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(71) Applicant: **Techtronic Cordless GP**
Anderson, SC 29621 (US)

(72) Inventor: **QIN, Tian Kui**
Dongguan City (CN)

(74) Representative: **Meissner Bolte Partnerschaft mbB**
Patentanwälte Rechtsanwälte
Postfach 86 06 24
81633 München (DE)

(54) HARD SURFACE CLEANING APPARATUS

(57) The present invention relates to a hard surface cleaning device. The hard surface cleaning device comprises: a suction assembly for creating a suction flow, the suction assembly comprising a suction unit and an electric motor for driving the suction unit; a suction nozzle in fluid communication with the suction assembly for sucking the liquid air mixture from the hard surface; a cleaning flow path between the suction nozzle and the suction assembly, and a separating member for separating liquid from the sucked liquid air mixture is provided in the cleaning flow path; and a fluid reservoir for containing the separated liquid, the fluid reservoir being detachably mounted to the separating member; wherein the fluid reservoir and the separating member are integrally attachable to and detachable from the hard surface cleaning device.

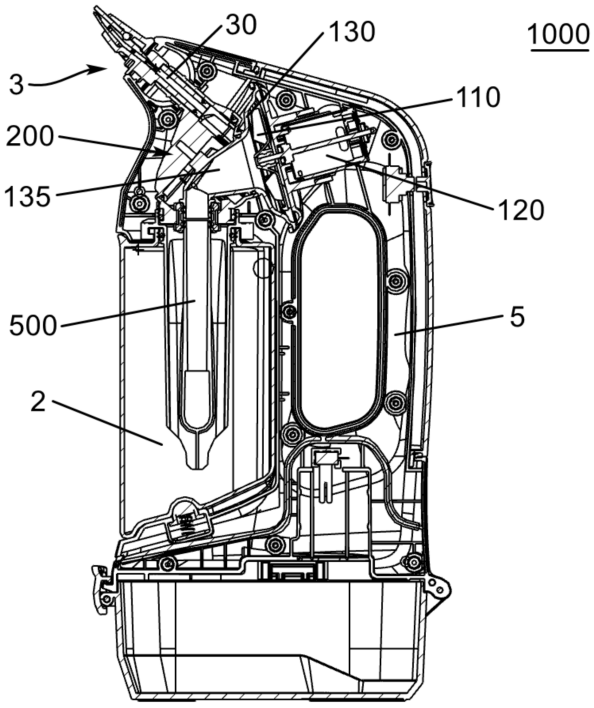

FIG. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of surface cleaning, and more particularly to a hard surface cleaning device having a suction assembly for creating a suction flow, a suction nozzle in fluid communication with the suction assembly, a cleaning flow path between the suction nozzle and the suction assembly, and a fluid reservoir for containing the separated liquid, and a separating member for separating liquid from a sucked liquid air mixture is arranged in the cleaning flow path.

BACKGROUND

[0002] A hard surface cleaning device is a device configured to clean hard surfaces such as glass surfaces. The hard surface cleaning device can perform cleaning and automatically absorb waste water and dirt produced during the cleaning at the same time, ensuring that the hard surface is clean and traceless.

[0003] By using such a hard surface cleaning device, surfaces such as floor surfaces or table surfaces, or tiled wall surfaces or for example glass surfaces, in particular for window glass, can be cleaned. The hard surface cleaning device may be guided along a surface to be cleaned, and the hard surface cleaning device has a suction nozzle which is in fluid communication with a suction assembly and configured to suck a liquid air mixture. The suction assembly generates a suction air flow, under the action of which the liquid air mixture can be sucked from the surface to be cleaned or from a suction nozzle of the hard surface cleaning device that is in contact with the surface, for example. The separating member is used for separating liquid from the sucked liquid air mixture, and the fluid reservoir is used for containing the separated liquid.

[0004] The fluid reservoir is typically detachable to allow a user to easily remove the fluid reservoir for cleaning and emptying. This reduces the risk of dirt accumulating inside the hard surface cleaning device, extends the useful life of the hard surface cleaning device, and ensures that the hard surface cleaning device remains being efficiently operated at all times.

[0005] In the art, a rotary locking type connection is generally used, and a rotary action is used for fixing the fluid reservoir, and a thread or a rotary locking groove is generally designed at an interface of the fluid reservoir. The user places the fluid reservoir into a corresponding interface of the hard surface cleaning device and then rotates the fluid reservoir clockwise so that the threads or locking tabs thereon engage the locking structure of the hard surface cleaning device to complete the locking. When detaching the fluid reservoir, the locking device can be released only by reversely rotating the fluid reservoir, and the fluid reservoir can be taken down.

