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(54) **STEAM MOP AND FLOOR TOOL THEREFOR**

(57) An apparatus for cleaning a floor surface, the apparatus may have an elongated body. A heater is configured for receiving liquid and heating the liquid. A conduit may be in fluid flow communication with an outlet of the heater. A floor tool is connected at a proximal end of the elongated body. The floor tool may include a hub portion, at least one roll defining a floor cleaning interface, the roll connected to the hub portion for rotation, the roll defining an inner cavity for receiving steam, the floor cleaning interface of the roll being permeable to steam. A delivery outlet may be in fluid flow communication with the conduit to receive steam or vapour therefrom, the delivery outlet in fluid flow communication with the inner cavity of the roll.

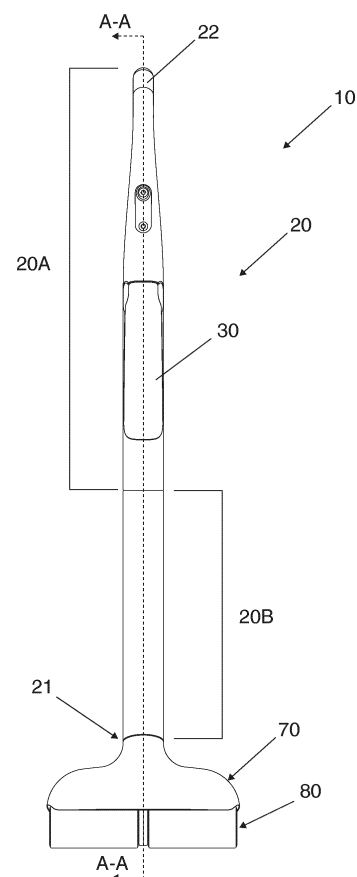


FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the priority of United States Patent Application No. 63/607,725, filed on December 8, 2023, the content of which is incorporated hereby in its entirety by reference.

TECHNICAL FIELD

[0002] The present application relates to mops or like mopping devices, and more particularly to hot mops or steam mops that produce steam, or like apparatuses using steam in a scrubbing or rubbing action.

BACKGROUND

[0003] Mops are commonly used to clean some ground surfaces, such as floors within building. In contrast to brooms, mops may soak up a liquid, such as water with or without detergent, to assist in cleaning a surface. Such mops may be known as wet mops. Mops have further evolved to include steam-generating capability. In such steam mops, also referred as hot mops, a heating element within the mop generates steam that is exhausted at a floor tool of the mop. Accordingly, the hot temperature of the steam or liquid at the floor tool may contribute to the cleaning operation, notably by the heated floor tool's capacity to disinfect and kill germs.

[0004] While existing floor tools for such mops may deliver steam to heat the floor surface to facilitate cleaning, improvements are still sought to better dislodge dirt and clean the surface rapidly and efficiently while limiting the manual scrubbing effort by the user.

SUMMARY

[0005] In a first aspect, there is provided an apparatus for cleaning a floor surface, the apparatus comprising: an elongated body; a heater configured for receiving liquid and heating the liquid; a conduit in fluid flow communication with an outlet of the heater; a floor tool connected at a proximal end of the elongated body, the floor tool including: a hub portion, at least one roll defining a floor cleaning interface, the roll connected to the hub portion for rotation, the roll defining an inner cavity for receiving steam, the floor cleaning interface of the roll being permeable to steam, and a delivery outlet in fluid flow communication with the conduit to receive steam or vapour therefrom, the delivery outlet in fluid flow communication with the inner cavity of the roll.

[0006] Further in accordance with the first aspect, for instance, the floor tool further includes a drive unit drivably engaged to the at least one roll to rotate the roll relative to the hub portion.

[0007] Still further in accordance with the first aspect, for instance, the drive unit includes a shaft rotating re-

lative to the hub portion, the at least one roll mounted to the shaft.

[0008] Still further in accordance with the first aspect, for instance, the drive unit includes an electric motor.

[0009] Still further in accordance with the first aspect, for instance, the electric motor is coupled to the roll by a transmission, the transmission reducing a rotational speed of the roll relative to a rotational speed of the electric motor.

[0010] Still further in accordance with the first aspect, for instance, the transmission includes a belt and pulleys or gears.

[0011] Still further in accordance with the first aspect, for instance, the delivery outlet includes a manifold in the hub portion, the manifold in fluid communication with the conduit.

[0012] Still further in accordance with the first aspect, for instance, the manifold defines at least one outlet aligned with an inlet of the at least one roll, the inlet of the at least one roll being in an end face thereof.

[0013] Still further in accordance with the first aspect, for instance, the floor tool has two rolls, the manifold has at least one of the outlet for each of the two rolls.

[0014] Still further in accordance with the first aspect, for instance, a liquid reservoir may be in fluid communication with the heater to supply liquid to the heater.

[0015] Still further in accordance with the first aspect, for instance, the liquid reservoir and the heater are in the elongated body.

[0016] Still further in accordance with the first aspect, for instance, the floor tool includes a rotative head rotatably coupled to the elongated body for rotation, the rotative head forming a rotational joint with an end of the elongated body.

[0017] Still further in accordance with the first aspect, for instance, the conduit is routed inside the rotative head and the hub portion.

[0018] Still further in accordance with the first aspect, for instance, the at least one roll is rotatably mounted to a shaft of the floor tool.

[0019] Still further in accordance with the first aspect, for instance, the floor tool has two of the roll, the two of the rolls being mounted to the shaft.

[0020] Still further in accordance with the first aspect, for instance, the at least one roll is matingly engaged to the shaft.

[0021] In a second aspect, there is provided a roll for a steam mop, the roll comprising: a body having a wall having an outer surface and defining an inner cavity; a floor interfacing layer permeable to steam, the floor interfacing layer mounted peripherally about the roll body; and a connector portion at an end of the body, the connector portion having a shaft receiving portion configured for matingly receiving a shaft of the steam mop therein, the connector portion having at least one fluid inlet at the connector portion in fluid communication with the inner cavity for steam to be injected in the inner cavity; wherein the body defines a steam path between the inner cavity

and the floor interfacing layer.

[0022] Further in accordance with the second aspect, for instance, the outer surface of the body is cylindrical, the wall having a plurality of holes therethrough to define the steam path.

[0023] Still further in accordance with the second aspect, for instance, the floor interfacing layer is one of a fabric, a cloth, a textile, bristles on a substrate.

[0024] Still further in accordance with the second aspect, for instance, the floor interfacing layer is glued to the outer surface.

[0025] Still further in accordance with the second aspect, for instance, the shaft receiving portion has an elongated shape.

[0026] Still further in accordance with the second aspect, for instance, the connector portion has a counter-bore portion, with the shaft receiving portion projecting inwardly from the counterbore portion.

[0027] Still further in accordance with the second aspect, for instance, the at least one fluid inlet is in the counterbore portion.

[0028] Still further in accordance with the second aspect, for instance, at least one keying feature is defined in the shaft receiving portion to block a rotation between the roll and the shaft.

[0029] In a third aspect, there is provided a method for defining a steam path between a floor tool of a steam mop and an outer surface of a roll, comprising: unscrewing a roll out of engagement from a shaft of the floor tool; subsequently screwing another roll into engagement with the shaft of the floor tool, for an end of the other roll having at least one inlet to be adjacent to a steam outlet of the floor tool; and activating a heater of the steam mop for steam to be generated and to follow a steam path being sequentially through the steam outlet, the at least one inlet, an inner cavity of the other roll and through the outer surface of the roll.

DESCRIPTION OF THE DRAWINGS

[0030] Reference is now made to the accompanying figures in which:

Fig. 1 is a front elevation view of a steam mop with a rotative head in accordance with the present disclosure;

Fig. 2 is a side elevation cross-sectional view of the steam mop in a plane A-A of Fig. 1;

Fig. 3A is a front elevation partial cross-sectional view of a portion of the steam mop of Figs. 1-2, without shell removed;

Fig. 3B is a cross-sectional view of the rotative head of the steam mop in a plane B-B of Fig. 2;

Fig. 3C is a side elevation cross-sectional view of the

rotative head of the steam mop in the plane A-A of Fig. 1;

Fig. 4 is a perspective view of one of the rolls of the steam mop of Figs. 1-2;

Fig. 5A is a magnified perspective view of a portion of the steam mop of Fig. 1, with rolls;

Fig. 5B is another magnified perspective view of the portion of the steam mop of Fig. 5A, with a roll removed to show part of a steam path;

Fig. 5C is another magnified perspective view of the portion of the steam mop of Fig. 5A-5B, with a part of a roll removed to further show part of the steam path;

Fig. 5D is another magnified perspective view of the portion of the steam mop of Fig. 5A-5C, with a part of a roll removed to further show part of the steam path; and

Fig. 6 is a side elevation cross-sectional view of the rotative head of a steam mop in accordance with another aspect.

DETAILED DESCRIPTION

[0031] Referring to Figs. 1 to 5D, a steam mop with a rotative head and floor tool(s) in accordance with the present disclosure is generally shown at 10. The steam mop 10 may also be known as a hot mop, steam generating mop, steamer mop, etc. and will be referred to herein as a steam mop for simplicity. Stated generally, the steam mop 10 heats a liquid such as water into steam, and may do so through electrical power, with resistive elements in direct heat exchange relation with a water circuit, or through a heat transfer fluid (e.g., oil), among other possibilities. The steam mop 10 exhausts the steam at floor tool(s). The steam may also be exhausted directly onto a floor. While the present description provides a rotative floor tool as an example, and describes the apparatus as a steam mop 10, the mop 10 may be used for other functions, not necessarily as a mop, and may thus be referred to as an apparatus 10, such as a surface-cleaning apparatus. For example, the apparatus 10 may be used with other floor tools, such as a squeegee, a brush or pads. These components could be accessories available with the apparatus 10, along with the floor tool shown and described herein. The expression "steam" is used herein. However, the mop 10 may produce vapour (a.k.a., vapor) that may be at a higher temperature than ambient temperature, and may not result from boiling. For simplicity, reference is made herein to steam, but steam may include vapour, and vice-versa.

[0032] Referring to Fig. 2, the steam mop 10 may be described as having an elongated body 20, a liquid tank

30, a pump 40, a heating unit 50, a power system 60, a floor tool 70, roll(s) 80, nozzle unit(s) 90 (Fig. 6) and/or various conduits in the 100s. The steam mop 10 may have all of these components and additional components, or fewer components than the ones listed above. For example, the steam mop 10 may not have a liquid tank 30 in the hand-held portion and may instead be in fluid communication with a liquid source. Moreover, the steam mop 10 may be connected to a steam supply so as not to enclose some of the components such as the heating unit 50 and liquid tank 30. However, in a variant, the steam mop 10 is a self-contained system that is configured to be employed in a portable manner, and could even integrate a battery, or may alternatively be connectable to the power grid for power supply.

