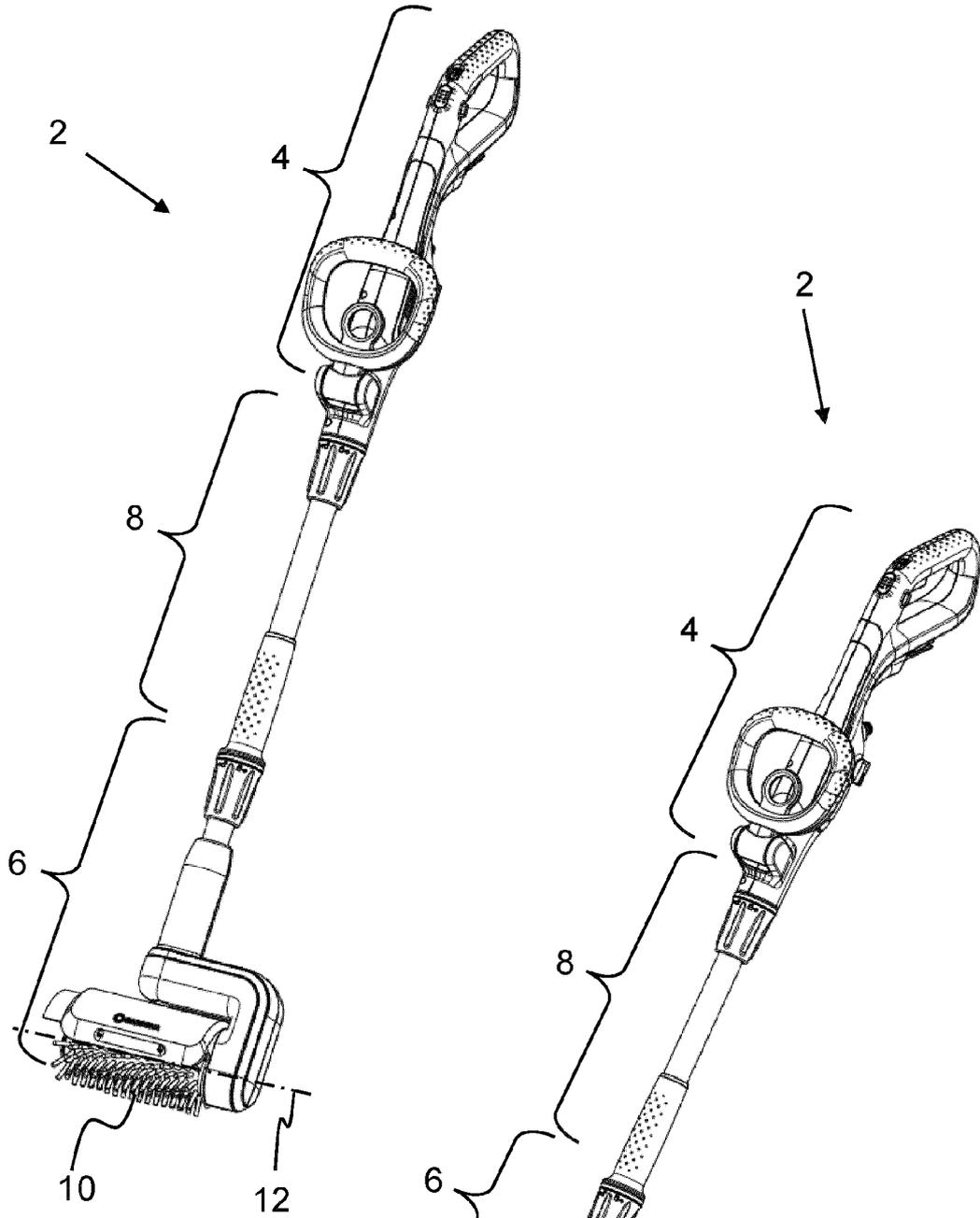
at least part of the shaft portion (8) comprises a tube (32) made from extruded material, and wherein at least part of the water channel (24) and at least part of the duct (30) are formed by the extruded material in one piece as portions of the tube (32).