[0006] In some applications, although a rotary locking type connection may detachably connect the fluid reservoir to the hard surface cleaning device, as the interface is subjected to the weight of the fluid reservoir during use, particularly when a volume of fluid has been stored in the fluid reservoir, the weight of the fluid reservoir may cause the sealing and connection of the fluid reservoir at the interface to become weakened by the greater weight due to the fluid reservoir being suspended from the hard surface cleaning device solely by the connection, the fluid reservoir may fall or the fluid in the fluid reservoir may flow out of the interface, thereby affecting the operation of the hard surface cleaning device.

[0007] Accordingly, there remains a need in the art for an improved hard surface cleaning device which facilitates good cleaning effects, wherein the fluid reservoir of the hard surface cleaning device can be easily removed and replaced, in particular tool-lessly replaced, and it is ensured that the fluid reservoir is held firmly in place and thus the hard surface cleaning device has good cleaning effects and an extended overall service life.

SUMMARY

[0008] It is an object of the present application to provide a hard surface cleaning device, in which a fluid reservoir can be locked to the hard surface cleaning device without tools at its upper and lower ends and can be detached from the hard surface cleaning device without tools, and the fluid reservoir is supported at both its upper and lower ends in use, helping to ensure that the fluid reservoir is held firmly in place, preventing the fluid reservoir from loosening and fluid leaking from the fluid reservoir, thus ensuring good cleaning effects for the hard surface cleaning device and extending overall lifetime for the hard surface cleaning device.

[0009] To solve the above technical problems, in one aspect of the present application, there is provided a hard surface cleaning device comprising:

a suction assembly for creating a suction flow, the suction assembly comprising a suction unit and an electric motor for driving the suction unit;

a suction nozzle in fluid communication with the suction assembly for sucking the liquid air mixture from the hard surface;

a cleaning flow path between the suction nozzle and the suction assembly, and a separating member for separating liquid from the sucked liquid air mixture is provided in the cleaning flow path; and

a fluid reservoir for containing the separated liquid, the fluid reservoir being detachably mounted to the separating member;

wherein the fluid reservoir and the separating member are integrally attachable to and detachable from the hard surface cleaning device.

[0010] In an embodiment of an aspect of the application, the separating member comprises a double cylinder

structure in an upper portion, and a mixture inlet is formed between an outer cylinder and an inner cylinder and the inner cylinder is formed as a gas exit outlet, and the sucked liquid air mixture enters the fluid reservoir via the mixture inlet and the gas exits the hard surface cleaning device via the gas exit outlet.

[0011] In an embodiment of an aspect of the application, the separating member and the fluid reservoir respectively comprise a fixing means and a complementary mating means, such that the separating member is releasably fixed to the fluid reservoir.

[0012] In an embodiment of an aspect of the application, the separating member comprises a flange at an upper portion, and the flange comprises a stopping portion extending axially downwardly from its peripheral edge.

[0013] In an embodiment of an aspect of the application, the stopping portion comprises a recessed portion which is formed circumferentially as a blind hole in the stopping portion.

[0014] In an embodiment of an aspect of the application, the fluid reservoir is provided with a stopping protrusion at the mouth extending radially outwards from the mouth, and the stopping protrusion is configured to engage the stopping portion, in particular the recessed portion.

[0015] In an embodiment of an aspect of the application, the stopping portions are provided at diametrically opposite positions of the flange, and the number of stopping protrusions is the same as the number of stopping portions.

[0016] In an embodiment of an aspect of the application, the stopping protrusion has a wedge shape along a clockwise direction.

[0017] In an embodiment of an aspect of the application, the hard surface cleaning device is provided with a locking element, and the fluid reservoir is provided with complementary locking means at its bottom side, and the fluid reservoir is releasably lockable to the hard surface cleaning device by means of the locking element and complementary locking means.

[0018] In an embodiment of an aspect of the application, the fluid reservoir is provided with a receiving portion recessed inwardly towards the accommodating space thereof, and said hard surface cleaning device comprises a bottom wall housing, and a locking cap is received in the bottom wall housing to be biased into said receiving portion and held in place.

[0019] In an embodiment of an aspect of the application, the fluid reservoir comprises a groove at a bottom thereof, and the groove is recessed inwardly from a bottom wall of the fluid reservoir, and the receiving portion is further recessed inwardly from the groove; the bottom wall housing is formed with a tongue projecting upward therefrom, and the groove is configured to slide on the tongue, and the locking cap is floatable to be exposed from the tongue.