[0033] From a general standpoint, the elongated body 20 encloses the various functional components of the steam mop 10 and has ornamental features as well as ergonomic features. As the elongated body 20 encloses some functional components such as the heating unit 50, the elongated body 20 may have a protective or shielding role. The liquid tank 30 is the water recipient of the steam mop 10. The expression "water" is used herein, but other liquids may be present instead of water, such as a mixture of liquid and chemical and/or natural cleaning agents. For simplicity, reference is made herein to water as being present in the liquid tank 30. Other ways to describe the tank 30 include a reservoir, a receptacle, a receiver, etc. In an embodiment, as shown, the liquid tank 30 may be removable from a remainder of the steam mop 10. The pump 40 is used to direct the liquid from the tank 30 to the heating unit 50. The heating unit 50 converts electrical power into heat so as to boil the liquid into steam. The power system 60 interfaces the steam mop 10 to a power source such as the power grid. The floor tool 70 is mounted at a distal end of the elongated body 20. The floor tool 70 may include a steam delivery system and supports the rolls 80. The rolls 80 are the interface of the steam mop 10 with the floor and may assist in directing steam out of the steam mop 10. The various conduits labelled in the 100s fluidly connect the liquid tank 30 optionally, the pump 40 and the heating unit 50. Moreover, the conduits 100s provide the steam to the steam delivery system of the floor tool 70.

[0034] Referring concurrently to Figs. 1-2, the elongated body 20 may have other names, such as handle, stick, rod, body, shaft, etc. The elongated body 20 may be hollow. The elongated body 20 may be made of a plastic, among other possibilities, notably due to the low heat transfer capability of plastic in comparison to some metals. Other materials, including metal and natural materials, may be used. The elongated body 20 is shown having a generally straight shape, with a continuous surface, optionally. The elongated body 20 exhibits a change in cross-sectional dimensions, again as an option. The elongated body 20 may generally be separated in two or more segments for the purpose of explaining its construction, though said segments may be imaginary and

may not show any physical demarcation. There may be more segments, or one segment only.

[0035] The elongated body 20 may have a distal segment 20A and a proximal segment 20B, and a delimitation between segments 20A and 20B may be arbitrary, and/or the delimitation may be virtual, i.e., not physical, though in a variant the elongated body 20 may be separated at a junction between segments 20A and 20B. The distal segment 20A is away from the floor tool 70, and generally points upward when the steam mop 10 is used. For leverage, the user may have a hand on the distal segment 20A when using the steam mop 10. The proximal segment 20B is between the distal segment 20A and the floor tool 70. The user may have his/her/their other hand on the proximal segment 20B when using the steam mop 10. The proximal segment 20B is that to which the floor tool 70 is connected. For example, a swivel joint 21, also known as swivel, may be at the end of the proximal segment 20B, for interfacing the floor tool 70 to the elongated body 20, and enable orientation movements therebetween. The swivel joint 21 may for example provide one rotational degree of freedom (DOF) between the elongated body 20 and the floor tool 70 (more DOF could be provided). The swivel joint 21 or other joint may be part of the rotative head as well. Other joints could be used, including a hinge, or a pair of hinges in serial arrangement, a spherical joint. The separation of the elongated body 20 may facilitate shipping of the steam mop 20, by reducing the overall length of a shipping package.

[0036] The segments are shown at 20A and 20B in Fig. 1. As observed, the distal segment 20A may have an end of reduced diameter, defining a handle portion of the mop 10. The handle portion has a grip 22 may also be known as a grip portion, etc, and is positioned in the distal segment 20A. The grip 22 may be present to enhance a user's grasp of the elongated body 20, as the steam mop 10 may be manipulated via the grip 22. In an embodiment, the grip 22 is covered with cork, but it may consist in other materials, such as rubbers (e.g., TPU) or like elastomeric polymers. Although one grip 22 is shown, other grips may be present, such as in the proximal segment 20B at a location where the hand of the user is expected to be located when the steam mop 10 is being manipulated.

[0037] Referring to Fig. 2, the tank 30 is shown, the tank 30 being optional. The tank 30 may be a removable component of the elongated body 20, though the tank 30 could be fixed integrally to the elongated body 20 as well, if such a tank is present. The tank 30 is shown as defining an outer wall portion of the elongated body 20, in a generally continuous, stepless manner (though this is optional). Such an assembly contributes to the sleek look of the elongated body 20, and the ergonomics of the steam mop 10. The tank 30 may typically be located in the distal segment 20A, but may be in the proximal segment 20B of the elongated body 20, or may overlap the segments 20A and 20B. By being located between handling locations or at a handling location, the maneu-

verability of the steam mop 10 may be facilitated. The tank 30 is shown as part of the steam mop 10, but only as an example as it is contemplated to connect the steam mop 10 to a water supply line, for example, or to have a liquid tank 30 separate from the steam mop 10. In an aspect, the tank 30 is made of or has a transparent material or of a translucent material such that a user may see the level of liquid in the tank 30. As alternatives, a window(s) could be present in the tank 30, again to show the level of liquid in the tank 30, or an electronic level probe could be on the steam mop 10 to provide data indicate of a level of water in the tank 30. For example, the probe could be connected to a LED or like interface to indicate to the user that the tank 30 must be refilled.

[0038] In an aspect, the tank 30 is removable. To achieve the removal, the tank 30 therefore may have a latch device, with a complementary catch arrangement in a bottom of the tank 30, with a receptacle in the elongated body 20, for example. A user may press on such latch device to detach the tank 30 from the elongated body 20. Other types of latching or locking devices could be used, including standard fasteners such as screws, if the tank 30 is removable. Moreover, a vent, with for example a valve (e.g., check valve) may be provided in the tank 30, such as in a bottom portion of the tank 30, to keep the liquid in the tank 30 when not connected attached in its receptacle of the elongated body 20.

[0039] In the variant of Figs. 1-2, the tank 30 may be part of the distal segment 20A. Accordingly, it may be detached with the distal segment 20A to be filled while separated from a remainder of the mop 10.

[0040] Referring to Fig. 2, the pump 40 is located in the cavity of the elongated body 20 so as to be concealed therein. The pump 40 may be in the proximal segment 20B, in the distal segment 20A, or partly in both. As illustrated in the figures, the pump 40 is located below the liquid tank 30 in the elongated body 20. The pump 40 is shown as having an inlet 41 and an outlet 42. The pump 40 is typically an electrically powered pump that is in fluid communication with the liquid tank 30 or other fluid source so as to receive a liquid supply therefrom. The pump 40 provides the motive force so as to direct the liquid to the heating unit 50. The steam mop 10 could be without a pump 40, relying instead on gravity and fluid pressure. However, the pump 40 may be used to control the steam output from the steam mop 10. The mop 10 could use an equivalent to the pump 40 such as an on/off valve. As an alternative to an electric pump, motive force may be provided by other mechanisms, such as a CO₂ cartridge, a hand pump operated with a trigger to increase a pressure in the tank 30, and force the water out by pressure differential. Other motive force arrangement may include using a pressurized water source feeding a flow of water from outside of the steam mop 10, e.g., a hose connected to a water tap. Hence, the steam mop 10 may not include a pump 40 or motive force source in a variant. Likewise, the mop 10 may rely on the pressure resulting from the exposure to heat as motive

force.

[0041] The heating unit 50 is typically located below the pump 40, in close proximity to the swivel 21. The heating unit 50 may thus be in the proximal segment 20B, though this is optional. The heating unit 50 may have a support 50A, also known as shell, though this is optional, so as to be generally centrally located in the cavity of the elongated body 20, and spaced from the walls of the elongated body 20. Such a support 50A may also be an integral part of the heating unit 50. If present, the support 50A may be made of a material that has suitable insulative properties, to limit heat conduction. If present, the support 50A interfaces the heater of the heating unit 50 to the inner surface of the elongated body 20 such that the heater is not in direct contact with a wall of the elongated body 20. Hence, the support 50A may be a heat shield, that could also be part of layers of the heating unit 50.

[0042] The heating unit 50 has an inlet 51 and an outlet 52. The inlet 51 receives a feed from the pump 40 (if present), while the outlet 52 exhausts steams that is directed to the floor tool 70. In an embodiment, the inlet 51 and outlet 52 are nipples for conduit connection thereto. Barbs may be present for conduit coupling. Other types of couplings may be used, such as tubing couplings, quick connect couplings, etc.

[0043] The heater of the heating unit 50 may typically include a heating pathway from the inlet 51 to the outlet 52. In an aspect, the heating pathway is heated by electrical power (though optionally) such that water entering the inlet 51 moves forward toward the outlet 52 while being heated. A labyrinth-like configuration, which may also be referred to as coil-like, extends the residence time of the liquid into the heater of the heating unit 50 so as to assist in converting the water into steam. The heater or at least an interior thereof with the heating pathway may be made of metal. In an aspect, the heater has resistive elements so as to convert electrical power into heat. Electrical connections may therefore extend to the power system 60. As alternatives to a heating pathway, the heater of the heating unit 50 may define a hollow chamber traversed by resistive elements acting as heating coils, among possibilities.

[0044] Referring to Figs. 1-2, some of the components of the power system 60 are shown. An electrical cord portion (not shown) may be at a distal end or connect to the proximal segment 20B of the elongated body 20. In an embodiment, a power cord extends from the steam mop 10 to a power source such as the grid, as an example among others. A battery could also be used, and port(s) may be present to recharge the battery. A power button 62 is optionally present on the elongated body 20 with at least an on/off capability, so as to activate the steam mop 10. In an embodiment, an on state via the power button 62 will automatically cause an actuation of the heating unit 50. In contrast, the pump 40 may be in an idle state until a trigger is used by a user. The appropriate electronic circuitry is provided, so as to cause an actuation of the pump 40 when the power button 62 is activated, or cause

an actuation of the motive force, allow a flow of water (e.g., power button 62 connected to an on/off valve), etc, if there is no pump 40. If present, the pump 40 will therefore pump liquid from the tank 30 or other source and direct it to the heating unit 50. In doing so, a pressure inside the heating unit 50 increases and this causes steam to outlet via the outlet 52. In an embodiment, the heating unit 50 is in a heating mode from the moment the steam mop 10 is turned on, but it is also contemplated to require that the power button 62 be depressed to turn the heating unit 50 on, and to actuate a rotation of rolls 80. Other power aspects of the power system 60 with components and functionalities of the floor tool 70 and roll 80 will be described later.

[0045] A printed circuit board of the power system 60 may be located at a bottom of the elongated body 20 or may be at other locations. In the variant of Figs. 1-2, all electronic components may be in the proximal segment 20B. The PC board or like circuit card, processor, etc is present in order to manage the commands of the steam mop 10. The PC board may include other features such as sensors, an interface, etc. The PC board may therefore perform functions such as managing electric current, preventing overheating, automatically shutting down the steam mop 10, provide water level indications, etc.

[0046] Referring to Figs. 3A-3C, 4 and 5A-5D, the floor tool 70 and rolls 80 will now be presented in more detail. The roll(s) 80 may be part of the floor tool 70. The floor tool 70 is connected at a proximal end of the elongated body 20. In the embodiment shown, the proximal end of the elongated body 20 is part of the proximal segment 20B. The floor tool 70 is rotatable relative to the elongated body 20 via the swivel 21.

[0047] As shown in Fig. 3B, the floor tool 70 has a shell body 71. The shell body 71 defines at least part of an outer surface of the floor tool 70. The shell body 71 may have the same general design appearance as the elongated body 20 (at least the proximal segment 20B) so as to form a continuous and sleek look with the adjacent outer surface of the proximal segment 20B. This is only one possibility, as the floor tool 70 could have other configurations. As shown, the shell body 71 may be hollowed to enclose components of the floor tool 70 therein. Amongst others, the shell body 71 may enclose a frame 72 of the floor tool 70, or equivalent structure. The frame 72 is coupled to the shell body 71. Coupling of these components may be via fasteners, clips, interlocking features, adhesives, etc. The frame 72 may provide structural integrity to the floor tool 70, while the shell body 71 conceals components, and provides the esthetic features. The frame 72 may support components of the floor tool 70. In variants, the shell body 71 and the frame 72 may be integral so as to form a same piece. The shell body 71 could also be the structure of the floor tool instead of the frame 72.