2. The cleaning tool (2) according to claim 1, comprising a first water conduit interface (34) between the handle portion (4) and the shaft portion (8), wherein the first water conduit interface (34) comprises a first socket (36) arranged in the shaft portion (8) or in the handle portion (4) and a first protruding tube end portion (38) arranged in the other of the shaft portion (8) and the handle portion (4), and wherein the first protruding tube end portion (38) fits into the first socket (36). 20 25 30
3. The cleaning tool (2) according to any one of the preceding claims, wherein the shaft portion (8) at its first end portion (26) comprises a first bearing (46) for the driveshaft (16). 35
4. The cleaning tool (2) according to claims 1 - 3, wherein the first bearing (46) and either at least part of the first socket (36) or the first protruding tube end portion (38) are formed in one single first element (48) and the first element (48) being at least partially inserted into the tube (32) made from extruded material at the first end portion (26) of the shaft portion (8). 40 45
5. The cleaning tool (2) according to any one of the preceding claims, comprising a second water conduit interface (40) between the shaft portion (8) and the surface cleaning portion (6), wherein the second water conduit interface (40) comprises a second socket (42) arranged in the shaft portion (8) or in the surface cleaning portion (6) and a second protruding tube end portion (44) arranged in the other of the shaft portion (8) and the surface cleaning portion (6), and wherein the second protruding tube end portion (44) fits into the second socket (42). 50 55
6. The cleaning tool (2) according to claim 5 and any one of claim 3 or 5, wherein the first protruding tube end portion (38) fits into the second socket (42) or

the second protruding tube end portion (44) fits into the first socket (36) when the shaft portion (8) is removed from the cleaning tool (2).

- 7. The cleaning tool (2) according to any one of the preceding claims, wherein the shaft portion (8) at its second end portion (28) comprises a second bearing (50) for the driveshaft (16). 5
- 8. The cleaning tool (2) according to claims 1 and 5 and 7, wherein the second bearing (50) and either at least part of the second socket (42) or the second protruding tube end portion (44) are formed in one single second element (52) and the second element (52) being at least partially inserted into the tube (32) made from extruded material at the second end portion (28) of the shaft portion (8). 10
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- 9. The cleaning tool (2) according to any one of the preceding claims, wherein the surface cleaning portion (6) comprises a transmission (74) arranged between the driveshaft (16) and the rotatable brush (10). 20
- 10. The cleaning tool (2) according to claim 9, wherein the at least one water outlet nozzle (20) is arranged at a proximity of the rotatable brush (10), and wherein a water conduit portion (80) in the surface cleaning portion (6) extends past at least a portion of the transmission from a region (82) of the surface cleaning portion (6) positioned at the shaft portion (8) to the at least one water outlet nozzle (20). 25
30
- 11. The cleaning tool (2) according to any one of the preceding claims, wherein the surface cleaning portion (6) comprises a splashguard (84) arranged at the rotatable brush (10), and wherein the at least one water outlet nozzle (20) is arranged on the splashguard (84). 35
40
- 12. The cleaning tool (2) according to any one of the preceding claims, comprising a flow controlling valve (25) arranged downstream of the water supply coupling element (18). 45
- 13. The cleaning tool (2) according to any one of the preceding claims, comprising a first driveshaft interface (54) between the handle portion (4) and the shaft portion (8), wherein the handle portion (4) comprises a hollow end portion (58), wherein the first driveshaft interface (54) is recessed from an end (60) of the handle portion (4) within the hollow end portion (58), and wherein the first end portion (26) of the shaft portion (8) is configured to extend into the hollow end portion (58) of the handle portion (4) for engagement of the first driveshaft interface (54). 50
55
- 14. The cleaning tool (2) according to any one of the

preceding claims, comprising a second driveshaft interface (56) between the surface cleaning portion (6) and the shaft portion (8), wherein the second driveshaft interface (56) is recessed within the second end portion (28) of the shaft portion (8), and wherein an end portion (62) of the surface cleaning portion (6) is configured to extend into the second end portion (28) of the shaft portion (8) for engagement of the second driveshaft interface (56).



