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(54) **SURFACE CLEANING APPARATUS AND ASSOCIATED CLEANING SYSTEM AND CLEANING METHOD**

(57) The present disclosure relates to a surface cleaning apparatus and an associated cleaning system and cleaning method. The surface cleaning apparatus (200) includes: a cleaning assembly (230), a clean water tank (210), and a waste water tank (220). The clean water tank (210) includes a water filling port (212). A base station (100) includes a cleaning sink (110), and the cleaning sink (110) is configured to be located underneath the surface cleaning apparatus (200) when the surface cleaning apparatus (200) is located within the base station (100), and define a cleaning space for cleaning a cleaning component (232). The surface cleaning apparatus (200) further comprises a water flow path communicating with the clean water tank (210). The water flow path is configured such that when the clean water tank (210) is filled with water via the water filling port (212), clean water for filling the cleaning sink (110) flows from the clean water tank (210) to the cleaning sink (110) along the water flow path.

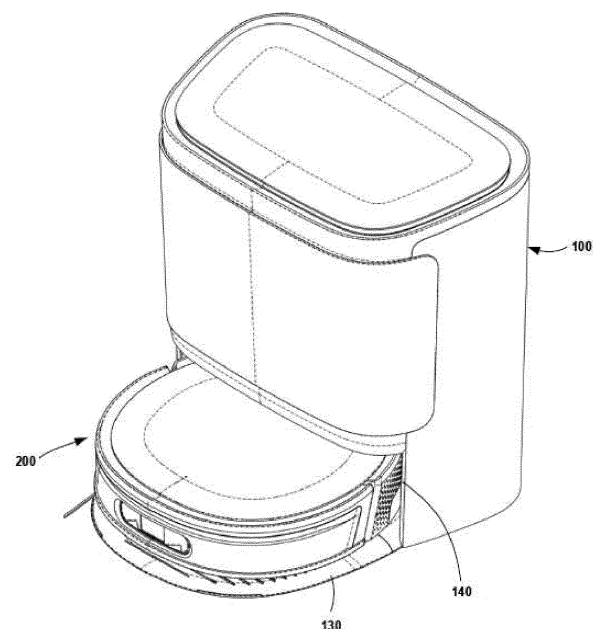


FIG. 1

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Description

FIELD OF TECHNOLOGY

[0001] The present disclosure relates to a surface cleaning apparatus, in particular to a cleaning system for a surface cleaning apparatus.

BACKGROUND

[0002] Surface cleaning robots, such as robot vacuum cleaners, mopping robots, and robot vacuum and mop combos, are increasingly being used to clean a variety of surfaces, such as floors and walls, due to their excellent cleaning performance. A wet-type surface cleaning robot with a mopping function typically includes a clean water tank and a wet-type cleaning component, where the water tank is used to wet the cleaning component during the cleaning process, so that the cleaning component may perform wet mopping in a wet state, and the cleaning component often needs to return to a base station for automated cleaning after use for a period of time.

[0003] Correspondingly, the base station of the robot is typically provided with a water source and a docking station adapted to accommodate the cleaning robot. The docking station is provided with various interfaces for connection to the cleaning robot, so as to perform maintenance operations on the cleaning robot. The base station is also provided with a cleaning sink that may be filled with clean water for the cleaning of cleaning devices of the cleaning robot.

[0004] A conventional base station is provided with a water supply system for replenishing clean water for the clean water tank of the robot on the one hand, and for supplying water to clean the wet-type cleaning assembly on the other hand, which results in the conventional cleaning system needing complex water supply piping as well as more water pump components. For example, CN219229765U discloses a water supply system including a clean water tank provided on a base station and a make-up water pump for controlling water supply to a cleaning sink, whereby the make-up water pump and a solenoid valve are used to control filling of the cleaning sink with water. Conventional solutions for water supply require a large number of components, resulting in a large size and high cost of the device. It is expected to further improve the water supply system for a conventional surface cleaning apparatus.

SUMMARY

[0005] The present disclosure aims to provide a surface cleaning apparatus, a cleaning system for the surface cleaning apparatus, and a cleaning method for the surface cleaning apparatus, in order to solve one or more of the foregoing problems, as well as other potential technical problems.

[0006] In a first aspect of the present disclosure, a

surface cleaning apparatus is provided. The surface cleaning apparatus includes: a cleaning assembly, including a cleaning component for cleaning a surface; and a clean water tank, configured to supply the cleaning component with cleaning water to wet the cleaning component, wherein the clean water tank includes a water filling port, the water filling port is configured to: communicate with a water source of a base station when the surface cleaning apparatus is located within the base station that cooperates with the surface cleaning apparatus, and the base station includes a cleaning sink for cleaning the cleaning component; and wherein the surface cleaning apparatus further includes a water flow path communicating with the clean water tank, and the water flow path is configured such that when the clean water tank is filled with water via the water filling port, clean water for filling the cleaning sink flows from the clean water tank to the cleaning sink along the water flow path.

[0007] According to the present disclosure, clean water for filling the cleaning sink flows from the clean water tank to the cleaning sink along the water flow path. Thus, the complexity of a water supply path for the cleaning sink may be simplified and the number of parts may be reduced, thereby reducing the cost of the apparatus.

[0008] In some embodiments, the water flow path is further configured such that water that continues to be supplied to the clean water tank overflows to the cleaning sink via the water flow path. In this case, automatic overflow filling of the cleaning sink may be achieved.

[0009] In some embodiments, the clean water tank may include an overflow pipe that serves as a part of the water flow path and protrudes upward by a predetermined filling height from an inner surface of a bottom of the clean water tank. A pressure difference for the flow of liquid may be created through the overflow pipe.

[0010] In some embodiments, the overflow pipe may include a water inlet in a top end and a water outlet in a bottom end, the water inlet in the top end is configured to allow water to enter the overflow pipe via the water inlet in the top end, and the water outlet in the bottom end is formed as a through hole penetrating through a surface of a bottom wall of the clean water tank. Thus, the structure of the overflow pipe may be simplified.

[0011] In some embodiments, the surface cleaning apparatus may further include: a check valve in the water flow path, the check valve being configured to allow water in the clean water tank to automatically overflow from the clean water tank to the cleaning sink via the water flow path when the water in the clean water tank reaches a predetermined filling height.

[0012] In some embodiments, the check valve may include a flexible diaphragm, the flexible diaphragm includes a plurality of sub-diaphragms provided with openings, and the plurality of sub-diaphragms are configured to: close the openings under action of elastic force of the sub-diaphragms; and open the openings under action of

water pressure when water in the clean water tank reaches the predetermined filling height.

[0013] In some embodiments, the water flow path may include a pipe section communicating with the overflow pipe, the pipe section is fixed to a surface of a bottom side of the clean water tank, and the check valve and the pipe section are fixed to an outer surface of the bottom of the clean water tank through fasteners.

[0014] In some embodiments, at least two water flow paths are provided, the at least two water flow paths guide water to the cleaning sink at different locations around the cleaning component, and the at least two water flow paths are arranged on different sides of the water filling port.

[0015] In some embodiments, the surface cleaning apparatus may further include a waste water tank, the waste water tank is configured to recycle waste water from the cleaning component, the water flow path is configured such that water from the clean water tank is guided to a gap between the waste water tank and the cleaning component and flows to the cleaning sink via the gap.

[0016] In some embodiments, the surface cleaning apparatus may further include a waste water tank, the waste water tank is configured to recycle waste water from the cleaning component, the water flow path may include a first section flow path and a second section flow path, the first section flow path is configured to make the clean water tank communicate with the waste water tank, and allow water in the clean water tank to automatically overflow from the clean water tank to the waste water tank when the water in the clean water tank reaches a predetermined filling height, and the second section flow path is configured to allow water in the waste water tank to automatically overflow from the waste water tank to the cleaning sink when the water in the waste water tank reaches a predetermined height.

[0017] In some embodiments, the waste water tank may include a waste water inlet disposed at the predetermined height, water from the clean water tank enters the waste water tank via the waste water inlet, and water entering the waste water tank automatically overflows from the waste water tank to the cleaning sink via the waste water inlet when reaching the predetermined height.