[0020] In an embodiment of an aspect of the application, the tongue comprises an opening, and the locking cap comprises a crown in the form of a dome and a brim extending outwardly from a bottom of the crown, and the crown is movable through the opening but the brim is not movable through the opening, and a resilient member is compressively disposed between the bottom wall housing and the crown.

[0021] In an embodiment of an aspect of the application, a molded seal is provided between the fluid reservoir and the separating member, and the molded seal is located in a radial direction between a mouth of the fluid reservoir and a body of the separating member.

[0022] In an embodiment of an aspect of the application, a projecting wall portion is provided below the flange, and the projecting wall portion projects slightly more in a radial direction relative to the body of the separating member to form a stopper against the molded seal sliding out in an axial direction.

[0023] In an embodiment of an aspect of the application, the molded seal is made of an elastomeric material, and the molded seal has ring portions on its outer peripheral surface which are spaced apart in the axial direction.

[0024] In an embodiment of an aspect of the application, O-rings are positioned between the spaced apart ring portions of the molded seal.

[0025] In an embodiment of an aspect of the application, the fluid reservoir further comprises a guide block projecting outwardly from an outer periphery of the upper end, and the shell of the hard surface cleaning device comprises a notch for receiving the guide block. In an embodiment of an aspect of the application, the fluid reservoir further comprises a longitudinally extending raised portion, and the shell of the hard surface cleaning device comprises a recess for mating with the raised portion. In an embodiment of an aspect of the application, the fluid reservoir is made of a transparent or translucent material.

[0026] With the hard surface cleaning device according to embodiments of an aspect of the application, a fluid reservoir can be locked to the hard surface cleaning device without tools at its upper and lower ends and can be detached from the hard surface cleaning device without tools, and the fluid reservoir is supported at both its upper and lower ends in use, helping to ensure that the fluid reservoir is held firmly in place, preventing the fluid reservoir from loosening and fluid leaking from the fluid reservoir, thus ensuring good cleaning effects for the hard surface cleaning device and extending overall lifetime for the hard surface cleaning device.

BRIEF DESCRIPTION OF THE FIGURES

[0027] Objectives and features of the present invention will become apparent from the following detailed description with reference to the accompanying drawings. However, it should be understood that the drawings are designed for illustration only, and are not intended to limit the

present invention.

Fig. 1 is a perspective view of a hard surface cleaning device according to an embodiment of the present invention.

Fig. 2 is a cross-sectional view of a hard surface cleaning device according to an embodiment of the present invention.

Fig. 3 is a perspective view of a portion of the hard surface cleaning device in Fig. 1 according to an embodiment of the present invention, for more clearly showing an internal structure of the hard surface cleaning device.

Fig. 4 is a cross-sectional view of a portion of the hard surface cleaning device in Fig. 3 according to an embodiment of the present invention.

Fig. 5 is a perspective view of a receiving chamber of a hard surface cleaning device according to one embodiment of the present invention.

Fig. 6 is an exploded perspective view of a portion of a hard surface cleaning device according to one embodiment of the invention, showing a connection between a fluid reservoir and a separating member.

Fig. 7 is a cross-sectional view of a portion of a hard surface cleaning device according to one embodiment of the present invention.

Fig. 8 is a perspective view of a separating member of a hard surface cleaning device according to one embodiment of the present invention.

Fig. 9 is a perspective view of a fluid reservoir of a hard surface cleaning device according to one embodiment of the present invention seen from below.

Fig. 10 is a perspective view of a fluid reservoir of a hard surface cleaning device according to one embodiment of the present invention seen from above.

Fig. 11 is a partially exploded perspective view of a hard surface cleaning device according to one embodiment of the present invention, wherein a fluid reservoir is removed from the hard surface cleaning device.

Fig. 12 is a longitudinal cross-sectional view of a portion of a hard surface cleaning device according to one embodiment of the present invention.

DETAILED DESCRIPTION

[0028] The technical solutions of the present invention will be described clearly and completely below with reference to the drawings; obviously, the described embodiments are some rather than all of the embodiments of the present invention. All other embodiments obtained by those of ordinary skill in the art based on the embodiments in the present invention without creative effort shall fall within the scope of protection of the present invention.

[0029] It should be noted that when an element is referred to as being "fixed to" or "arranged at" another element, it may be directly or indirectly on the other element. When an element is referred to as being "connected to" another element, it may be directly or indirectly connected to the other element.