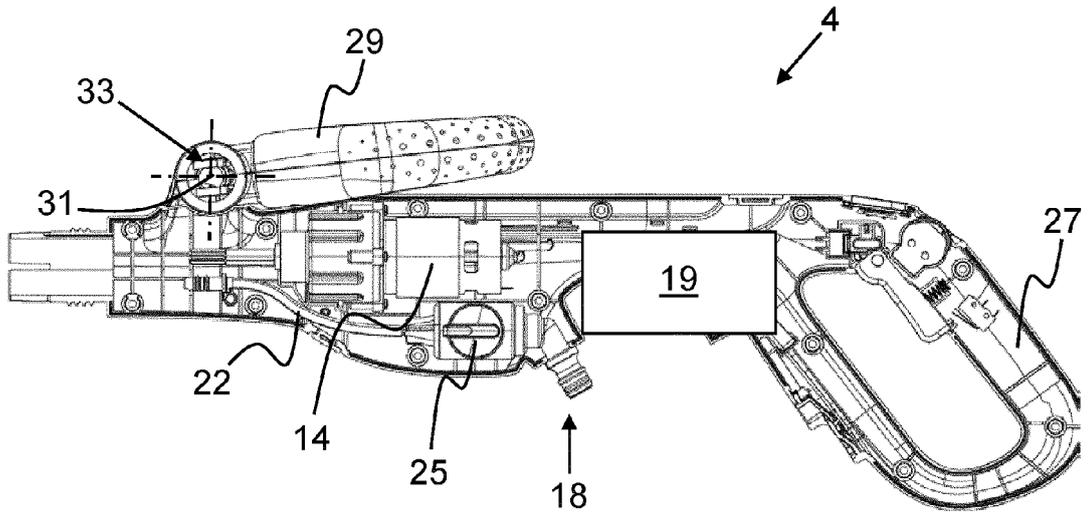


Fig. 2a

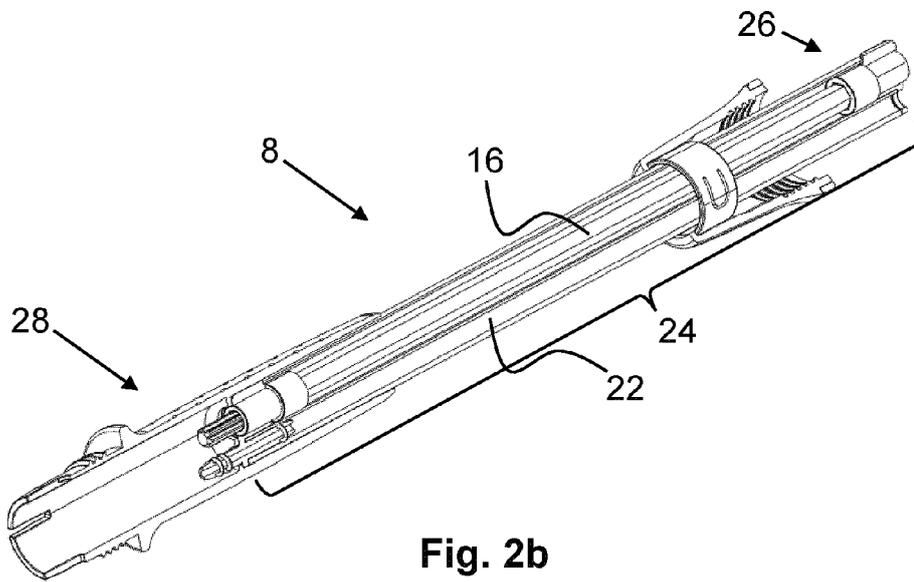