[0018] In some embodiments, the waste water tank may further include a valve disposed at the waste water inlet, and the valve is configured to be opened during filling of the cleaning sink with water and to be closed during non-filling of the cleaning sink with water.

[0019] In a second aspect of the present disclosure, a cleaning system for a surface cleaning apparatus is provided. The cleaning system includes: a water source, disposed at a base station; a cleaning sink, located at a bottom side of a docking station of the base station, the cleaning sink defining a cleaning space for cleaning a cleaning component of the surface cleaning apparatus; a clean water tank, disposed at the surface cleaning appa-

ratus, the clean water tank including a water filling port, the water filling port being configured to communicate with the water source when the surface cleaning apparatus is located within the docking station; and a water flow path, configured to guide water from the clean water tank to the cleaning sink, the water flow path being configured such that when the clean water tank is filled with water via the water filling port, clean water for filling the cleaning sink flows from the clean water tank to the cleaning sink along the water flow path.

[0020] In a third aspect of the present disclosure, a cleaning method for a surface cleaning apparatus is provided. The cleaning method includes: transmitting, on the basis of a cleaning instruction from the surface cleaning apparatus, an instruction to a water source disposed at a base station to turn on the water source, so as to supply water to a clean water tank of the surface cleaning apparatus, wherein the clean water tank includes a water filling port, the water filling port is configured to communicate with the water source when the surface cleaning apparatus is located within the base station, the surface cleaning apparatus further includes a water flow path communicating with the clean water tank, and the water flow path is configured such that when the clean water tank is filled with water via the water filling port, clean water for filling the cleaning sink flows from the clean water tank to the cleaning sink along the water flow path for self-cleaning treatment of the surface cleaning apparatus.

[0021] In some embodiments, the method further includes: transmitting, on the basis of a water fullness signal from a water level sensor in the cleaning sink indicating that a water level in the cleaning sink has reached a predetermined height, an instruction to the water source to stop supplying water to the clean water tank; and transmitting the water fullness signal to the surface cleaning apparatus to cause the surface cleaning apparatus to initiate the self-cleaning treatment on the basis of the water fullness signal.

[0022] The aspects and advantages previously described with respect to a self-cleaning device are accordingly applicable to an electrical apparatus according to the present disclosure, which will thus not be repeated herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] These and other purposes, features and advantages of embodiments of the present disclosure will become readily understood by reading the detailed description below with reference to the accompanying drawings. In the accompanying drawings, several embodiments of the present disclosure are shown by way of example and not limitation.

FIG. 1 illustrates an overall schematic diagram of a surface cleaning apparatus disposed within a base station according to an embodiment of the present

disclosure.

FIG. 2 illustrates an overall schematic diagram of a base station according to an embodiment of the present disclosure, where a surface cleaning apparatus is away from the base station and a cleaning sink is shown from a top view.

FIG. 3 illustrates a schematic diagram of a partial cross-sectional structure of filling a clean water tank of the surface cleaning apparatus with water from a base station of a cleaning system for a surface cleaning apparatus according to an embodiment of the present disclosure.

FIG. 4 illustrates a schematic diagram of a partial cross-sectional structure of water overflowing from a clean water tank to a cleaning sink of a cleaning system for a surface cleaning apparatus according to an embodiment of the present disclosure.

FIG. 5 illustrates a three-dimensional schematic diagram of a clean water tank viewed from a top side according to an embodiment of the present disclosure.

FIG. 6 illustrates a three-dimensional schematic diagram of a clean water tank viewed from a bottom side according to an embodiment of the present disclosure.

FIG. 7 illustrates a schematic diagram of a partial cross-sectional structure of water overflowing from a clean water tank to a cleaning sink via a waste water tank of a cleaning system for a surface cleaning apparatus according to another embodiment of the present disclosure.

FIG. 8 illustrates a flow diagram of a cleaning method for a surface cleaning apparatus according to an embodiment of the present disclosure.

[0024] In each of the accompanying drawings, the same or corresponding reference numerals indicate the same or corresponding parts.

DESCRIPTION OF THE EMBODIMENTS

[0025] Preferred embodiments of the present disclosure will be described in more detail below with reference to the accompanying drawings. Although the preferred embodiments of the present disclosure are shown in the accompanying drawings, it should be understood that the present disclosure can be implemented in various forms and should not be limited to the embodiments set forth herein. Rather, these embodiments are provided so that the present disclosure will be more thorough and complete, and will be able to fully convey the scope of the present disclosure to those skilled in the art.

[0026] References to "an embodiment" or "an implementation" in the framework of this specification are intended to indicate that a particular configuration, structure, or feature described with respect to that embodiment is included in at least one embodiment. Accordingly, phrases "in embodiments," "in an embodiment," and the

like that may appear in various aspects of this specification do not necessarily refer to the same embodiment exactly. Furthermore, particular configurations, structures, or features may be combined in one or more embodiments in any suitable manner.

[0027] As used herein, the term "include" and variations thereof indicate open-ended inclusion, i.e., "including but not limited to". Unless specifically stated, the term "or" indicates "and/or". The term "based on" indicates "at least partially based on". The terms "one exemplary embodiment" and "one embodiment" indicate "at least one exemplary embodiment". The term "another embodiment" indicates "at least one additional embodiment". The terms "upper", "lower", "front", "rear" and the like indicate placement or positional relationships based on the orientation or positional relationships shown in the accompanying drawings, and are intended only to facilitate the description of the principles of the present disclosure, rather than indicate or imply that the referenced elements must have a particular orientation, be constructed or operated in a particular orientation, and therefore are not to be construed as limitations on the present disclosure.

[0028] A cleaning system for a surface cleaning apparatus and an associated method according to embodiments of the present disclosure are described below in detail in conjunction with the accompanying drawings.

[0029] A surface cleaning apparatus 200 is typically used in cooperation with a base station 100. FIG. 1 illustrates a schematic diagram of a state where the surface cleaning apparatus 200 enters a docking station 140, and FIG. 2 illustrates a schematic diagram of a state where the surface cleaning apparatus 200 leaves the docking station 140. As shown in FIG. 1 and FIG. 2, the base station 100 may include the docking station 140 for accommodating the surface cleaning apparatus 200. The docking station 140 may, for example, be in the form of an opening, and the surface cleaning apparatus 200 is allowed to enter the docking station 140. The docking station 140 may be closed, for example, by an openable cover plate 130. The cover plate 130 may close the docking station when the base station 100 is in a standby state (i.e., when the surface cleaning apparatus 200 has not returned to the base station 100). When the surface cleaning apparatus 200 is ready to return to the base station 100, the cover plate 130 may be laid flat to form a path for the surface cleaning apparatus 200 to enter the docking station 140. However, it is to be appreciated that the cover plate 130 may also remain laid flat, such that the docking station 140 may be always in an open form.

[0030] The base station 100 includes a cleaning sink 110. The cleaning sink 110 is in the form of an open groove and is configured to be located underneath a to-be-cleaned component of the surface cleaning apparatus 200 when the surface cleaning apparatus 200 is located within the base station 100. The cleaning sink 110 may hold water for cleaning the to-be-cleaned component.

[0031] A cleaning robot typically includes cleaning components such as a cleaning roller or a cleaning turntable, and the cleaning components such as the cleaning roller or the cleaning turntable need to be wet using cleaning water during the cleaning process of the cleaning robot. The surface cleaning apparatus 200 needs to periodically return to the base station 100 for maintenance operations after or during the surface cleaning operations. The docking station 140 may be provided with various interfaces for connection to the cleaning robot, such as an electrical interface, a clean water interface 120, a waste water interface and a dust collection interface. When the cleaning robot enters the docking station, the various interfaces of the base station establish a connection with corresponding interfaces of the cleaning robot, so as to carry out maintenance operations on the cleaning robot. For example, the cleaning robot may be charged by means of the electrical interface, water for cleaning the floor is replenished for a clean water tank of the cleaning robot by means of the water interface 120, waste water generated during cleaning the floor is recycled from a waste water tank of the cleaning robot by means of the waste water interface, and dirt collected by the cleaning robot during cleaning is recycled by means of the dust collection interface. Through the maintenance of the cleaning robot, the cleaning robot may re-clean the floor in a good state.