[0048] The floor tool 70 includes a rotative head 73 that is rotatably coupled to the elongated body 20 for rotation. The rotative head 73 may define the spinal column of the

floor tool 70, as it provides the articulation and junction between the elongated body 20 and the remainder of the floor tool 70. The rotative head 73 may extend along a swivel axis SS. The rotative head 73 may be coupled to the frame 72 and/or shell body 71, and interfaces them to the elongated body 20. In a variant, the rotative head 73 may form part of the structure of the floor tool 70 with the frame 72. A coupling between the rotative head 73 and frame 72 and/or shell body 71 may be achieved via fasteners, clips, interlocking, adhesives, as some possibilities. The rotative head 73 includes a swivel connection 73A at a top end thereof for connection with the proximal end of the elongated body 20. Stated otherwise, the rotative head 73 may form part(s) of the swivel 21 allowing the rotating movement (e.g., up to 180 degrees about the swivel axis in an embodiment but it could be more) between the elongated body 20 and the floor tool 70. In an embodiment, the swivel connection 73A may include a bearing arrangement interfacing with the elongated body 20. In a variant, the swivel connection 73A is defined by an annular channel in a surface of the rotative head 73, with a rim in the elongated body 20 forming a plain bearing for the rotative head 73. As an alternative configuration, the bearing arrangement making up the swivel joint 21 may include roller bearings or cylindrical bearings, for example. The bearing arrangement could be considered to form part of the elongated body 20 as well, in variants.

[0049] Thus, in an aspect, the rotative head 70 has a cylindrical outer surface, with various segments of different diametrical dimensions, for the rotative head 70 to rotate relative to the elongated body 20, when connected to it. The rotative head 73 may include a plurality of sections 73B, 73C (here two sections) which, once assembled, may define a shell-like structure. Coupling of the sections 73B, 73C may be achieved via fasteners, clips, interlocking, adhesives, as some possibilities. In the embodiment shown, the rotative head 73 may define an enclosure 73D. As will be described later, conduit 103 from the heating unit 50 may be routed through such enclosure 73D to reach a steam delivery outlet 73G (Fig. 3C).

[0050] The rotative head 73 has a hub portion 73E defined at a proximal end thereof. The hub portion 73E is configured to engage with one or more rolls 80, as will be described later. The hub portion 73E may be generally hollow. As shown in Fig. 3B, the hub portion 73E may enclose components of a drive unit 74 (described later). In the embodiment shown, the hub portion 73E has a cup-shape, with its convex side facing outwardly towards the rolls 80, and its concave side facing towards the swivel axis SS. This is an option of configuration as other configurations are possible. In the embodiment shown, and as can also be seen in Fig. 5B, the hub portion 73E may have a peripheral wall, optionally cylindrical, and an end wall, optionally round, capping an end of the peripheral wall. Steam delivery outlet 73G may be defined in such end wall, as shown in Fig. 5B, and/or in the peripheral

wall, in some variants. Returning to Fig. 3B, the rotative head 73 has a transmission guard portion 73F which extends in a distal direction from the hub portion 73E. The transmission guard portion 73F encloses some of the components of the drive unit 74. The transmission guard portion 73F may define connection interface(s) with components of the drive unit 74. The transmission guard portion 73F may be aligned with the swivel axis SS, as in the embodiment shown. The transmission guard portion 73F may define a relatively thin section of the rotative head 73 that extends between the hub portion 73E and a remainder of the rotative head 73 that extends up to the swivel connection 73A. The transmission guard portion 73F may have a shape that is complementary with that of components of the drive unit 74. Stated otherwise, an interior of the transmission guard portion 73F may define a negative of the components of the drive unit 74 it interfaces with. This is only one possibility, as the transmission guard portion 73F may not have such shape. The transmission guard portion 73F may enclose some of the moving components of the drive unit 74 to protect them from an exterior of the floor tool 70. The transmission guard portion 73F may also be part of the structure of the floor tool 70, as it supports some of the components of the floor tool 70, including the roll(s) 80.

[0051] The drive unit 74 provides driving power to the roll(s) 80. A pair of rolls 80 are shown, but a single roll 80 could be present, or more than the two shown. For simplicity, reference is made herein to rolls 80, even though a single roll 80 could be present. The drive unit 74 is drivingly engaged to the rolls 80 so as to rotate the rolls 80 for scrubbing/rubbing against the floor surface when such option of the steam mop 10 is activated (e.g., via the power button 62 discussed above). In a variant, the drive unit 74 is optional, as the rolls 80 could rotate by themselves as a result of friction when a user mops a surface with the mop 10. However, the presence of a drive unit 74 could impart a rotational movement to the rolls 80 at a RPM level substantially higher than without a drive unit 74. As a result, increased scrubbing action could contribute to the efficiency of the mop 10. With continued reference to Fig. 3B, the drive unit 74 includes an actuator 74A. In an embodiment, the actuator 74A may be a motor, such as an electric motor. In the embodiment shown, the actuator 74A is mounted to the frame 72. The actuator 74A may be coupled with the rotative head 73 to minimize relative displacement therebetween or undesirable vibrations that could be caused by a loose interface between them. Fasteners may be used for coupling, though this is optional. In the embodiment shown, the actuator 74A, here a motor, has a motor shaft 74B. As shown, the shaft 74B may be rotatably mounted to the rotative head 73 via a shaft support 74C. The shaft support 74C may include a sleeve slidably receiving an end of the motor shaft 74B. The shaft support 74C could include bearing(s), sleeve(s), or plain bearing(s), as some examples. In the embodiment shown, the shaft support 74C is engaged in a complementary portion of a wall of the

rotative head. The shaft support 74C may be defined by the rotative head 73 as an integral part thereof, in some variants.

[0052] With continued reference to Fig. 3B and additional reference to Fig. 3C, in an embodiment, the drive unit 74 may include a belt 74D (e.g., a transmission belt or toothed belt, chain, etc) and gears 74E forming parts of a transmission between the actuator 74A and the rolls 80 to transmit the driving power of the actuator 74A to the rolls 80 (or intermediary components therebetween), with a reduction ratio as observed. One of such gears 74E (or pinion, pulley, etc) may be mounted to the motor shaft 74B, as shown. Another one of the gears 74E may be mounted to a shaft 75 (described later) in driving engagement with the rolls 80. Other transmission types could be contemplated, such as a chain and gear arrangement, a belt and pulley arrangement or the like. A gear assembly could also be contemplated in variants. In other variants, the actuator 74A could be in direct engagement with the rolls 80, without transmission, as another option. For simplicity, the following description will refer to gears, such as gears 74E, even though the use of gears is an option among others.

[0053] The drive unit 74 is drivingly engaged to the shaft 75 to rotate the shaft 75 relative to the hub portion 73E. As shown, the shaft 75 is rotatably mounted to the hub portion 73E. In other variants, in which there is no drive unit 74, the shaft 75 may be fixed so as not to rotate, to serve as an axle for the rolls 80. The shaft 75 may be supported by the hub portion 73E via one or more bearing 75A. The bearing support(s) 75A may include a plain bearing, a sleeve, a ball bearing, or other types of bearings. The rotative head 73 may support such bearings 75A. As shown, the bearings 75A may be seated in a complementary portion of a wall of the rotative head 73, as one possibility. The bearings 75A could be considered to be part of the hub portion 73E, or as part of a shaft assembly mountable to the hub portion 73E. The gear 74E of the transmission of the drive unit 74 is fixed to the shaft 75, so as to rotate with it. The gear 74E or equivalent could be integral with the shaft 75. The gear 74E is drivingly engaged to the shaft 75 such that, upon actuation of the drive unit 74 and torque transmission via the belt 74D and gears 74E arrangement, the shaft 75 may rotate. The gear 74E may be mounted in an interference fit on the shaft 75. The gear 74E could be slidably engaged to the shaft 75 and rotatably locked thereto via interlocking features of keying features, as other possibilities. In variants, the gear 74E and the shaft 75 may form an integral part. In an embodiment, the gear 74E is located between bearing supports 75A. Stated otherwise, the gear 74E may be located in a non-cantilevered section of the shaft 75. Other configurations could be contemplated. For instance, the shaft 75 may be supported by a single bearing 75A, or the bearings 75A may be located on a same side of the gear 74E in variants. In an embodiment, the shaft 75 is hollowed to reduce weight. The shaft 75 has an annular wall with a

wall thickness. The shaft 75 could be plain in some variants. The wall of the shaft 75 may define a thread(s) 75B as illustrated, or keying features such as a keyway, a key, splines, or any equivalent disruption from circularity. In an embodiment, the thread(s) 75B are adapted to engage complementary thread(s) of the rolls 80 or other keying features, for the shaft 75 and the rolls 80 to rotate concurrently when the drive unit 74 is present. As shown, in an embodiment featuring keying features, the keying features may be defined by one or more areas of reduced and/or increased thickness of the shaft wall. In the embodiment shown, the keying features are part of an outer periphery of the shaft 75. The keying features may be located anywhere along the length of the shaft 75. In an embodiment, the keying features are spaced apart on opposite sides of the center of the shaft 75. The keying features may include a tooth or a plurality of teeth, crenellations, tabs, or other types of projections. In an embodiment, the keying features and the rolls 80 may define a bayonet connection. The keying features may interlock with complementary portions of the rolls 80, for concurrent rotation. For example, in an embodiment, upon mounting the rolls 80 axially on the shaft 75, and aligning the keying features with the complementary portions of the rolls 80, an indexation (e.g., a relative rotation of a few degrees) of the shaft 75 relative to the rolls 80 may lock the rolls 80 onto the shaft 75. In a variant in which 75B is a thread(s) as illustrated in Fig. 5B, a screwing direction of the roll 80 onto the shaft 75 when installing the roll 80 on the shaft 75, is the opposite to the direction of rotation of the roll 80 when driven by the drive unit 74. As a result, the friction between a rotating roll 80 and the ground may contribute to keeping the roll 80 screwed.

[0054] Now referring to Fig. 3C, the floor tool 70 is configured to exhaust steam at a proximal end thereof. More particularly, the floor tool 70 is configured to exhaust steam in or on the rolls 80, or on the floor surface in proximity with the rolls 80. A steam delivery outlet 76 is in fluid flow communication with a conduit 77, which may be called a steam tube, to receive steam therefrom. The conduit 77 may be flexible so as to not impede the rotational movement of the floor tool 70 relative to the elongated body 20. In an embodiment, as shown, the conduit 77 is routed through the swivel 21, from the elongated body 20, though this is optional. The conduit 77 may be routed within the enclosure 73D of the rotative head 73. As shown, the conduit 77 may extend through the transmission guard portion 73F of the rotative head 73. Thus, the conduit 77 may be concealed within the mop 10, so as not to be visible to a user. The conduit 77 may also extend to the hub portion 73E, and into it. The conduit 77 may thus be routed internally from within the elongated body 20 to the steam delivery outlet 76 in the proximal end of the floor tool 70. This may be desirable to protect the conduit 77 against impacts or pinch points between components of the floor tool 70 or between the floor tool 70 and objects in the surrounding of the floor tool

70 during use. The steam delivery outlet 76 may be defined by a manifold 78 that is adapted to exhaust steam towards at least one, if not both, of the rolls 80. The manifold 78 may include an intake portion that is connected, either removably connected to or continuous with the conduit 77. The intake portion may be tubular and be coupled with the conduit 77 to receive steam therefrom. The manifold 78 could form part of the conduit 77 and thus form an integral part of the conduit 77, in variants.