Fig. 2b

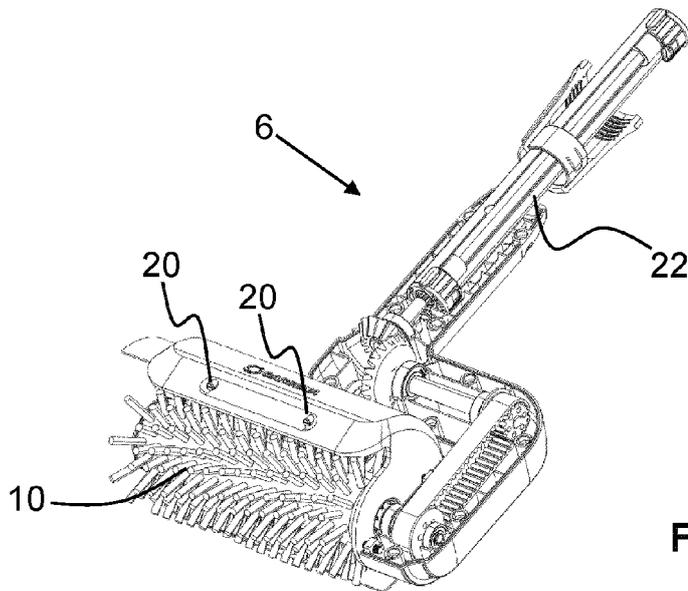


Fig. 2c

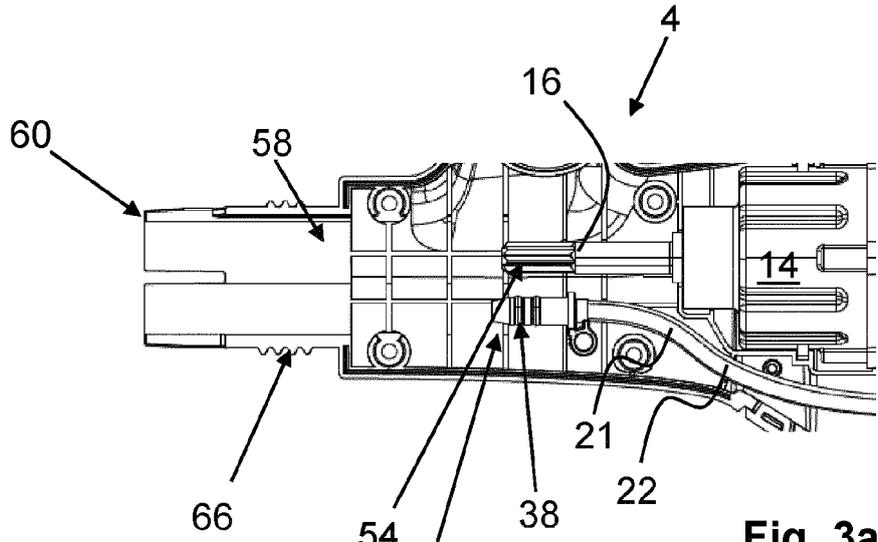