[0032] In order to clean the cleaning component of the surface cleaning apparatus 200, a conventional base station 100 is provided with at least two clean water supply paths, one for filling the clean water tank of the cleaning robot 200 with water, and the other for filling the cleaning sink 110 with water. Thus, at least two pumps and/or solenoid valves for controlling the supply paths need to be provided, which inevitably increases the cost of the base station 100 and makes the size of the base station large. According to embodiments of the present disclosure, by utilizing a water filling path of the clean water tank of the surface cleaning apparatus 200 to form a water filling path of the cleaning sink 110, the structure of the water filling path for the cleaning sink of the base station may be simplified or even omitted, the cost of the apparatus is reduced, and the size of the apparatus is reduced.

[0033] Structural details of a cleaning system for a surface cleaning apparatus according to an embodiment of the present disclosure are shown in detail below in conjunction with FIG. 3 and FIG. 4. FIG. 3 and FIG. 4 illustrate a schematic diagram of a partial cross-sectional structure of filling a clean water tank of the surface cleaning apparatus with water from a base station, and a schematic diagram of a partial cross-sectional structure of water overflowing from the clean water tank to a cleaning sink of a cleaning system for a surface cleaning apparatus according to embodiments of the present disclosure, respectively.

[0034] As shown in FIG. 3 and FIG. 4, the surface cleaning apparatus 200 includes a cleaning assembly

230, a clean water tank 210, and a waste water tank 220. The cleaning assembly 230 may include a cleaning component 232. The cleaning component 232 may be in various forms. In some embodiments, as shown in FIG. 3, the cleaning component 232 is in the form of a rotating drum, where a circumferential surface of the drum may be pressed against the floor to clean the floor. In some embodiments (not shown), the cleaning component 232 may also be in the form of a rotating turntable, where the surface of the turntable may be pressed against the floor to clean the floor.

[0035] The clean water tank 210 and the waste water tank 220 are formed in the form of closed cavities and are suitable for holding water therein. During a cleaning operation performed by the surface cleaning apparatus 200, the clean water tank 210 is configured to supply cleaning water to the cleaning component 232 to wet the cleaning component 232, thus improving the cleaning performance of the cleaning component; and the waste water tank 220 is configured to recycle waste water from the cleaning component 232 to prevent secondary contamination of the floor by waste water on the cleaning component 232. In some embodiments, the clean water tank 210 and the waste water tank 220 may be formed by injection molding. In some embodiments, the clean water tank 210 and the waste water tank 220 may be discrete components and may be assembled on the surface cleaning apparatus 200. In some embodiments, the clean water tank 210 and the waste water tank 220 may be integrally molded.

[0036] As shown in FIG. 3, the clean water tank 210 includes a water filling port 212. When the surface cleaning apparatus 200 is located within the base station 100, the water filling port 212 communicates with the clean water interface 120 (also referred to as a water source 120) of the base station 100. Thus, water may be delivered to the water filling port 212 through the water source 120 of the base station 100 to fill the clean water tank 210. In some embodiments, the water source 120 may be a water tank. A pump or valve may be provided on a pipe from the water source, which may be operated, for example, to shut off or close the pipe.

[0037] The surface cleaning apparatus 200 further includes a water flow path communicating with the clean water tank 210. Before the surface cleaning apparatus performs self-cleaning, the clean water tank 210 may be filled with water via the water filling port 212, and water flows from the clean water tank 210 to the cleaning sink 110 along the water flow path.

[0038] In some embodiments, the water supply to the cleaning sink 110 may be controlled by controlling the on-off of the water flow path. As an example, an active control component, such as a solenoid valve, may be provided in the water flow path, and the solenoid valve may be controlled to open to supply water to the cleaning sink when water supply to the cleaning sink is required. In some embodiments, the water flow path may not be provided with any active control component such as a

solenoid valve, and the water supply to the cleaning sink may be automatically controlled through an overflow pipe, for example, when water in the clean water tank reaches a predetermined height, water may automatically flow into the cleaning sink by overflow. In this case, water may be automatically supplied to the cleaning sink without any additional control. According to the present disclosure, since the clean water tank is filled with water by using the base station, and water for filling the clean water tank 210 is further used to fill the cleaning sink, the filling speed of the cleaning sink 110 may be significantly increased by the driving of water filling power, and the cleaning sink may be filled with water within a short period of time, as compared to the conventional mode of using water in the clean water tank 210 to fill the cleaning sink.

[0039] FIG. 4 illustrates a water flow path without any active control element. In particular, an overflow path for water to flow from the clean water tank 210 to the cleaning sink 110 is illustrated in FIG. 4 with dotted lines with arrows. The water flow path is configured such that when water in the clean water tank 210 reaches a predetermined filling height, water overflows to the cleaning sink 110 via the water flow path. Since water from the base station 100 overflows to the cleaning sink 110 via the clean water tank 210 in the surface cleaning apparatus 200 and then via the water flow path communicating with the clean water tank 210, that is, the water filling path for the cleaning sink is at least partially implemented by means of the clean water tank 210 of the surface cleaning apparatus 200, the base station 100 does not need to be provided with any additional water supply device for the cleaning sink 110. The number of parts required for a water supply facility of the base station 100 is decreased, and thus the cost of the apparatus may be reduced. Furthermore, considering that the water supply facility does not need to be provided with additional water supply devices for the cleaning sink 110, the layout of the base station 100 may be further optimized, and the size of the base station 100 may be further reduced, which are technically advantageous for household equipment.

[0040] In some embodiments, the water supply from the clean water tank 210 to the cleaning sink 110 relies on an excess water supply from the water source. No active control component for controlling the flow of water from the clean water tank 210 to the cleaning space is provided on the water flow path from the clean water tank 210 to the cleaning sink 110, for example, there is no need for solenoid valves or pumps or other components. When water in the clean water tank 210 reaches the predetermined filling height, water that continues to be supplied to the clean water tank 210 may automatically overflow to the cleaning sink 110 via the water flow path.

[0041] In some embodiments, as shown in FIG. 4, the clean water tank 210 includes an overflow pipe 214 that serves as a part of the water flow path and protrudes upward by the predetermined filling height from an inner surface of a bottom of the clean water tank 210. The overflow pipe 214 includes a water inlet at a top and a

water outlet at a bottom. In some embodiments, the water outlet at the bottom may be provided as a hole penetrating through the bottom of the clean water tank 210, which is advantageous in cases where the overflow pipe and the clean water tank are integrally molded by injection, allowing for easy drafting of the integrally molded clean water tank. It should be understood that this is merely exemplary, and in other embodiments the overflow pipe 214 may be formed in other forms.

[0042] When the water level of the clean water tank 210 reaches the predetermined filling height, water that continues to be supplied to the clean water tank 210 may enter the overflow pipe 214 via the water inlet at the top of the overflow pipe 214 and flow out of the overflow pipe 214 via the water outlet at the bottom of the overflow pipe 214. Water flowing out of the overflow pipe 214 via the water outlet at the bottom of the overflow pipe 214 is then guided to the cleaning sink 110. In some embodiments, the overflow pipe 214 may be integrally molded with the clean water tank 210. The overflow pipe 214 may have a size that gradually increases from the water inlet at the top to the water outlet at the bottom, which facilitates drafting of the overflow pipe 214.

[0043] In some embodiments, as shown in FIG. 4, the surface cleaning apparatus 200 further includes a check valve 216 provided in the water flow path. The check valve 216 is configured to allow water in the clean water tank 210 to automatically overflow from the clean water tank 210 to the vicinity of the cleaning space via the water flow path when the water in the clean water tank 210 reaches the predetermined filling height. Additionally, accidental leakage of water in the clean water tank 210 via the water flow path may be prevented by the check valve.

[0044] In some embodiments, as shown in FIG. 4, the check valve is formed in the form of a flexible diaphragm, which has cost advantages. In some embodiments, the diaphragm may include a plurality of sub-diaphragms provided with openings. In some embodiments, the openings may be formed in the form of slits in a zigzag, cross, or other shape. In some embodiments, the plurality of sub-diaphragms are configured to close the openings in a natural state under action of elastic force of the sub-diaphragms, and open the openings under action of water pressure when water in the clean water tank 210 reaches the predetermined filling height.