[0055] In the cross-section of Fig. 3C, it can be seen that the steam delivery outlet 76 is open to the roll 80, in particular, open to a connector 81 (described later) of the roll 80. In an embodiment, the steam delivery outlet 76 is in fluid flow communication with the connector 81 via the steam outlet 73G of the hub portion 73E (Fig. 5B). The steam delivery outlet 76 may have the same cross-section as that of the steam outlet 73G. In an embodiment, the steam delivery outlet 76 has a crescent shape extending circumferentially about part of the shaft 75 (or gear 74E). The steam delivery outlet 76 has a cross-section that is at least greater than a cross section of the intake portion or conduit 77 upstream thereof. This may cause a pressure increase at the outlet to ease the flow out from the conduit 77 and through the outlet 76. While a crescent shape has been mentioned, such shape could also be referred to as a slot shape (straight or curved), and other shapes are possible. As will be described below, the elongated shape of the steam delivery outlet 76 is adapted to overlap with steam inlets of the rolls 80 during rotation of the rolls 80.

[0056] Referring to Figs. 3B and 4, components of the rolls 80 will now be described. A single roll 80 is shown in Fig. 4, though it should be understood that both rolls 80 shown in the previous figures may be configured the same. As described above, the roll 80 may be secured (removably) to the shaft 75 of the floor tool 70 for rotating therewith. In an embodiment, as shown, each roll 80 may include a connector 81 having a shaft receiving portion 81A and a thread(s) or thread engaging portion 81B that are complementary to the thread(s) 75B of the shaft 75. Other keying features may be present instead, as an alternative to thread(s) or thread engaging portion 81B, such as a key, keyway, spline, etc. As mentioned previously, as part of another configuration, the rolls 80 may rotate relative to the shaft 75 as opposed to rotate with it. Accordingly, the thread(s) 81B may be optional. If present, keying features 75B and 81B may rely on elastic deformation to engage to one another, or to disengage from one another. The shaft receiving portion 81A extends axially along a roll axis RR. The shaft receiving portion 81A may enclose at least part of the shaft 75 when it is received therein. The shaft receiving portion 81A extends from a sleeve end 81C of the connector 81, the sleeve end 81C being shaped for instance as a counter-bore, to receive therein part of the hub portion 73E. The sleeve end 81C extends from an end of the roll 80, and inwardly within the roll 80 so as to define a recess. The sleeve end 81C may have a flange defining the end of the

roll 80. An annular wall of the sleeve end 81C may extend inwardly from the flange to an end wall of the sleeve end 81C. In an embodiment, as shown, the sleeve end 81C has a cup-shape that is complementary to the cup-shape of the hub portion 73E discussed above, for sliding mating engagement, or to provide sufficient clearance to avoid or reduce friction between the rolls 80 and the hub portion 73E. The sleeve end 81C and the hub portion 73E may engage each other in a male-female relationship upon installation of a roll 80 onto the floor tool 70. This can be seen at Fig. 3B. The sleeve end 81C may be cylindrical, just like the hub portion 73E with which it is intended to engage. This is only one option, as other shapes could be contemplated, such as square, pentagonal, hexagonal, heptagonal, octagonal, oval, squircle, as some possibilities.

[0057] With continued reference to Fig. 4, the sleeve end 81C defines one or more inlets in the form of apertures 81D circumferentially distributed about the opening of the shaft receiving portion 81A. As briefly described above, these apertures 81D may define steam inlets of the rolls 80 which may be in fluid flow communication with the steam delivery outlet 76 of the floor tool 70. As the roll 80 rotates with the shaft 75, the apertures 81D will sequentially, and intermittently be in alignment with the steam delivery outlet 76, hence momentarily in fluid flow communication therewith. As a result of their cross-section that are relatively smaller than the cross-section of the steam delivery outlet 76, a plurality of the apertures 81D may be simultaneously in fluid flow communication with the steam delivery outlet 76 as the roll 80 rotates relative to the steam delivery outlet 76. However, this is optional. Such intermittent fluid flow communication may create a pulsative pressure differential at the steam delivery outlet 76, which may contribute to drawing steam out from the steam delivery outlet 76.

[0058] Still referring to Fig. 4 with additional reference to Fig. 5D, the roll 80 includes a roll body 82. The roll body 82 engages with the connector 81. Engagement may be interference fit, interlocking, by adhesives or fasteners, for example. As shown, the roll body 82 is tubular and forms the outer structure of the roll 80. The roll body 82 defines an inner cavity 82A for receiving steam therein from the steam inlets (apertures 81D). The roll body 82 may extend over an entire length of the roll 80 though this is optional. As shown, in an embodiment, the roll body 82 is perforated. The roll body 82 could have a mesh like or web structure in variants. The roll body 82 is therefore configured to allow steam to pass therethrough. A floor cleaning interface 83 is defined by the roll 80. In an embodiment, as shown, the floor cleaning interface 83 may be defined by a layer (or panel) of material(s) extending peripherally about the roll body 82, such as a sleeve of material. For simplicity, the expression "layer" is used herein, but the interface 83 may be defined as being a panel of material, the panel being non-rigid so as to conform to the surface of the roll body 82. The panel may have limited stretch in its planar direction. Such floor

interfacing layer of material may be microfiber, or other types of material such as fabric or felt. In variants, the floor cleaning interface 83 could include hairs or bristles, as other possibilities. Steam passing through the roll body 82, via the perforations or the like, may thus humidify and/or heat the floor cleaning interface 83, and/or pass through it. The floor cleaning interface 83 may be permanently connected to the roll body 82 (e.g., with a glue) or may be removable therefrom to be cleaned. A steamed floor cleaning interface 83 combined with the rubbing or scrubbing of the interface 83 with the floor surface caused by the driven rolls 80 may thus be obtained upon operation of the steam mop 10. It may be said that the roll 80 is permeable to water or steam and/or is porous, as the interface 83 is wetted by the presence of steam.

[0059] Returning to Fig. 3B, the roll 80 may include an end cap 84 at an end of the roll body 82. The end cap 84 may be secured to the end of the roll body 82 that is opposite to the connector 81. The end cap 84 could form part of the roll body 82 in variants. In a variant, the entire roll 80 may be pushed into or pulled out of engagement with the shaft 75. It is possible to then remove the floor cleaning interface 83 from the roll body 82 to clean, sterilize, bleach, etc the floor cleaning interface 83, but this is optional. The entire roll 80 may be replaced by a new clean roll 80. As observed from Fig. 5D, the end cap 84 may have a handle to facilitate the screwing and unscrewing.

[0060] Now referring to Figs. 5A-5D, the steam mop 10 in operation will now be described. Upon activation of the steam mop 10, e.g., by actuation of the power button 62 (Fig. 1), the drive unit 74 of the floor tool 70 may be powered by the power system 60, for example after the heating unit 50 has been activated and can generate steam. If present, the drive unit 74 in driving engagement with the rolls 80 may thus actively rotate the rolls 80. The rotation direction of the rolls 80 may be such that the rolls 80 rotate against a forward sweep motion direction of the steam mop 10 performed by the user by holding the grip 22. Such rotation direction is illustrated in Fig. 5A by a force vector VV tangent to the rolls 80 and parallel to the floor surface. The rotation direction could be reversed. In variants, the rotation direction could be controlled so as to switch direction depending on the direction of the sweep motion effected by the user. The user may, while sweeping, cause the swivel 21 to rotate so as to change an orientation of the floor tool 70 relative to the elongated body 20. The swivel 21 may facilitate the manoeuvrability of the steam mop 10 and facilitate the cleaning action by providing flexibility to the sweep motion direction.

[0061] Fig. 5A shows the steam mop 10 with the rolls 80 already mounted to the floor tool 70. The rolls 80 are removable, such that, sets of rolls 80, or a single roll 80 may be replaced when worn out, or when dirty, and replaced by a clean roll 80. A pair of rolls 80 are mounted to the hub portion 73E. A roll 80 may be axially engaged with a projecting length of the shaft 75 so as to mate with such length of shaft 75 into the shaft receiving portion 81A

of the connector 81. Axial mating of the roll 80 is effected until the hub portion 75E is received within the sleeve end 81C, for instance to the point where the roll 80 is blocked from further axial movement. The threads 75B, 81B may engage, and the user may manually shift clockwise (or counter clockwise) the roll 80 relative to the shaft 75 so as to engage the threads.

[0062] Once the steam delivery is activated by the user, e.g., by actuating the power button 62, in at least one mode of operation, the pump 40 (Fig. 2) may draw liquid from the tank 30 (Fig. 2) and circulate liquid into the heating unit 50 (Fig. 2). The heating unit 50 may heat the liquid to produce steam that is then routed to the floor tool 70. The steam may reach the steam delivery outlet 76 to be exhausted therefrom. Referring to Figs. 5B to 5D, a steam path SP is illustrated.

[0063] In Fig. 5B the steam path SP is illustrated by the bold arrow. The steam path SP exits the steam delivery outlet 76, here through the steam outlet 73G defined by the hub portion 75E.

[0064] In Fig. 5C, the connector 81 of the roll 80 is shown without the other components of the roll 80 for illustrative purpose. As the connector 81 rotates about the hub portion 73E, the steam path SP is intermittently prolonged through some of the apertures 81D. The rotation arrow illustrated at Fig. 5C illustrates that apertures 81D sequentially receive steam therethrough as they are indexed relative to the steam delivery outlet 76 upon rotation of the connector 81 in an opposite angular direction as the rotation direction of the rolls 80. The steam path SP further extend in the inner cavity 82A (Fig. 3B) of the roll body 82. It can be observed in Fig. 5C that guide fins may be present to reinforce the connector 81.

[0065] In Fig. 5D, the roll body 82, perforated in the embodiment shown, such that the steam path SP may extend through the wall of the roll body 82 towards the floor cleaning interface 83. The steam may permeate through the floor cleaning interface 83. In a variant, the microfiber layer of the roll 80 defining the floor cleaning interface 83 may capture at least some of the moisture and be heated by the steam.

[0066] In a mode of operation, the rotation of the rolls 80 and the activation of the steam may be done independently. For example, the user may decide not to activate steam while rotation of the rolls 80 is engaged. The user could decide to activate steam sporadically while the rolls 80 sweep the floor, in rotation or still. These functionalities may be enabled by the PC board acting as a controller for the mop 10. In another variant, a rotational speed of the rolls 80 could be adjusted. The rotational speed imparted by the drive unit 74 may substantially exceed a rotational speed of the roll 80 reliant on friction and user movement.

[0067] Referring to Fig. 6, another aspect of the steam mop is shown at 10. In the steam mop 10 of Fig. 6, a nozzle unit 90 is located adjacent to an outer surface of the roll(s) 80. The nozzle unit 90 is connected to a steam or vapour source, and outlets steam or vapour onto the

outer surface of the roll 80. The nozzle unit 90 may be on a leading side of the floor tool, or on a trailing side thereof, as also shown in Fig. 6. Both of the nozzle units 90 of Fig. 6 may be present, with one of the nozzle units 90 having jets oriented toward the ground to spray steam or vapour directly on the ground, while the other nozzle unit 90 may spray steam on the roll(s) 80. As another possibility, a single one of the nozzle units 90 may be present, and may have two sets of jets, with a first set oriented toward the roll(s) 80 to spray steam or vapour on the roll(s) 80, while a second set of jets may spray steam or vapour on the ground.