Fig. 3a

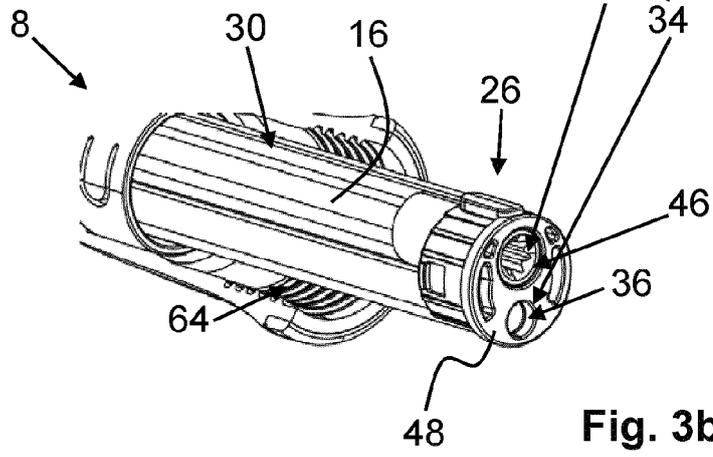


Fig. 3b

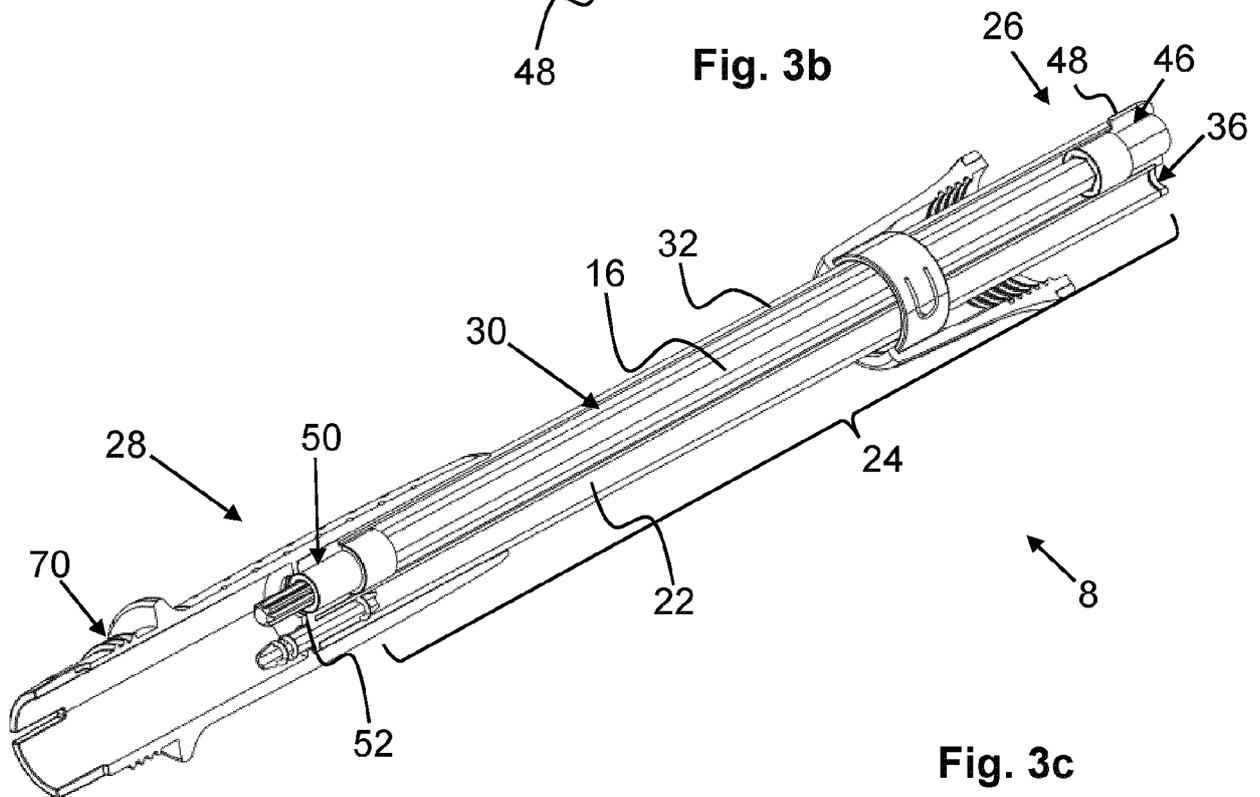