[0045] In some embodiments, the water flow path from the clean water tank 210 to the cleaning sink 110 may be formed by connecting two or more sections. As shown in FIG. 4, the water flow path may include a pipe section 218 configured to be in fluid connection to the overflow pipe 214. An inlet end of the pipe section 218 is connected to the water outlet of the overflow pipe 214, and an outlet end 219 of the pipe section 218 may be provided at a suitable location adjacent to the cleaning sink 110.

[0046] FIG. 5 and FIG. 6 further illustrate an embodiment of the pipe section 218. In the embodiment shown in FIG. 5 and FIG. 6, the pipe section 218 is formed in the

form of a frame attached to the bottom of the clean water tank 210. The side of the frame connected to the clean water tank 210 may be open, and the circumference and bottom of the frame may be closed. The outlet end 219 may be formed by providing an opening in a circumferential wall or bottom wall of the frame. The pipe section 218 may be fixed to the clean water tank 210 together with the flexible diaphragm serving as the check valve by means of fasteners such as threads. Thus, not only may the check valve be easily mounted, but water may also be guided to any desired location. In the embodiment of FIG. 6, the outlet end 219 is provided on a circumferential wall of the pipe section 218, and water from the clean water tank 210 may flow out via the outlet end 219. It should be understood that the illustrated embodiment of the pipe section 218 is merely exemplary, and in other embodiments, the outlet end may extend to the vicinity of a cleaning assembly 230 and water may be guided to the space near the cleaning assembly 230 via the outlet end and then enter the cleaning sink 110. In some embodiments, the outlet end may be provided adjacent to the waste water tank 220. As an example, water from the outlet end may flow into the cleaning sink 110 along an outer wall of the waste water tank 220. In some embodiments, an outlet end may be arranged in a space on one side of the waste water tank 220 and the cleaning assembly 230, and water falls into the cleaning sink 110 under gravity via a gap between the two. It should be understood that the above embodiments are merely exemplary, and the pipe section may be arranged in any other suitable manner as long as the pipe section is capable of guiding water into the cleaning sink 110.

[0047] Additionally, although in the illustrated embodiment, the water flow path from the clean water tank 210 to the cleaning sink 110 includes the overflow pipe 214 and the pipe section 218, it should be understood that this is merely exemplary; in other embodiments, the overflow pipe 214 and the pipe section 218 may be formed as a single component and may be mounted to the clean water tank 210. Alternatively, in some embodiments, the water flow path from the clean water tank 210 to the cleaning sink 110 may include a plurality of sections.

[0048] In some embodiments, at least two water flow paths from the clean water tank 210 to the cleaning sink 110 may be provided. The at least two water flow paths guide water to the cleaning sink 110 at different locations around the cleaning component 232. The plurality of water flow paths are beneficial for uniform filling of the cleaning sink 110. Since the cleaning component 232 is typically highly water-absorbent, when water is guided from the clean water tank 210 to the cleaning sink 110 via one of the water flow paths, the water has an uneven distribution in the cleaning sink 110, which may lead to inaccurate water level detection for the cleaning sink 110 or false alarms. By providing a plurality of water flow paths, it is convenient to eliminate localized differences in the water level of the cleaning sink 110 caused by the water absorption of the cleaning component 232.

[0049] As shown in FIG. 5, the clean water tank 210 may include two overflow pipes 214 that serve as a part of the water flow paths and protrude upward by a predetermined filling height from the bottom of the clean water tank 210. As an example, in the case where the cleaning component 232 is a cleaning drum, the two overflow pipes 214 may be spaced apart by a certain distance along the axial direction of the cleaning drum, thereby preventing localized differences in the water level of the cleaning sink 110 caused by the water absorption of the cleaning component 232. As an example, in the case where the cleaning component 232 is a cleaning turntable, the two overflow pipes 214 may be spaced apart by a certain distance along the radial direction of the cleaning turntable, thereby preventing localized differences in the water level of the cleaning sink 110 caused by the water absorption of the cleaning component 232. With further reference to FIG. 2, FIG. 2 also illustrates two sensors 115 for detecting the water level of the cleaning sink 110. Since the cleaning component 232 is highly water-absorbent, there is a risk of false alarms of the water level of the cleaning sink 110 as water flows into the cleaning sink 110 via one of the water flow paths. In the illustrated embodiment, by providing two or more overflow pipes as the water flow paths, the cleaning sink may be filled with water evenly, thereby preventing false alarms of the water level of the cleaning sink.

[0050] In some embodiments, the water supply path used for supplying clean water from the clean water tank 210 to the cleaning sink 110 may also pass through other chambers (for example, the waste water tank), which is advantageous in some instances, particularly where the structural configuration of the surface cleaning apparatus is not suitable for setting of a direct path from the clean water tank 210 to the cleaning sink 110.

[0051] FIG. 7 illustrates a schematic diagram of a partial cross-sectional structure of water overflowing from the clean water tank 210 to the cleaning sink 110 via the waste water tank 220 of a cleaning system for a surface cleaning apparatus according to another embodiment of the present disclosure. As shown in FIG. 7, the water flow path from the clean water tank 210 to the cleaning sink 110 includes a first section flow path and a second section flow path. The first section flow path is configured to make the clean water tank 210 communicate with the waste water tank 220, and to allow water in the clean water tank 210 to automatically overflow from the clean water tank 210 to the waste water tank 220 via the first section flow path when the water in the clean water tank 210 reaches the predetermined filling height. In some embodiments, the waste water tank 220 may be provided with a water collection portion, water flowing out of the first section flow path may fall to the water collection portion, and the water collection portion may be formed in the form of a guide groove or a guide ramp to facilitate guiding the water to the waste water tank. In some embodiments, as shown in FIG. 7, the first section flow path may be in the form of an overflow pipe integrally

molded with the clean water tank, for example, being similar to the overflow pipe shown in FIG. 4.

[0052] The second section flow path is configured to allow water in the waste water tank 220 to automatically overflow from the waste water tank 220 to the cleaning sink 110 via the second section flow path when the water in the waste water tank 220 reaches a predetermined height. In some embodiments, the waste water tank 220 may include a waste water inlet 227 disposed at the predetermined height. Water from the clean water tank 210 enters the waste water inlet 227 via a waste water channel, and water entering the waste water tank 220 automatically overflows from the waste water tank 220 to the cleaning sink 110 via the waste water inlet 227 when reaching the predetermined height. In some embodiments, a squeegee 225 of the cleaning assembly 230 may serve to guide water from the first section flow path. The squeegee 225 may be provided with a guide path, such as in the form of a ramp, to guide water to the waste water inlet 227. Thus, water from the clean water tank is easily guided to the cleaning sink 110 without any complex modifications to the waste water tank 220.

[0053] In some embodiments, the waste water tank 220 further includes a valve (not shown) provided at the waste water inlet 227, and the valve is configured to be opened during filling of the cleaning sink 110 with water and to be closed during non-filling of the cleaning sink 110 with water. Thus, it may be ensured that the waste water tank is only opened when the cleaning robot needs to be cleaned, avoiding leakage caused by opening at other times.

[0054] The present disclosure further provides a cleaning system for a surface cleaning apparatus 200. The cleaning system includes: a water source 120, disposed at a base station 100; a cleaning sink 110, located at a bottom side of a docking station 140 of the base station 100 for accommodating the surface cleaning apparatus 200, the cleaning sink 110 including a cleaning space for cleaning a cleaning component 232 of the surface cleaning apparatus 200; a clean water tank 210, disposed at the surface cleaning apparatus 200, the clean water tank 210 including a water filling port 212, the water filling port 212 being configured to communicate with the water source 120 when the surface cleaning apparatus 200 is located within the docking station 140; and a water flow path, configured to guide water from the clean water tank 210 to the cleaning sink 110, and configured such that when water in the clean water tank 210 reaches a predetermined filling height, water that continues to be supplied from the water source 120 to the clean water tank 210 automatically overflows to the cleaning sink 110 via the water flow path. According to the present disclosure, a water filling path of the cleaning sink 110 for cleaning the surface cleaning apparatus 200 is implemented with the aid of a water filling system of the clean water tank of the surface cleaning apparatus 200, so that the cleaning system has fewer parts and lower costs.