[0068] Returning to Fig. 2, various conduits are present in order to direct liquid from the tank 30 to the heating unit 50. A conduit shown as 101, also known as a pipe, a tube, tubing, channel, etc., is in fluid communication with the tank 30. The conduit 101 may have its intake directly in the tank 30 or may be connected to a liquid source (e.g., tap). Other components may be present such as a check valve, the check valve preventing liquid from returning to the tank 30. The conduit 101 extends to the inlet 41 of the pump 40, and is in fluid communication with the pump 40.

[0069] A conduit 102 is in fluid communication with the heating unit 50. The conduit 102 extends from the outlet 42 of the pump 40 to the heating unit 50, and is in fluid communication with the heating unit 50.

[0070] A conduit 103 is in fluid communication with the steam delivery outlet 76 of the floor tool 70. The conduit 103 may extend integrally with the conduit 77 described above or a separate part that is fluidly connected to the conduit 77. Such conduit 103 must therefore extend from the elongated body 20 to the floor tool 70. In an embodiment, as shown, the conduit 103 is internally routed, and passes through the swivel joint 21.

[0071] The roll 80 may generally be described as being for a steam mop. The roll 80 may have a body having a wall having an outer surface and defining an inner cavity; a floor interfacing layer permeable to steam, the floor interfacing layer mounted peripherally about the roll body; and a connector portion at an end of the body, the connector portion having a shaft receiving portion configured for matingly receiving a shaft of the steam mop therein, the connector portion having at least one fluid inlet at the connector portion in fluid communication with the inner cavity for steam to be injected in the inner cavity. The body defines a steam path between the inner cavity and the floor interfacing layer. According to a variant, the outer surface of the body is cylindrical, the wall having a plurality of holes therethrough to define the steam path. The floor interfacing layer may be one of a fabric, a cloth, a textile, bristles on a substrate. The floor interfacing layer may be glued to the outer surface. The shaft receiving portion may have an elongated shape. The connector portion may have a counterbore portion, with the shaft receiving portion projecting inwardly from the counterbore portion. The at least one fluid inlet is in the counterbore portion. At least one keying feature is defined in the shaft receiving portion to block a rotation

between the roll and the shaft.

[0072] The steam mop 10 may be operated in different ways. In accordance with a variant, the steam mop 10 enables a method for defining a steam path between a floor tool of a steam mop and an outer surface of a roll. The method may include unscrewing a roll out of engagement from a shaft of the floor tool; subsequently screwing another roll into engagement with the shaft of the floor tool, for an end of the other roll having at least one inlet to be adjacent to a steam outlet of the floor tool; and activating a heater of the steam mop for steam to be generated and to follow a steam path being sequentially through the steam outlet, the at least one inlet, an inner cavity of the other roll and through the outer surface of the roll. The activating may be done prior to the unscrewing and/or screwing. The roll may be discarded, and/or cleaned for subsequent use. Screwing for engagement may include having a hub portion of the floor tool penetrate a counter-bore portion of the roll. A step of aligning keying features between the roll and the floor tool may be done prior to the screwing, and it may be preceded by a step of inserting a portion of the roll onto a shaft. The method may also include adding water or liquid or aqueous substance in a reservoir of the mop. The method may include activating a rotation of the roll, for instance when steam is in the roll. The activation of the rotation of the roll may include activating a motor. The activating of a rotation of the roll may include manually rotating the roll, by manipulating the mop with the roll on a surface. The method may include removing a panel (i.e., the floor interfacing layer) forming the outer surface of the roll and connecting a new panel.

[0073] The above description is meant to be exemplary only, and one skilled in the art will recognize that changes may be made to the embodiments described without departing from the scope of the invention disclosed. Still other modifications which fall within the scope of the present invention will be apparent to those skilled in the art, in light of a review of this disclosure, and such modifications are intended to fall within the appended claims.

Claims

1. An apparatus for cleaning a floor surface, the apparatus comprising:

an elongated body;
a heater configured for receiving liquid and heating the liquid;
a conduit in fluid flow communication with an outlet of the heater;
a floor tool connected at a proximal end of the elongated body, the floor tool including:

a hub portion,
at least one roll defining a floor cleaning

interface, the roll connected to the hub portion for rotation, the roll defining an inner cavity for receiving steam, the floor cleaning interface of the roll being permeable to steam, and

a delivery outlet in fluid flow communication with the conduit to receive steam or vapour therefrom, the delivery outlet in fluid flow communication with the inner cavity of the roll.

2. The apparatus according to claim 1, wherein the floor tool further includes a drive unit drivingly engaged to the at least one roll to rotate the roll relative to the hub portion.
3. The apparatus according to claim 2, wherein the drive unit includes a shaft rotating relative to the hub portion, the at least one roll mounted to the shaft.
4. The apparatus according to claim 2 or claim 3, wherein the drive unit includes an electric motor.
5. The apparatus according to claim 4, wherein the electric motor is coupled to the roll by a transmission, the transmission reducing a rotational speed of the roll relative to a rotational speed of the electric motor.
6. The apparatus according to claim 5, wherein the transmission includes a belt and pulleys or gears.
7. The apparatus according to any one of claims 1 to 6, wherein the delivery outlet includes a manifold in the hub portion, the manifold in fluid communication with the conduit.
8. The apparatus according to claim 7, wherein the manifold defines at least one outlet aligned with an inlet of the at least one roll, the inlet of the at least one roll being in an end face thereof.
9. The apparatus according to claim 8, wherein the floor tool has two rolls, the manifold has at least one of the outlet for each of the two rolls.
10. The apparatus according to any one of claims 1 to 9, including a liquid reservoir in fluid communication with the heater to supply liquid to the heater.
11. The apparatus according to claim 10, wherein the liquid reservoir and the heater are in the elongated body.
12. The apparatus according to any one of claims 1 to 11, wherein the floor tool includes a rotative head rotatably coupled to the elongated body for rotation, the rotative head forming a rotational joint with an end of the elongated body.

13. The apparatus according to claim 12, wherein the conduit is routed inside the rotative head and the hub portion.
14. The apparatus according to claim 1, wherein the at least one roll is rotatably mounted to a shaft of the floor tool. 5
15. The apparatus according to claim 14, wherein the floor tool has two of the roll, the two of the rolls being mounted to the shaft. 10

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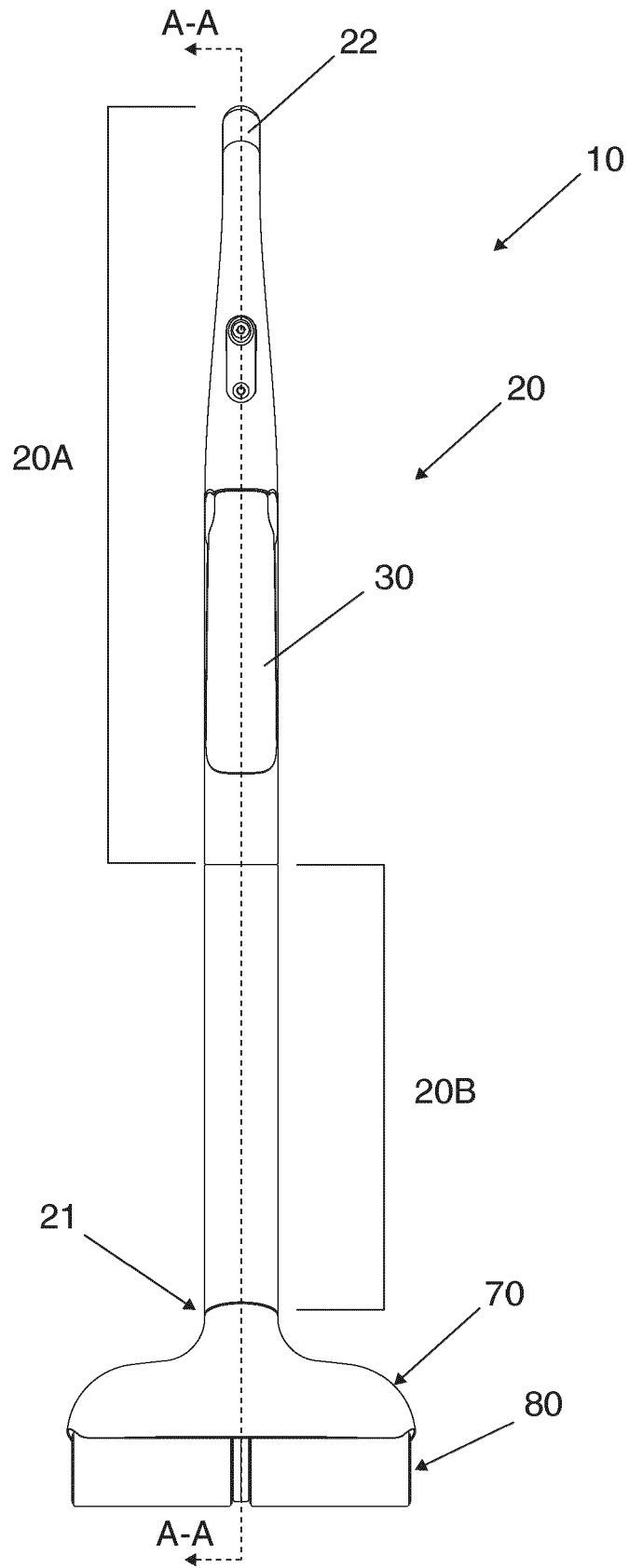