Fig. 3c

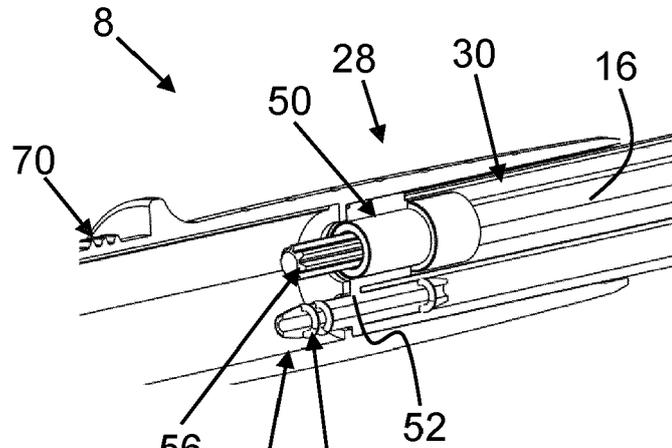


Fig. 3d

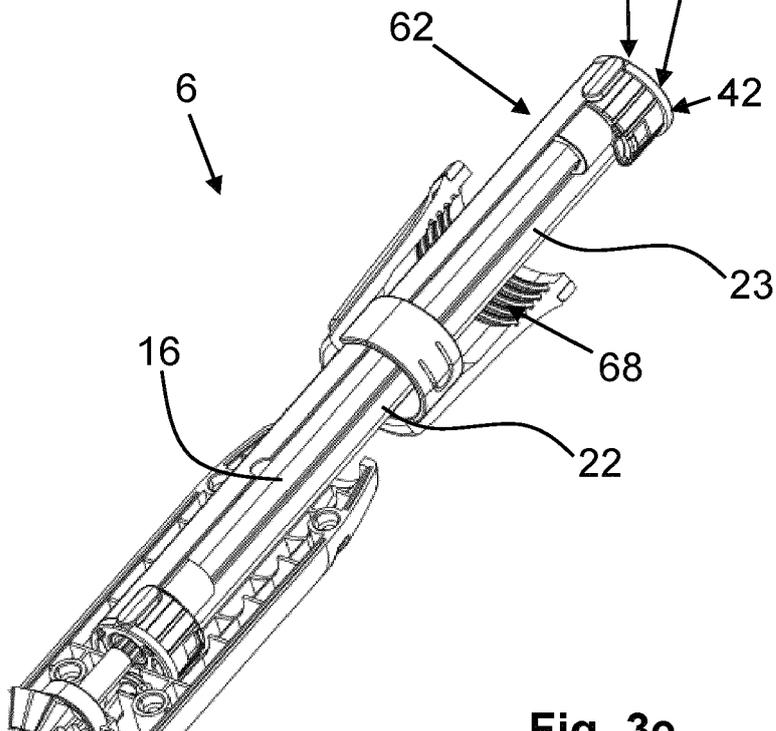