[0055] The present disclosure further provides a clean-

ing method 300 for a surface cleaning apparatus 200. At block 302, on the basis of a cleaning instruction from the surface cleaning apparatus 200, an instruction is transmitted to a water source 120 disposed at a base station 100 to turn on the water source 120. Thus, water is supplied to a clean water tank 210 of the surface cleaning apparatus 200. The clean water tank 210 includes a water filling port 212, and the water filling port 212 is configured to communicate with the water source 120 when the surface cleaning apparatus 200 is located within the base station 100. When water in the clean water tank 210 reaches a predetermined filling height, water that continues to be supplied from the water source 120 to the clean water tank 210 automatically overflows to a cleaning sink 110 of the base station 100 via a water flow path.

[0056] In some embodiments, at block 304, on the basis of a water fullness signal from a water level sensor in the cleaning sink 110 indicating that a water level in the cleaning sink 110 has reached a predetermined height, an instruction is transmitted to the water source 120 to stop supplying water to the clean water tank 210. At block 305, the water fullness signal is transmitted to the surface cleaning apparatus 200 to cause the surface cleaning apparatus 200 to initiate cleaning treatment on the basis of the water fullness signal.

[0057] For example, in some embodiments, the method 300 may be implemented as a computer software program that is tangibly contained in a machine-readable medium, such as a storage unit. In some embodiments, some or all of the computer program may be loaded and/or installed onto the apparatus via an ROM and/or a communication unit. When the computer program is loaded into an RAM and executed by a CPU, one or more steps of the method 300 described above may be performed. Alternatively, in other embodiments, the CPU may be configured to execute the method 300 in any other suitable manner (e.g., with the aid of firmware).

[0058] The functions described above herein may be performed, at least in part, by one or more hardware logic components. For example, without limitation, exemplary types of hardware logic components that may be used include: a field programmable gate array (FPGA), an application specific integrated circuit (ASIC), an application specific standard product (ASSP), a system on chip (SOC), a complex programmable logic device (CPLD), and the like.

[0059] Program codes for implementing the methods of the present disclosure may be written in any combination of one or more programming languages. These program codes may be provided to processors or controllers of a general-purpose computer, a special-purpose computer or other programmable data processing apparatuses, so that when executed by the processors or controllers, the program codes enable the functions/operations specified in the flow diagrams and/or block diagrams to be implemented. The program codes may be executed completely on a machine, partially on the

machine, partially on the machine and partially on a remote machine as a separate software package, or completely on the remote machine or a server.

[0060] In the context of the present disclosure, a machine-readable medium may be a tangible medium that may include or store a program for use by or in connection with an instruction execution system, device or apparatus. The machine-readable medium may be a machine-readable signal medium or a machine-readable storage medium. The machine-readable medium may include but not limited to an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, device or apparatus, or any suitable combination of the above contents. More specific examples of the machine-readable storage medium may include electrical connections based on one or more wires, a portable computer disk, a hard disk, a random access memory (RAM), a read only memory (ROM), an erasable programmable read only memory (EPROM or flash memory), an optical fiber, a portable compact disk read only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the above contents.

[0061] In addition, while the operations are depicted in a particular order, it is not to be construed as requiring that the operations be performed in the particular order indicated or in a sequential order, or that all of the illustrated operations should be performed to achieve the desired result. Multitasking and parallel processing may be advantageous in certain environments. Similarly, while a plurality of specific implementation details are included in the above discussion, these should not be construed as limiting the scope of the present disclosure. Certain features described in the context of separate embodiments may also be implemented in combination in a single implementation. Conversely, the various features described in the context of a single implementation may also be implemented in a plurality of implementations individually or in any suitable sub-combination.

[0062] Although the present subject matter has been described using language specific to structural features and/or method logical actions, it is to be understood that the subject matter as defined in the appended claims is not necessarily limited to the particular features or actions described above. Rather, the particular features and actions described above are merely exemplary forms to implement the claims.

[0063] The embodiments of the present disclosure have been described above. The above description is exemplary, rather than exhaustive, and is not limited to the disclosed embodiments. Numerous modifications and alterations are apparent to those of ordinary skill in the art without departing from the scope and spirit of the illustrated embodiments. The selection of terms used herein is intended to best explain the principles and practical applications of the various embodiments or the improvements to technologies on the market, or to enable other persons of ordinary skill in the art to understand the embodiments disclosed herein.

Claims

1. A surface cleaning apparatus (200), **characterized by** comprising:

a cleaning assembly (230), comprising a cleaning component (232) for cleaning a surface; and a clean water tank (210), configured to supply the cleaning component (232) with cleaning water to wet the cleaning component (232), wherein the clean water tank (210) comprises a water filling port (212), the water filling port (212) is configured to: communicate with a water source (120) of a base station (100) when the surface cleaning apparatus (200) is located within the base station (100) that cooperates with the surface cleaning apparatus (200), and the base station (100) comprises a cleaning sink (110) for cleaning the cleaning component (232); and

wherein the surface cleaning apparatus (200) further comprises a water flow path communicating with the clean water tank (210), and the water flow path is configured such that when the clean water tank (210) is filled with water via the water filling port (212), clean water for filling the cleaning sink (110) flows from the clean water tank (210) to the cleaning sink (110) along the water flow path.

2. The surface cleaning apparatus (200) according to claim 1, **characterized in that** the water flow path is further configured such that when water in the clean water tank (210) reaches a predetermined filling height, water that continues to be supplied to the clean water tank (210) overflows to the cleaning sink (110) via the water flow path.
3. The surface cleaning apparatus (200) according to claim 2, **characterized in that** the clean water tank (210) comprises an overflow pipe (214) that serves as a part of the water flow path and protrudes upward by the predetermined filling height from an inner surface of a bottom of the clean water tank (210).
4. The surface cleaning apparatus (200) according to claim 3, **characterized in that** the overflow pipe (214) comprises a water inlet in a top end and a water outlet in a bottom end, wherein the water inlet in the top end is configured to allow water to enter the overflow pipe (214) via the water inlet in the top end when water in the clean water tank (210) reaches the predetermined filling height, and the water outlet in the bottom end is formed as a through hole penetrating through a surface of a bottom wall of the clean water tank.
5. The surface cleaning apparatus (200) according to

any one of claims 2 to 4, **characterized by** further comprising:

a check valve (216) in the water flow path, the check valve (216) being configured to allow water in the clean water tank (210) to flow from the clean water tank (210) to the cleaning sink (110) via the water flow path.

6. The surface cleaning apparatus (200) according to claim 5, **characterized in that** the check valve comprises a flexible diaphragm, the flexible diaphragm comprises a plurality of sub-diaphragms provided with openings, and the plurality of sub-diaphragms are configured to:

close the openings under action of elastic force of the sub-diaphragms; and

open the openings under action of water pressure when water in the clean water tank (210) reaches the predetermined filling height.

7. The surface cleaning apparatus (200) according to claim 5, **characterized in that** the water flow path comprises a pipe section (218) communicating with the overflow pipe (214), the pipe section is fixed to a surface of a bottom side of the clean water tank (210), and the check valve and the pipe section (218) are fixed to an outer surface of the bottom of the clean water tank through fasteners.

8. The surface cleaning apparatus (200) according to any one of claims 1-4, 6 and 7, **characterized in that** at least two water flow paths are provided, the at least two water flow paths guide water to the cleaning sink (110) at different locations around the cleaning component (232), and the at least two water flow paths are arranged on different sides of the water filling port (212).

9. The surface cleaning apparatus (200) according to any one of claims 1-4, 6 and 7, **characterized by** further comprising a waste water tank (220), the waste water tank (220) being configured to recycle waste water from the cleaning component (232), wherein the water flow path is configured such that water from the clean water tank (210) is guided to a gap between the waste water tank (220) and the cleaning component (232) and flows to the cleaning sink (110) via the gap.

10. The surface cleaning apparatus (200) according to any one of claims 1-4, 6 and 7, **characterized by** further comprising a waste water tank (220), the waste water tank (220) being configured to recycle waste water from the cleaning component (232), wherein the water flow path comprises a first section flow path and a second section flow path,

the first section flow path is configured to make the clean water tank (210) communicate with the waste water tank (220), so as to allow water in the clean water tank (210) to flow from the clean water tank (210) to the waste water tank (220), and

the second section flow path is configured to allow water in the waste water tank (220) to automatically overflow from the waste water tank (220) to the cleaning sink (110) when the water in the waste water tank (220) reaches a predetermined height.