[0030] It should be understood that the orientations or positional relationships indicated by the terms "length", "width", "upper", "lower", "front", "rear", "left", "right", "vertical", "horizontal", "top", "bottom", "inner", "outer", etc. are based on the orientations or positional relationships shown in the drawings, and are only for the convenience of describing the present application and simplifying the description, rather than indicating or implying that the device or element referred to must have a specific orientation or be constructed and operated in a specific orientation, and therefore cannot be construed as limiting the present application. In addition, the terms "first" and "second" are used for descriptive purposes only, and cannot be construed as indicating or implying relative importance or implicitly indicating the number of technical features indicated. Thus, features defined with "first" and "second" may explicitly or implicitly include one or more of the features. In the description of the present application, "a plurality of" means two or more, unless explicitly and specifically defined otherwise.

[0031] The various specific technical features and embodiments described in this section may be combined in any suitable manner unless there is a contradiction. For example, different implementations may be formed by combining different specific technical features and/or embodiments and/or implementations. In order to avoid unnecessary repetition, the various possible combinations of the specific technical features and/or embodiments and/or implementations in the present application will not be described separately.

[0032] Various embodiments of a hard surface cleaning device according to the present invention are schematically showed in the drawings, where the hard surface cleaning device is generally indicated by reference number 1000. In the shown embodiments, the hard surface cleaning device 1000 is designed as a manually guided hard surface cleaning device with which liquid can be sucked up from a hard surface, for example, from window glass or from a table surface, or, for example, from a tiled wall or from a wall or glass of a shower room.

[0033] In an embodiment of the present invention, the hard surface cleaning device 1000 includes a suction assembly for creating a suction flow, a suction nozzle 3 in fluid communication with the suction assembly and configured to suck a liquid air mixture, a cleaning flow path between the suction nozzle 3 and the suction assembly, and a fluid reservoir 2 for containing separated liquid. In an embodiment of the present invention, a separating member 500 configured to separate liquid from the sucked liquid air mixture is provided in the cleaning flow path. In an embodiment of the invention, the cleaning flow path comprises a receiving chamber 200 between the suction nozzle 3 and the separating member 500, the receiving chamber 200 being independent of the shell 1 of the hard surface cleaning device 1000. The fluid reservoir 2 for containing the liquid separated from the

separating member 500 is detachably held in the shell 1. In one embodiment of the present invention, the fluid reservoir 2 is made of a transparent or translucent material so that a user can observe how much liquid is stored in the fluid reservoir 2.

[0034] As shown in Fig. 1, the hard surface cleaning device 1000 includes the shell 1. The suction nozzle 3 and the fluid reservoir 2 are detachably held on the shell 1. In an embodiment of the present invention, the shell 1 includes a left half-shell 11 and a right half-shell 12. In an embodiment of the present invention, the shell 1 is configured with a handle 5. A user can grip the handle 5 with one hand during operation to guide the hard surface cleaning device 1000 along a surface to be cleaned. In an embodiment of the present invention, a switch 6 is provided at an upper portion of the handle 5, and the user can start the hard surface cleaning device 1000 by, for example, pressing the switch 6 with a thumb. In an embodiment of the present invention, the shell 1 may preferably receive at least one rechargeable battery 4, in particular lithium-ion battery. The suction assembly can be supplied with power by the battery 4. In an embodiment of the present invention, the shell 1 may further include a charging port (not shown) for charging the hard surface cleaning device 1000, so as to charge the rechargeable battery of the hard surface cleaning device 1000 as required. In an embodiment of the present invention, the shell 1 further includes a discharge opening 13 to facilitate the discharge of air or gas sucked by the hard surface cleaning device 1000 to the ambient environment.

[0035] Fig. 2 is a cross-sectional view of a hard surface cleaning device 1000 according to an embodiment of the present invention. In an embodiment of the present invention, a suction assembly is arranged above the handle 5 in the shell 1, and the suction assembly includes a suction turbine or blade 110, and an electric motor 120 for driving the suction turbine 110. The suction assembly can suck air so that the sucked air, liquid and even solid dirt can be sucked into the cleaning flow path (e.g., the receiving chamber 200) via the suction nozzle 3, and air is separated by the separating member 500 and then discharged by the suction turbine 110 to the ambient environment via the discharge opening 13. In an embodiment of the present invention, the suction assembly further includes a suction housing 130. The suction housing 130 surrounds and supports the suction turbine 110 and the electric motor 120. In an embodiment of the present invention, the suction housing 130 includes a throat portion 135 and a horn portion 131, and an outer periphery of the throat portion 135 is sealingly connected to the receiving chamber 200. The horn portion 131, together with a motor housing surrounding the electric motor 120, forms a suction chamber. In one embodiment of the invention, the suction chamber includes an exhaust passage at an upper portion. In one embodiment of the invention, two exhaust passages are located on both sides of the suction turbine 110. In one embodiment of the invention, the exhaust passage opens to a position in a vertical direction above the axis of rotation of the suction turbine 110. In one embodiment of the present invention, the exhaust passage takes a meandering path such that liquid, such as water, cannot enter the suction chamber via the exhaust passage.