FIG. 1

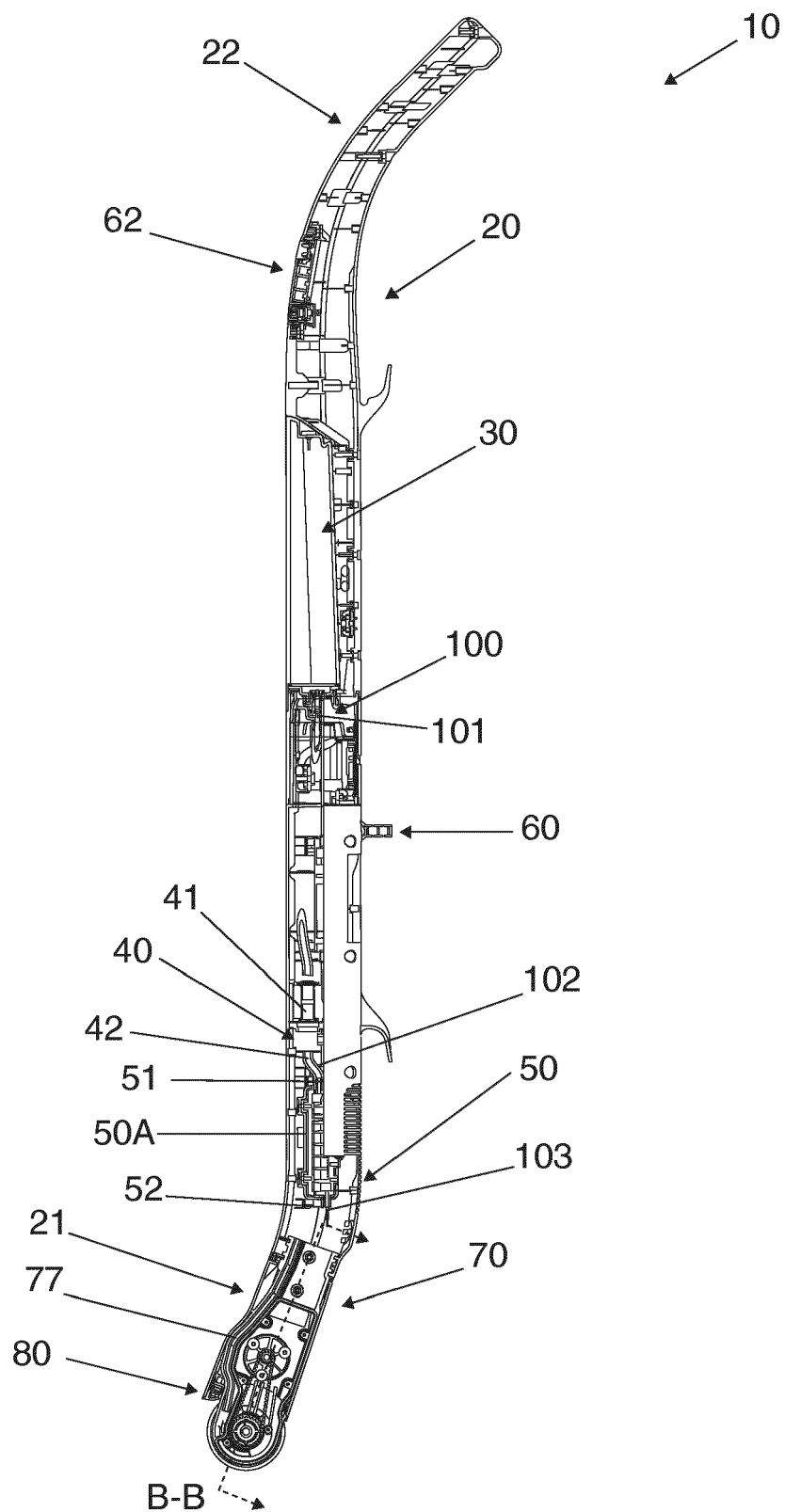


FIG. 2

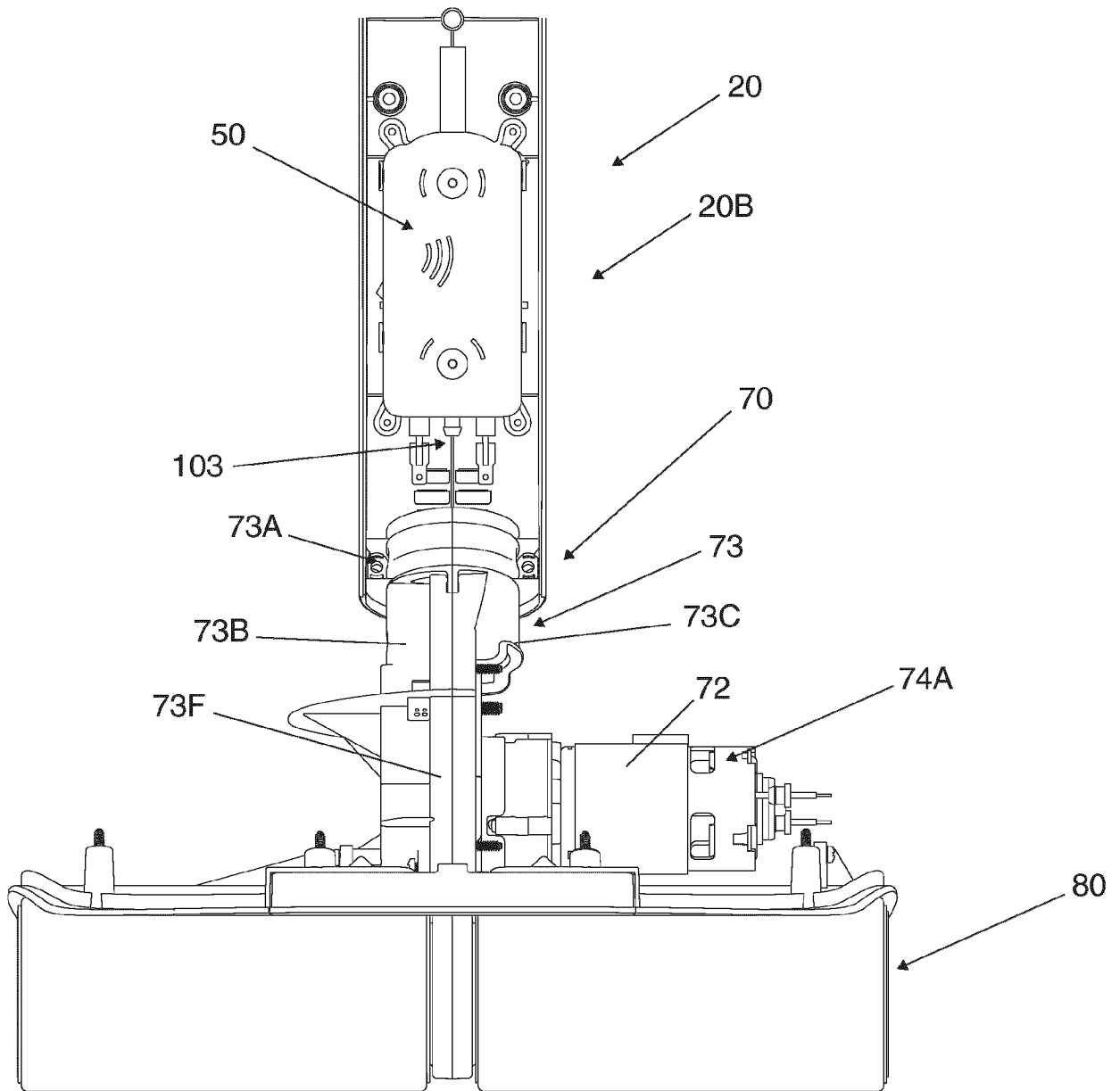


FIG. 3A

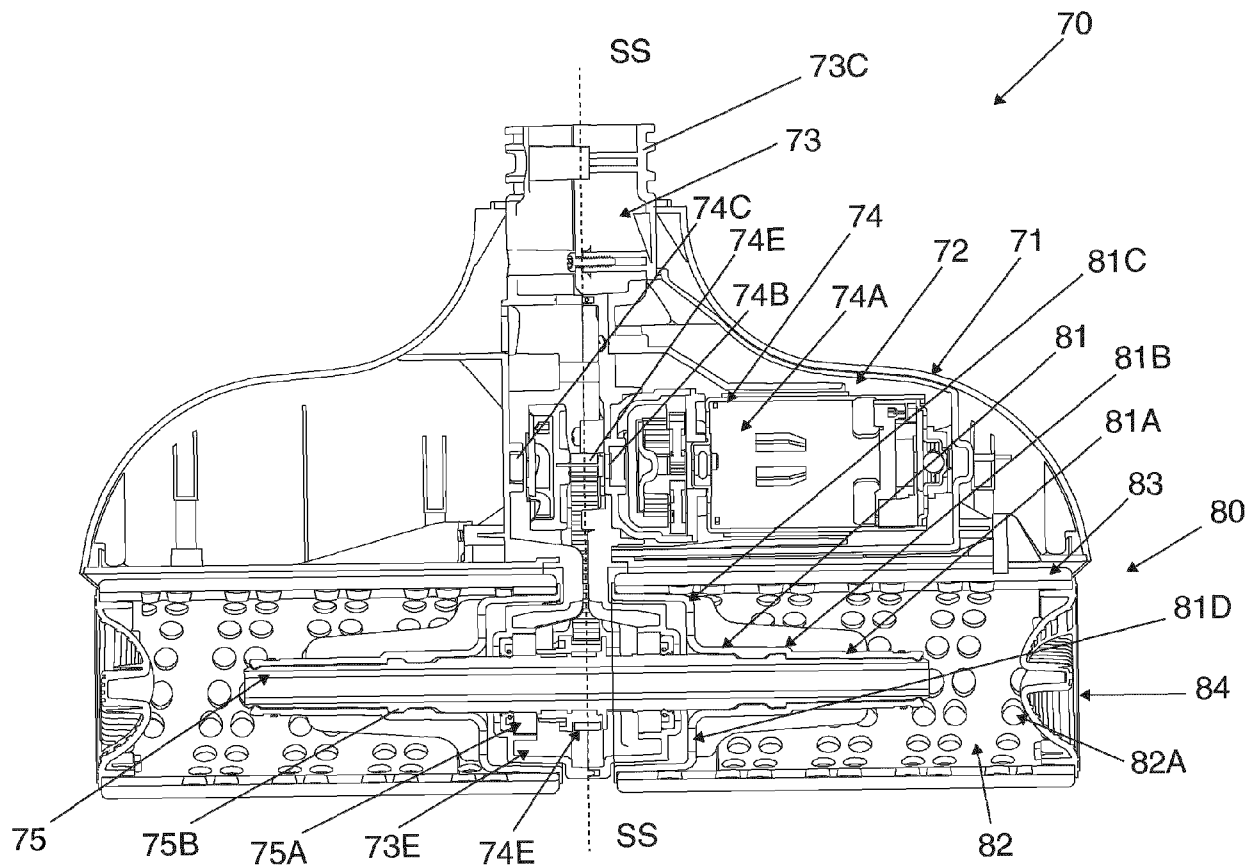


FIG. 3B

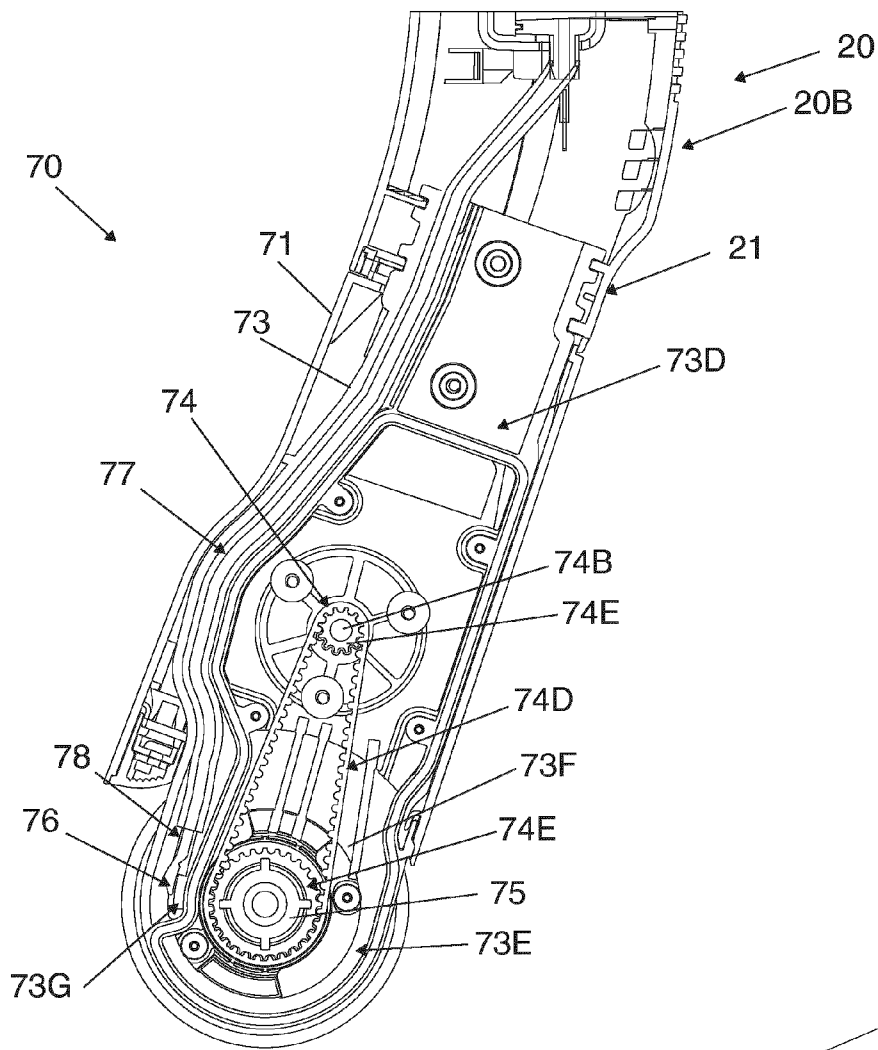


FIG. 3C

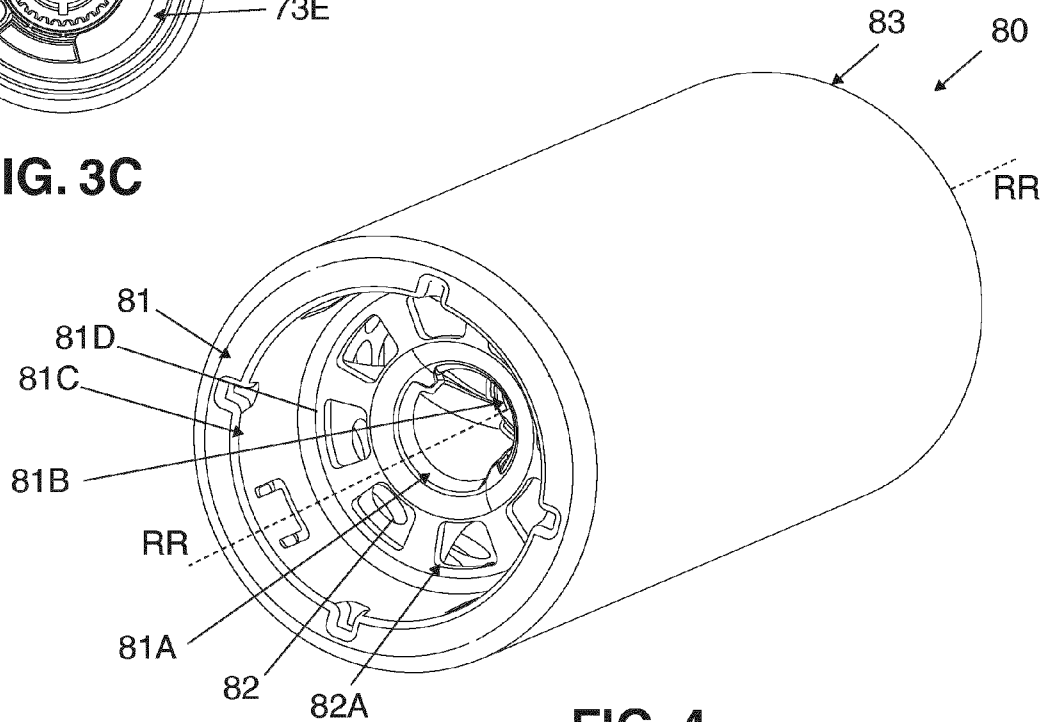


FIG. 4

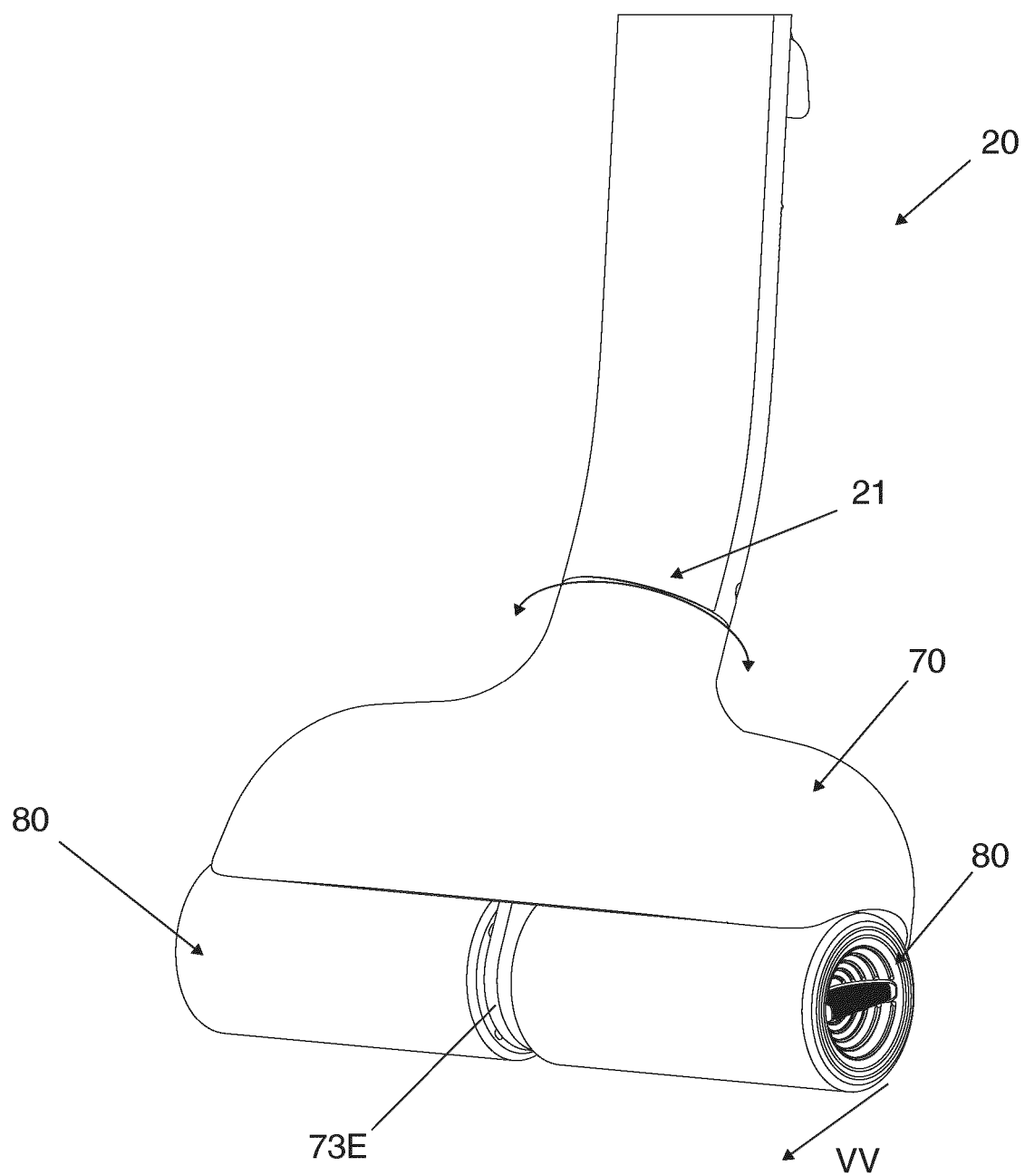


FIG. 5A

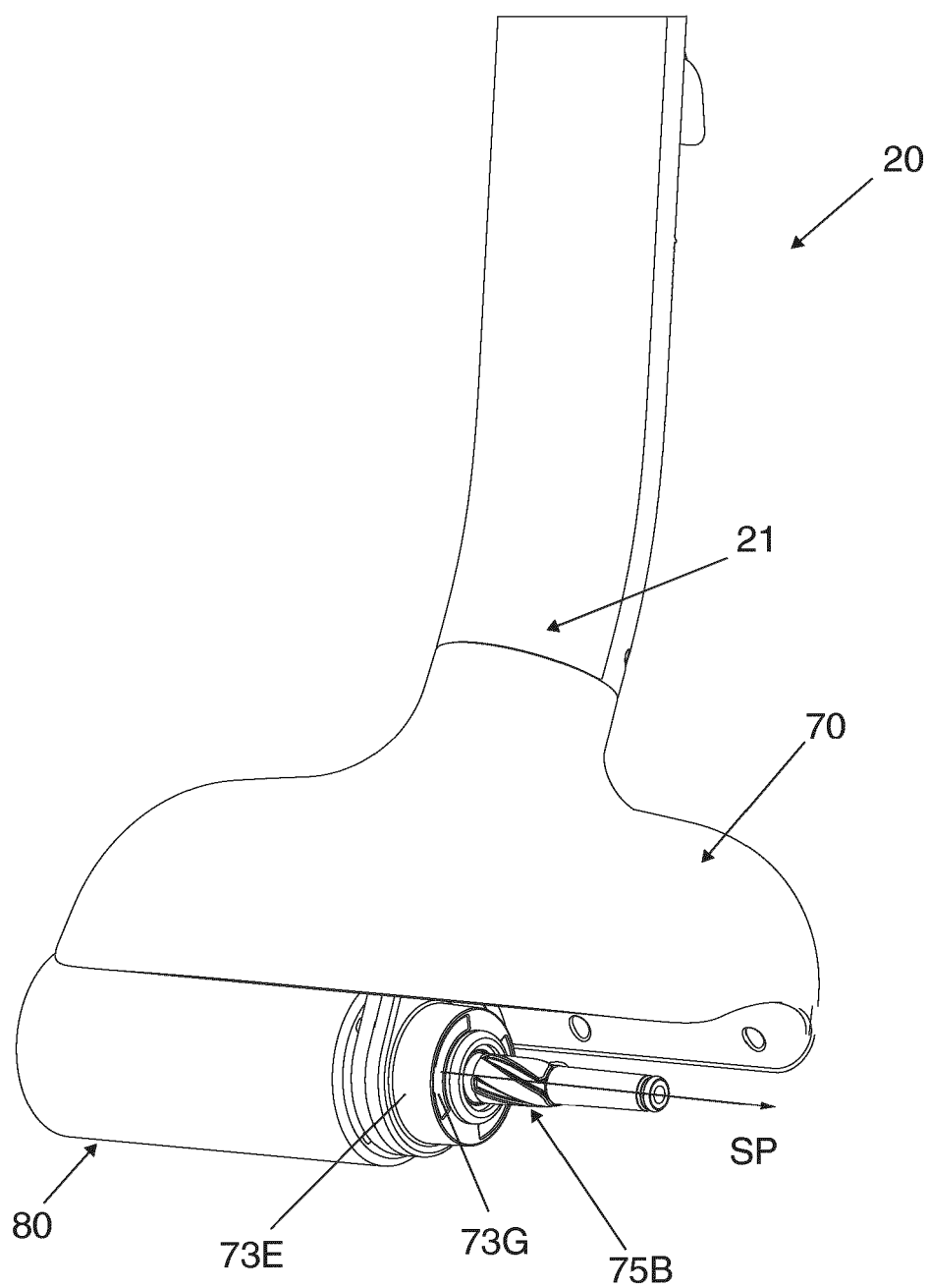


FIG. 5B

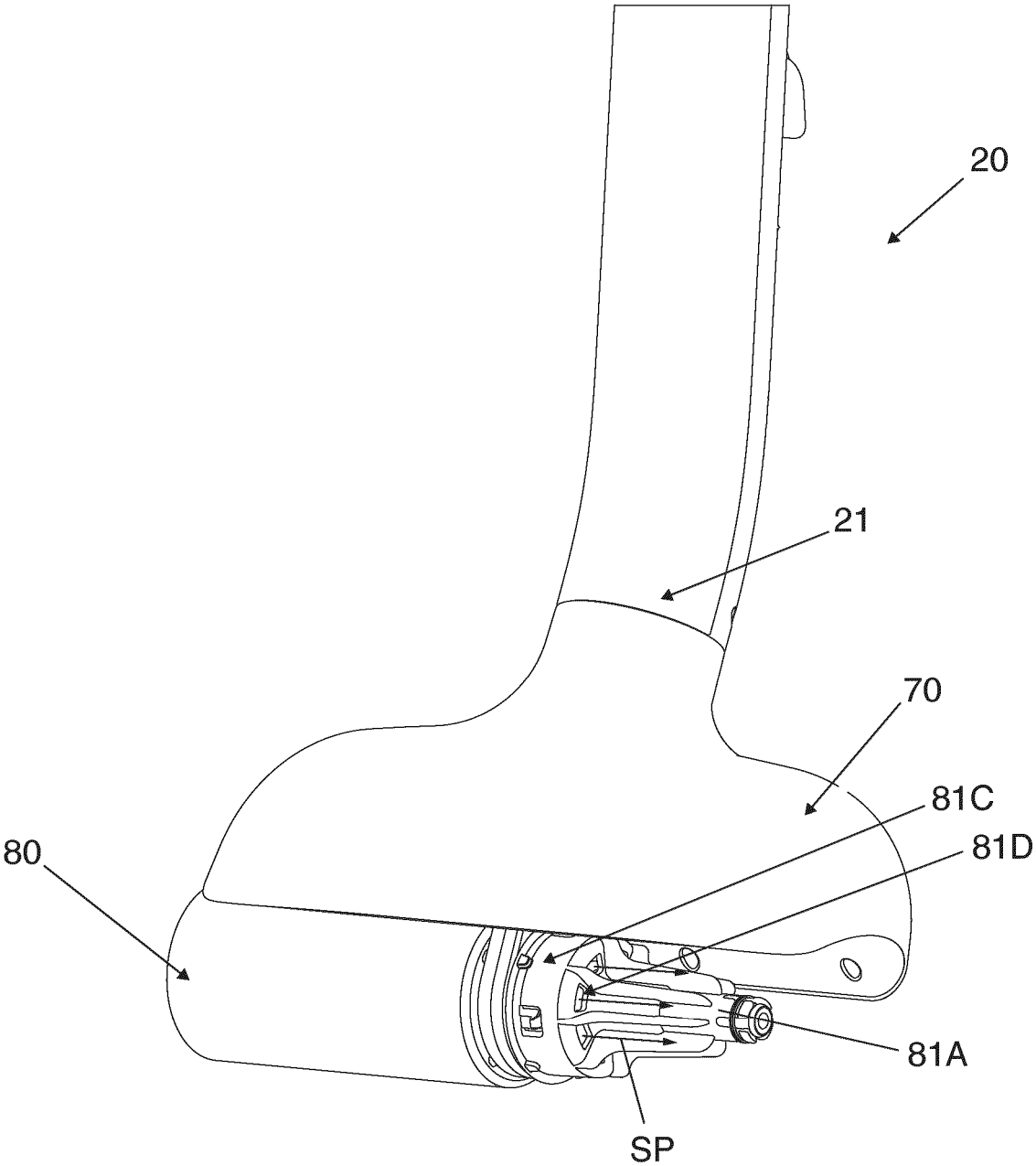


FIG. 5C

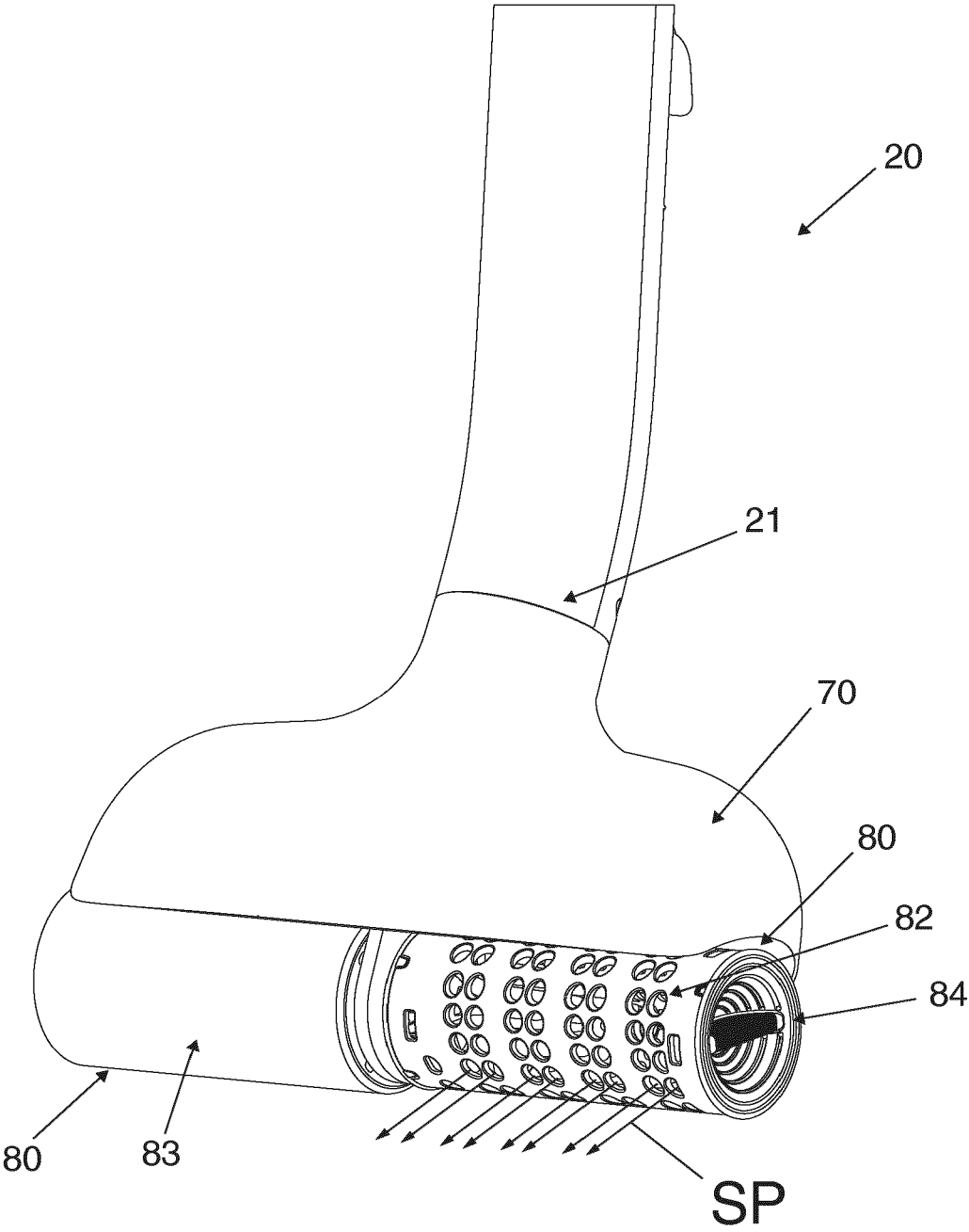