11. The surface cleaning apparatus (200) according to claim 10, **characterized in that** the waste water tank (220) comprises a waste water inlet (227) disposed at the predetermined height, water from the clean water tank (210) enters the waste water tank (220) via the waste water inlet (227), and automatically overflows from the waste water tank (220) to the cleaning sink (110) via the waste water inlet (227) when the water in the waste water tank (220) reaches the predetermined height.

12. The surface cleaning apparatus (200) according to claim 11, **characterized in that** the waste water tank (220) further comprises a valve disposed at the waste water inlet (227), and the valve is configured to be opened during filling of the cleaning sink (110) with water and to be closed during non-filling of the cleaning sink (110) with water.

13. A cleaning system for a surface cleaning apparatus (200), **characterized by** comprising:

a water source (120), disposed at a base station (100);

a cleaning sink (110), located at a bottom side of a docking station (140) of the base station (100), the cleaning sink (110) defining a cleaning space for cleaning a cleaning component (232) of the surface cleaning apparatus (200);

a clean water tank (210), disposed at the surface cleaning apparatus (200), the clean water tank (210) comprising a water filling port (212), the water filling port (212) being configured to communicate with the water source (120) when the surface cleaning apparatus (200) is located within the docking station (140); and

a water flow path, configured to guide water from the clean water tank (210) to the cleaning sink (110), the water flow path being configured such that when the clean water tank (210) is filled with water via the water filling port (212), clean water for filling the cleaning sink (110) flows from the clean water tank (210) to the cleaning sink (110) along the water flow path.

14. A cleaning method for a surface cleaning apparatus (200), **characterized by** comprising:
transmitting, on the basis of a cleaning instruction from the surface cleaning apparatus (200), an instruction to a water source (120) disposed at a base station (100) to turn on the water source (120), so as to supply water to a clean water tank (210) of the surface cleaning apparatus (200), wherein the clean water tank (210) comprises a water filling port (212), the water filling port (212) is configured to communicate with the water source (120) when the surface cleaning apparatus (200) is located within the base station (100), the surface cleaning apparatus (200) further comprises a water flow path communicating with the clean water tank (210), and the water flow path is configured such that when the clean water tank (210) is filled with water via the water filling port (212), clean water for filling the cleaning sink (110) flows from the clean water tank (210) to the cleaning sink (110) along the water flow path for self-cleaning treatment of the surface cleaning apparatus.

15. The cleaning method according to claim 14, **characterized by** further comprising:
transmitting, on the basis of a water fullness signal from a water level sensor in the cleaning sink (110) indicating that a water level in the cleaning sink (110) has reached a predetermined height, an instruction to the water source (120) to stop supplying water to the clean water tank (210); and
transmitting the water fullness signal to the surface cleaning apparatus (200) to cause the surface cleaning apparatus (200) to initiate the self-cleaning treatment on the basis of the water fullness signal.