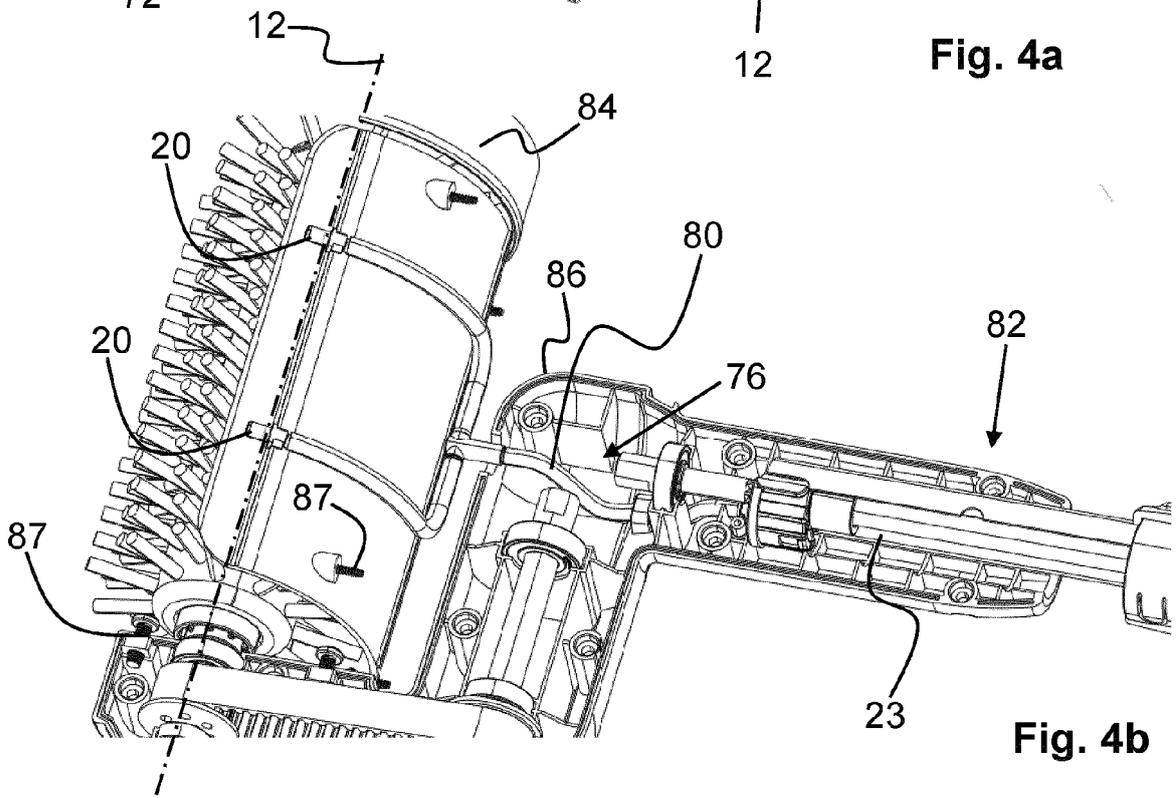
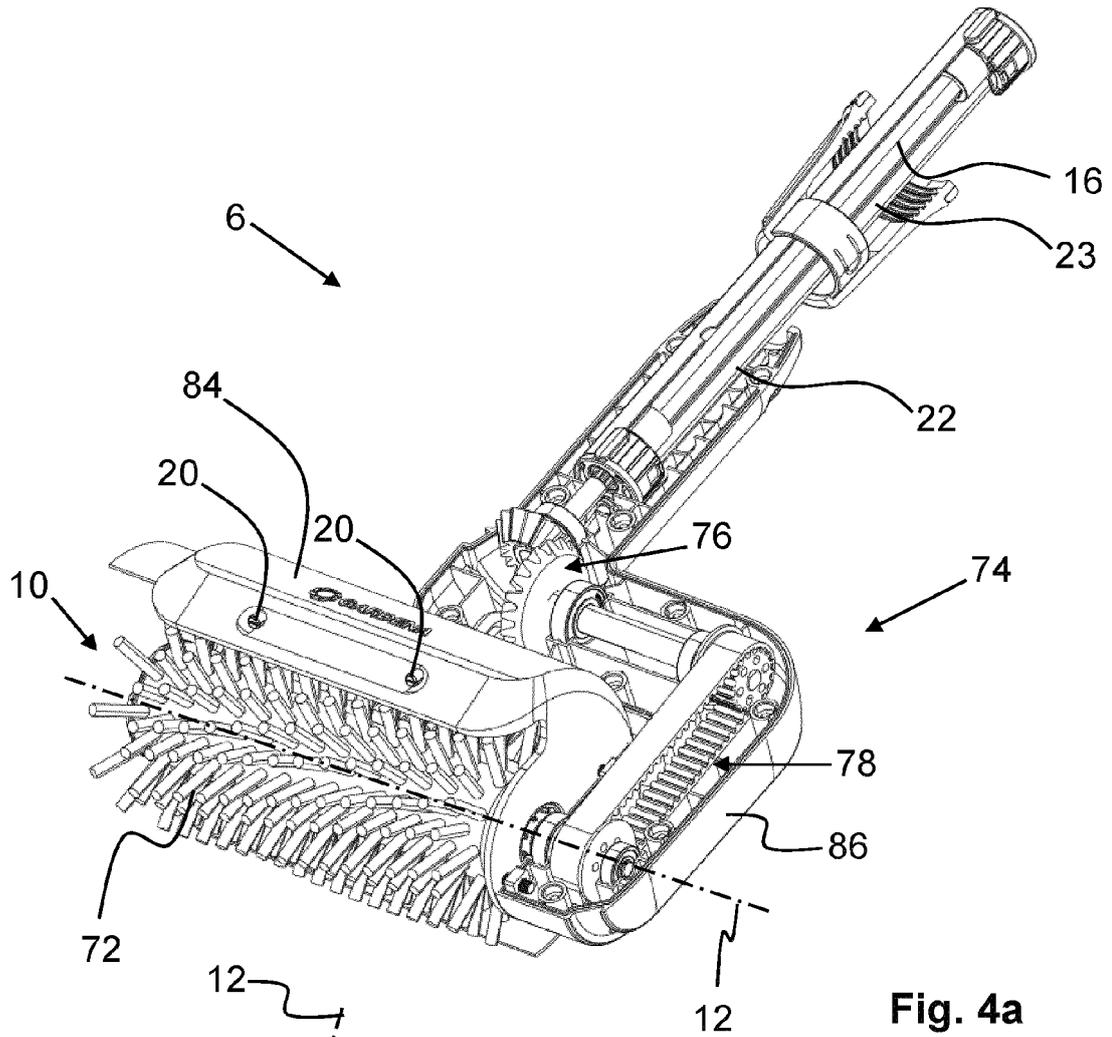