FIG. 5D

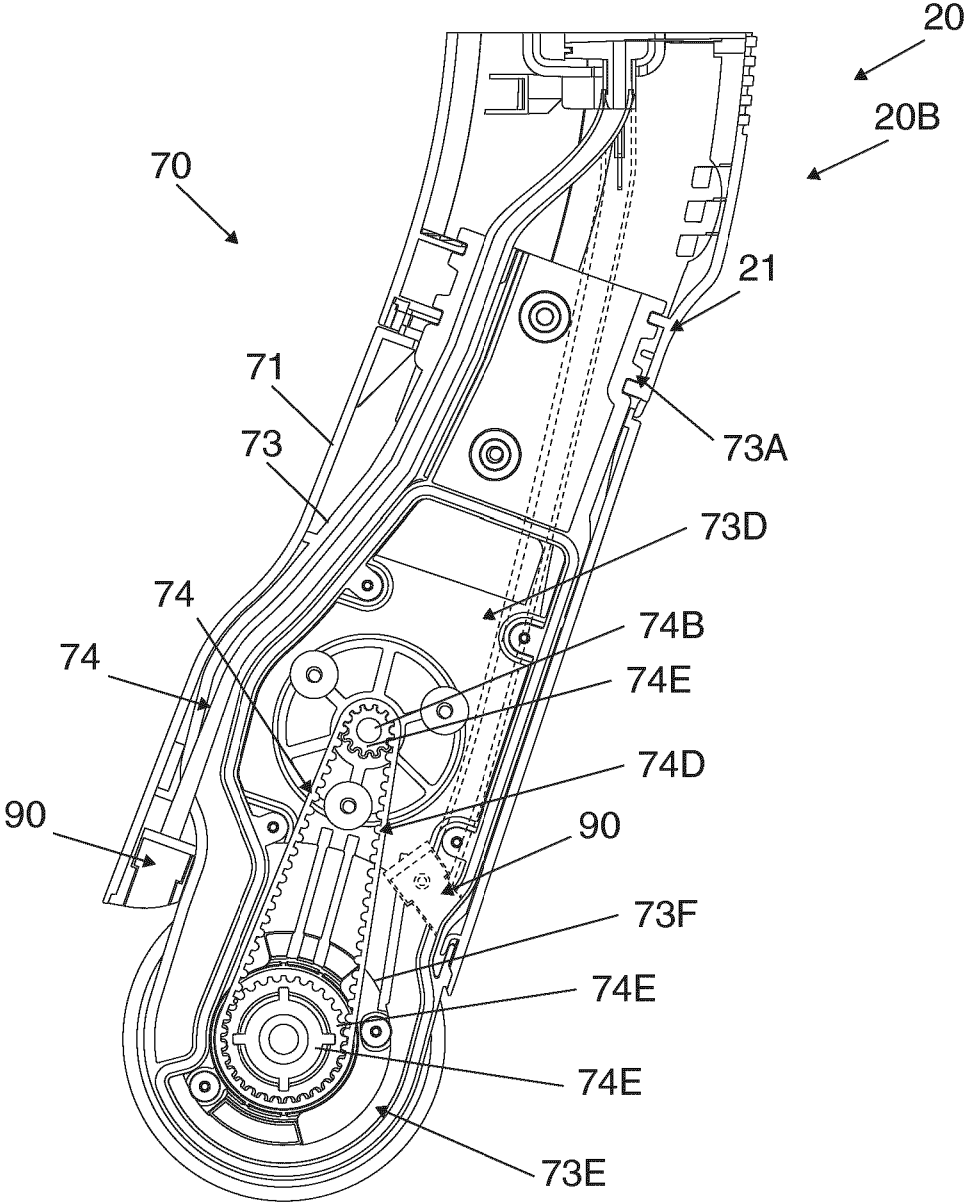


FIG. 6



EUROPEAN SEARCH REPORT

Application Number

EP 24 21 7977

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 110 151 076 A (ZHONGSHAN JINSHUN HOUSEHOLD WARES CO LTD; LIANG JINRAN) 23 August 2019 (2019-08-23) * the whole document *	1-15	INV. A47L11/14 A47L11/18 A47L11/282 A47L11/40
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A	* the whole document *	4-6,9,15	
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			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		17 April 2025	Masset, Markus
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T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 24 21 7977

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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17-04-2025

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