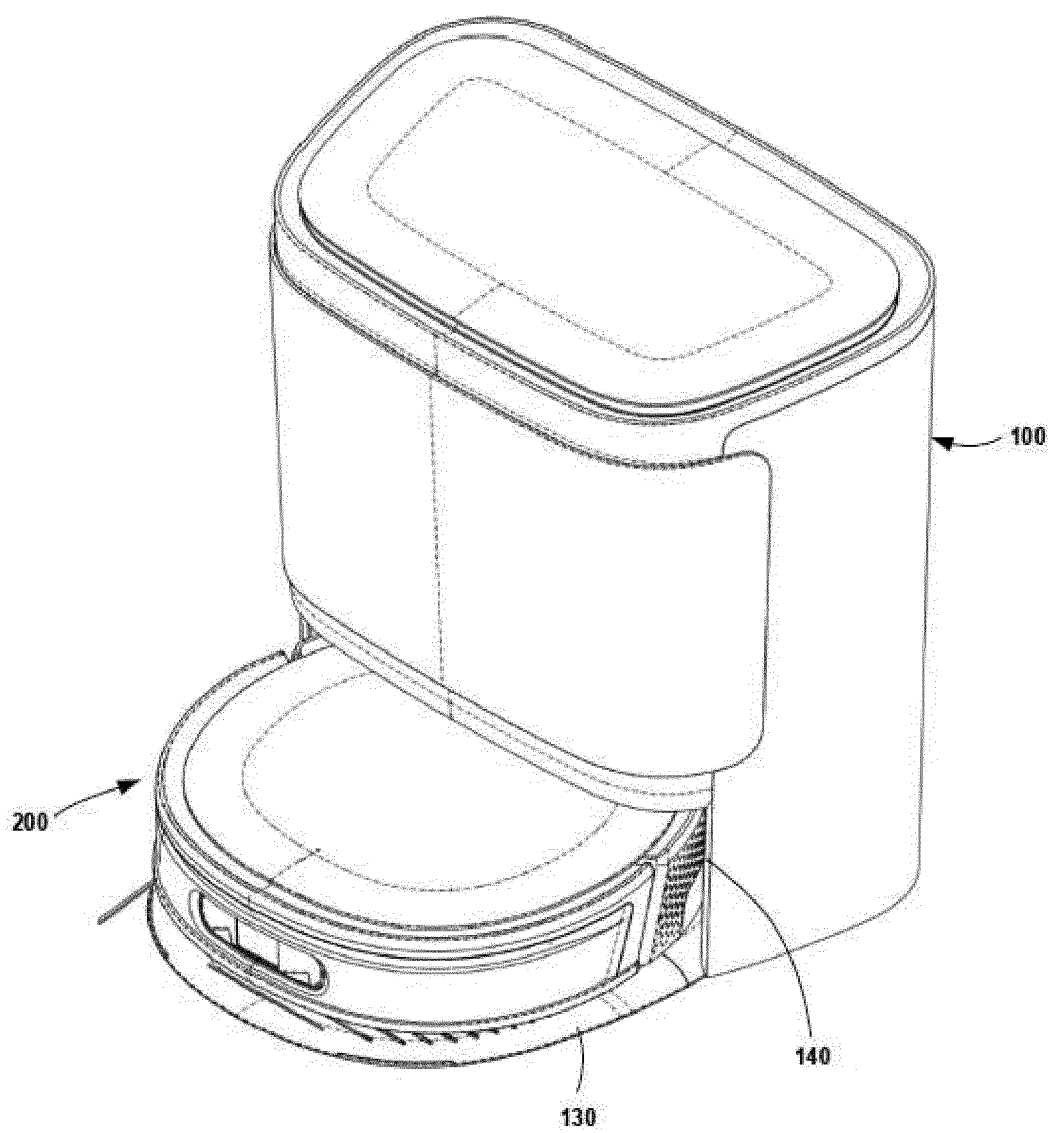


FIG. 1

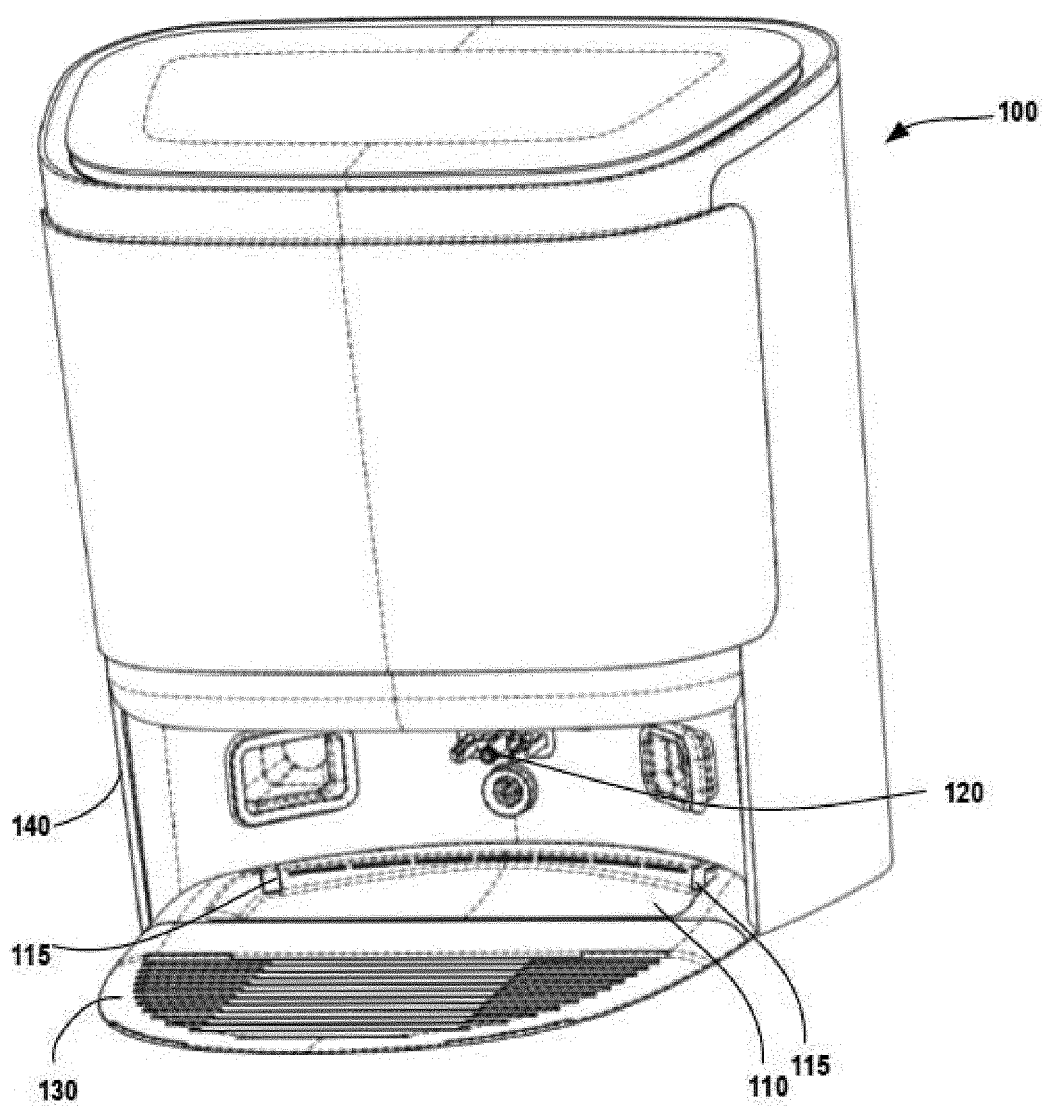


FIG. 2

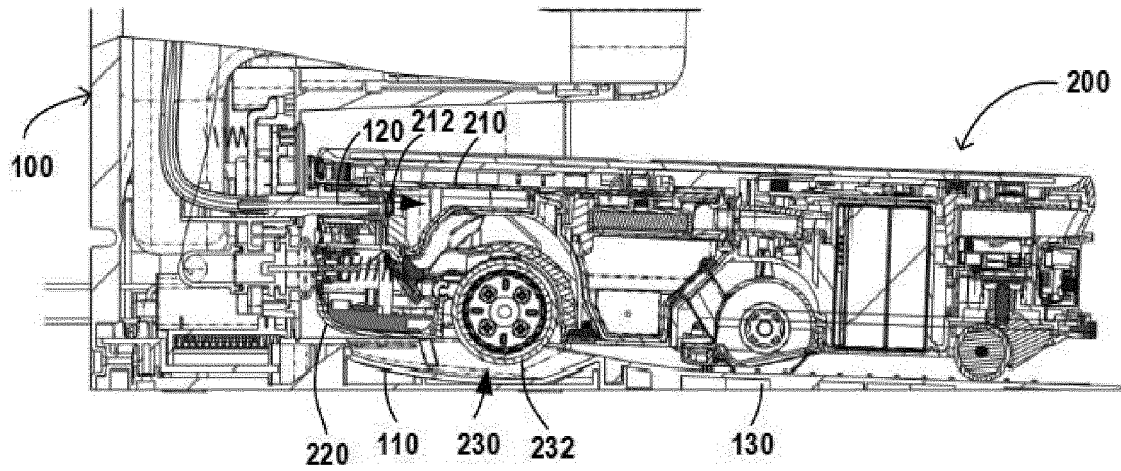


FIG. 3

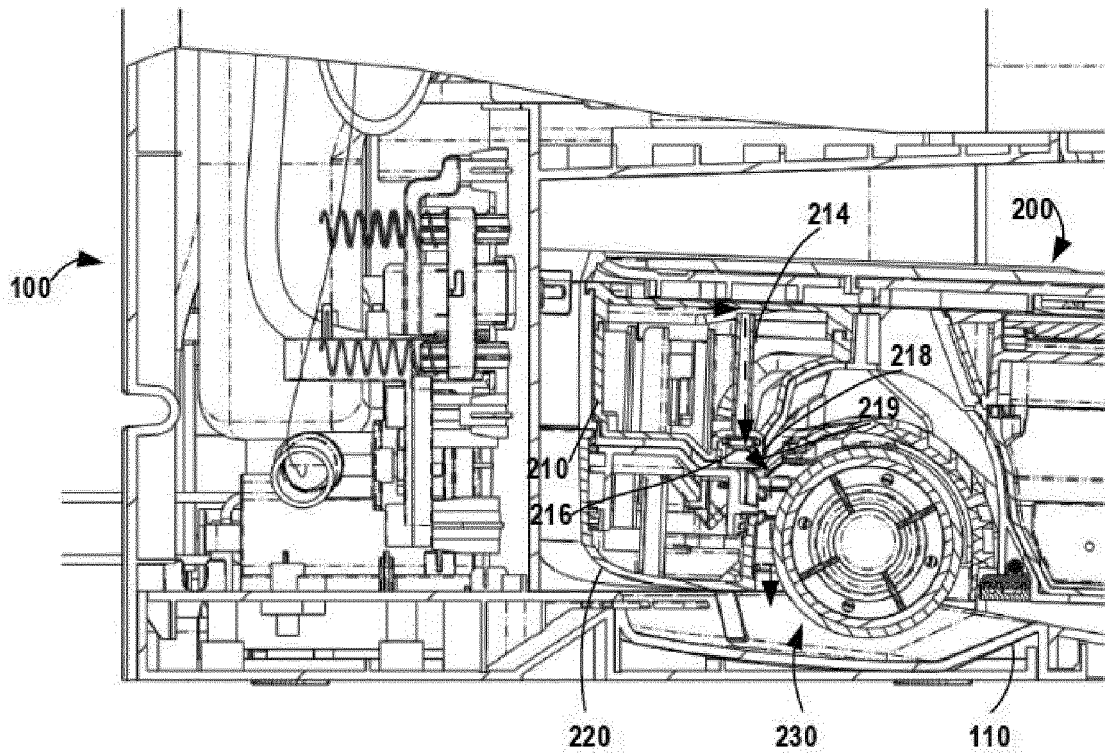


FIG. 4

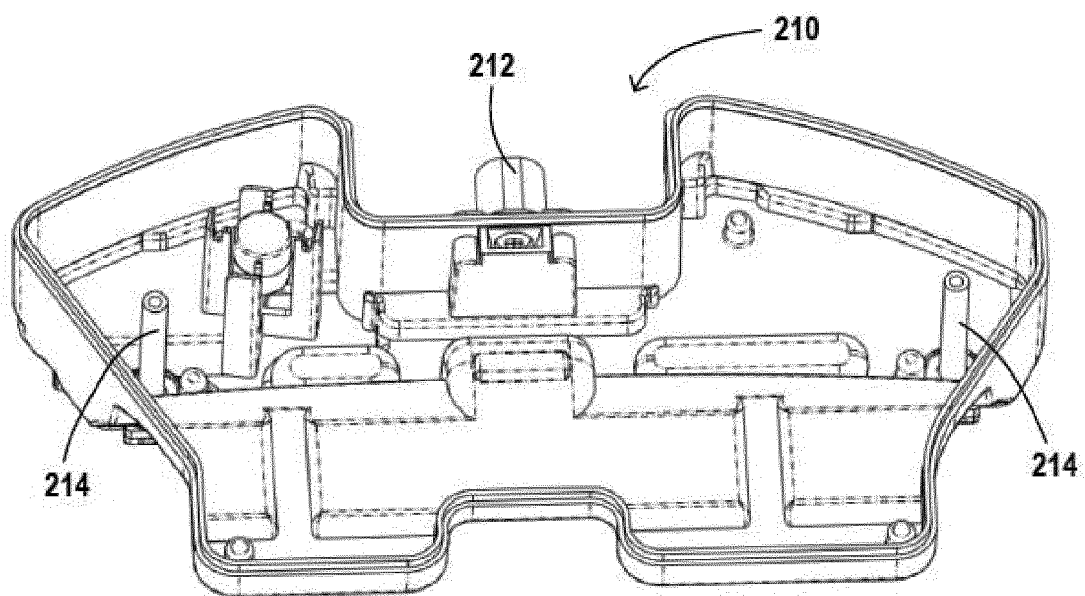


FIG. 5

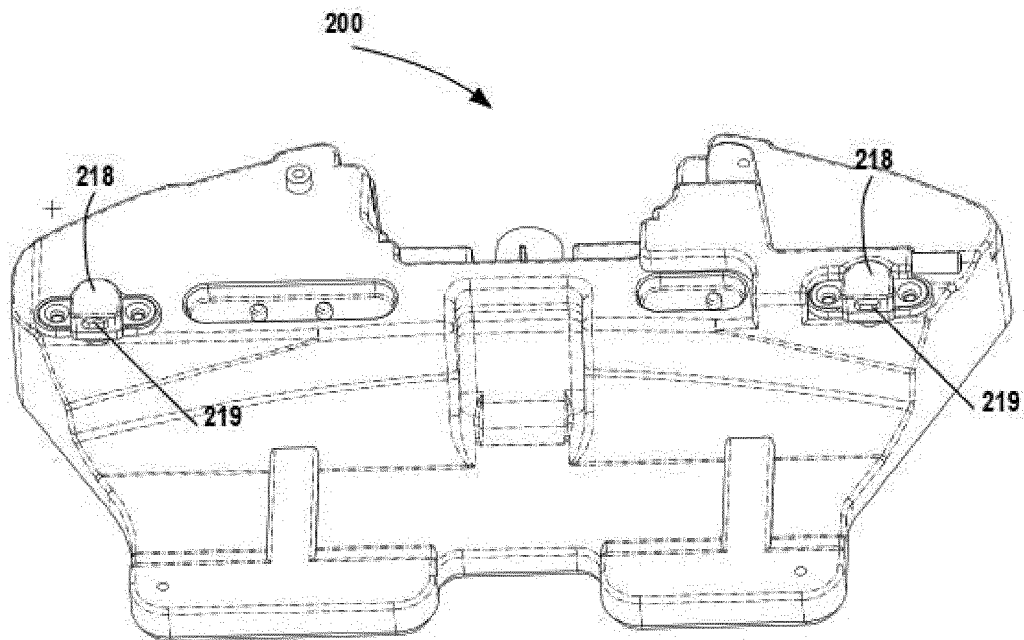


FIG. 6

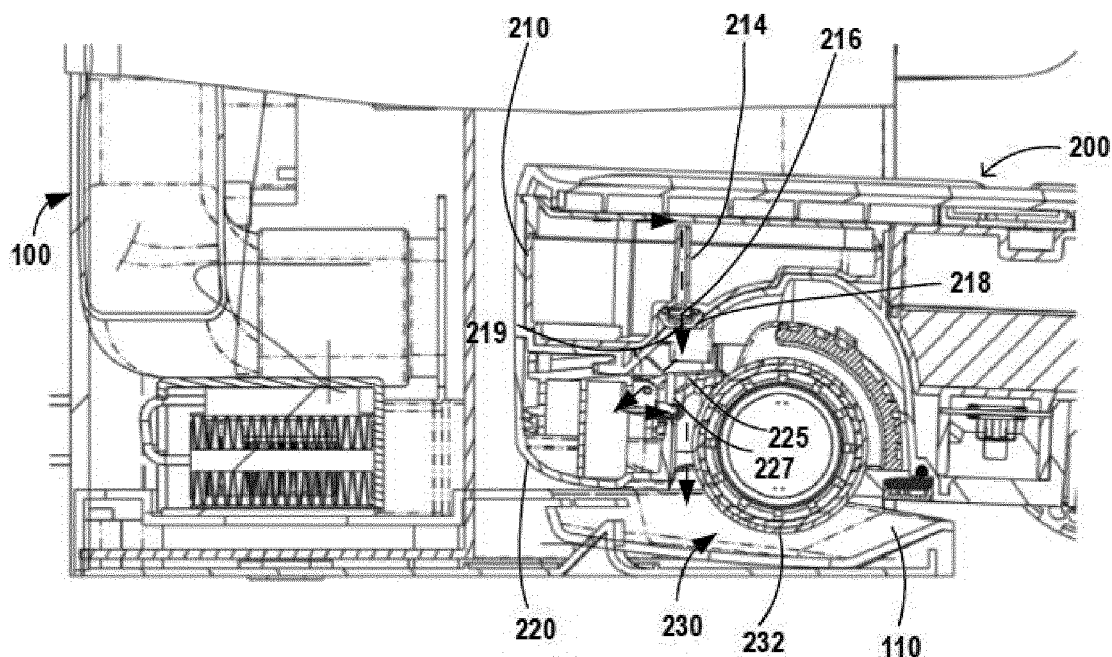


FIG. 7

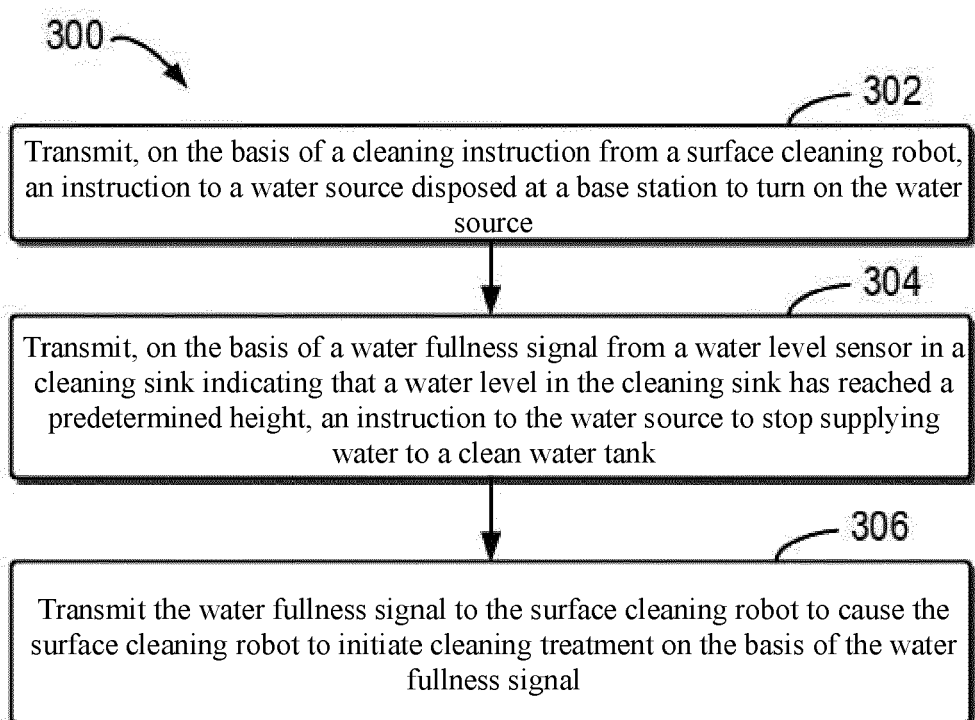


FIG. 8



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 9928

DOCUMENTS CONSIDERED TO BE RELEVANT

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A	* paragraph [0041] - paragraph [0042]; figures 1-4 *	10-12,15	
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	* paragraph [0044]; figures 5, 9 *		
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	* paragraph [0045] *		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
Place of search		Date of completion of the search	Examiner
Munich		28 May 2024	Rippel, Andreas
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ON EUROPEAN PATENT APPLICATION NO.

EP 23 21 9928

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28 - 05 - 2024

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CN 219229765 U	23-06-2023	NONE	

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REFERENCES CITED IN THE DESCRIPTION

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