Fig. 3e



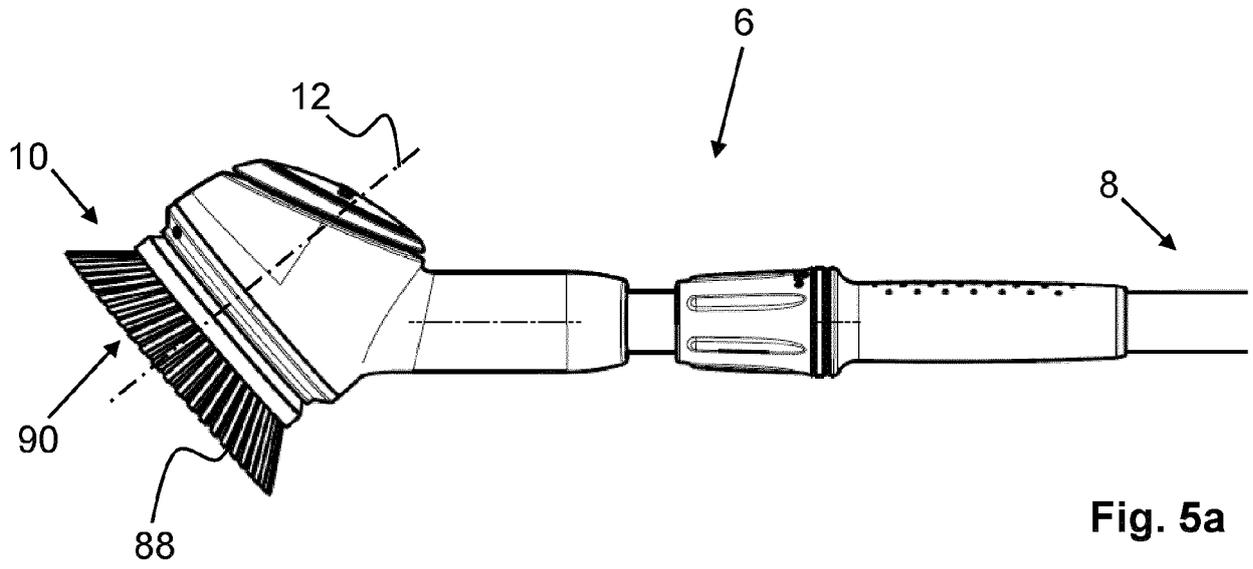


Fig. 5a

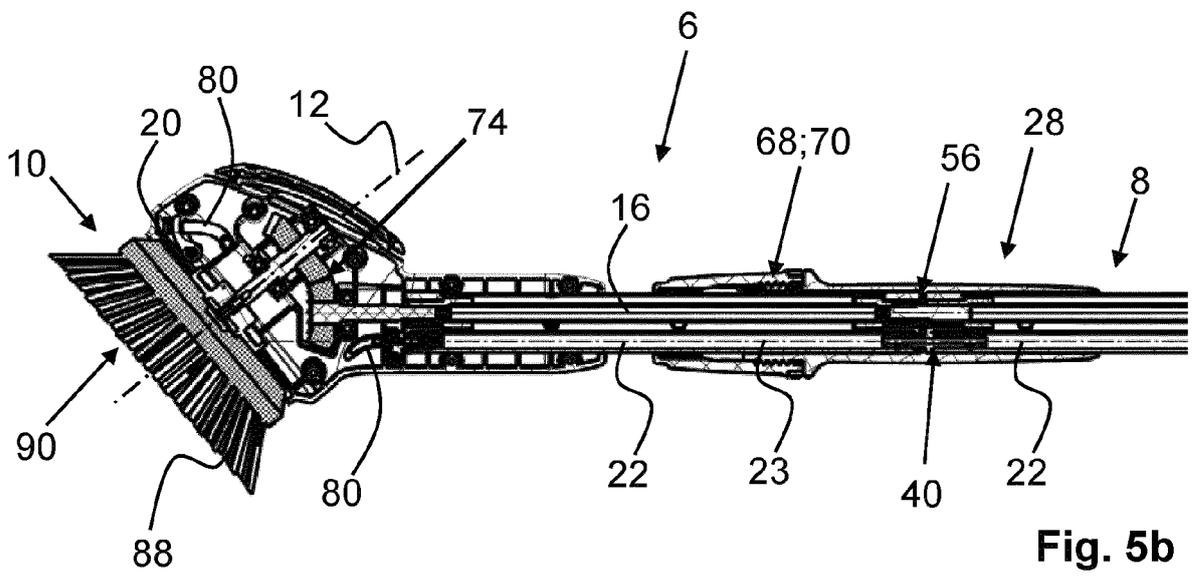


Fig. 5b



EUROPEAN SEARCH REPORT

Application Number

EP 23 15 9175

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DOCUMENTS CONSIDERED TO BE RELEVANT

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	<p>KR 100 787 144 B1 (KIM MUN JOUNG [KR]) 21 December 2007 (2007-12-21) * claims 1-9; figures 3,4,6,9,13 *</p> <p>-----</p>	1, 2, 4, 8, 10-13	<p>INV. A47L11/282 A47L11/40 B08B1/00</p>
X	<p>US 5 146 642 A (MANK JAMES F [US] ET AL) 15 September 1992 (1992-09-15) * column 2, line 44 - column 4, line 53; figures 1,2,3,7,12,13 *</p> <p>-----</p>	1-4, 6-8, 10, 13-15	B08B1/04
Y	<p>US 4 335 481 A (SLAYMAN GLEN E) 22 June 1982 (1982-06-22) * figures 1,2 *</p> <p>-----</p>	8	B08B3/02
A	<p>DE 20 2022 100665 U1 (MI SHOUQIANG [CN]) 18 February 2022 (2022-02-18) * figure 1 *</p> <p>-----</p>	11, 12	
A	<p>US 4 780 992 A (MCKERVEY ROY B [US]) 1 November 1988 (1988-11-01) * figures 1,2 *</p> <p>-----</p>	1	
A	<p>CN 112 386 182 A (SUMEC HARDWARE & TOOLS CO LTD) 23 February 2021 (2021-02-23) * figures 1,4 *</p> <p>-----</p>	1, 11, 12	<p>TECHNICAL FIELDS SEARCHED (IPC)</p> <p>A47L A61D A46B B08B</p>
A	<p>EP 1 961 518 A1 (FLEX ELEKTROWERKZEUGE GMBH [DE]) 27 August 2008 (2008-08-27) * figures 1-5 *</p> <p>-----</p>	1	
<p>The present search report has been drawn up for all claims</p>			
Place of search		Date of completion of the search	Examiner
The Hague		15 August 2023	Cassiat, Clément
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>..... & : member of the same patent family, corresponding document</p>			

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

EP 23 15 9175

5 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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15-08-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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