[0036] In one embodiment of the invention, the shell 1 comprises a discharge opening 13 at a position corresponding to the exhaust passage, to facilitate the discharge of air or gas sucked by the hard surface cleaning device 1000 into the ambient environment via the suction turbine 110. In one embodiment of the present invention, the left and right half-shells 11 and 12 include respective discharge openings 13 to correspond to the exhaust passages on both sides of the suction turbine 110 respectively, thereby facilitating the discharge of air or gas sucked by the hard surface cleaning device 1000 into the ambient environment via the suction turbine 110.

[0037] Fig. 3 is a perspective view of a portion of hard surface cleaning device 1000 of Fig. 1 according to one embodiment of the present invention, for more clearly showing an internal structure of the hard surface cleaning device 1000. Fig. 4 is a cross-sectional view of a portion of hard surface cleaning device 1000 of Fig. 3 according to one embodiment of the present invention.

[0038] With reference to Figs. 3-4 and with continuing reference to Fig. 2, the hard surface cleaning device 1000 further comprises a cleaning flow path which is configured to receive the liquid air mixture from the suction nozzle 3 and separate liquid and air from each other. In one embodiment of the invention, the cleaning flow path includes a receiving chamber 200. The receiving chamber 200 receives the liquid air mixture from the suction nozzle 3. The cleaning flow path further includes a separating member 500 located downstream of the receiving chamber 200, and the separating member 500 is configured to separate liquid and gas in the liquid air mixture from each other. In an embodiment of the present invention, the receiving chamber 200 comprises a receiving portion 210 and a discharge portion 220, the receiving portion 210 being configured to receive a liquid air mixture from the suction nozzle 3. The discharge part 220 serves to discharge the received liquid air mixture from the receiving chamber 200. The receiving chamber 200 has a receiving interface 201 at the receiving portion 210, for sealing connection with the suction channel 30 of the suction nozzle 3. The receiving chamber 200 further has a separation interface 202 at the discharge part 220 for sealing connection with the separating member 500, so as to guide the liquid air mixture received from the suction nozzle 3 to the separating member 500. In an embodiment of the present invention, the receiving chamber 200 further includes a discharge interface 203. The discharge interface 203 is connected to the suction assembly, for sucking and discharging the separated gas or air into the ambient environment. In an embodiment of the present invention, a sealing element 240 such as an O-shaped ring is provided between the discharge interface 203 and

the throat portion 135 of the suction housing 130 of the suction assembly, so as to prevent the liquid air mixture sucked into the receiving chamber 200 from overflowing or leaking from the discharge interface 203. In one embodiment of the present invention, the separating member 500 includes a double cylinder structure in the upper portion thereof, wherein a mixture inlet 580 is formed between the outer cylinder and the inner cylinder, and the inner cylinder is formed as a gas exit outlet 570. The sucked liquid air mixture enters the fluid reservoir 2 from the receiving chamber 200 via the mixture inlet 580, and gas exits the fluid reservoir 2 via the gas exit outlet 570 to be discharged to the environment.

[0039] A fluid reservoir 2 for containing the liquid separated in the separating member 500 is detachably held in the shell 1. In an embodiment of the present invention, the fluid reservoir 2 is made of a transparent or translucent material so that a user can observe how much liquid is stored in the fluid reservoir 2.

[0040] Referring to Fig. 4, the separating member 500 includes a mixture inlet 580 at an upper end, a liquid discharge port 530 at a lower end, and a gas discharge port 550 at a higher height with respect to the liquid discharge port 530. In one embodiment of the invention, the center tube 555 is an inner cylinder, which is hollow, and a gas discharge passage 590 is formed inside the center tube 555. In one embodiment of the present invention, the gas discharge port 550 is the lowermost end of the gas discharge passage 590. In one embodiment of the present invention, the center tube 555 forms a gas discharge port 550 at a lower end and a gas exit outlet 570 at an upper end. In the embodiment of the present invention, the lowermost end of the separating member 500 does not contact the bottom of the fluid reservoir 2 in the mounted state. Thus, the liquid air mixture first enters the fluid reservoir 2 through the liquid discharge port 530, and then the air or gas flows from the space within the fluid reservoir 2 into the gas discharge port 550, then flows by suction action through the gas discharge passage to enter the suction assembly, in particular into the suction housing 130 of the suction assembly, and then is discharged into the ambient environment via the discharge opening 13 of the shell 1.

[0041] In an alternative embodiment of the invention, as shown in Figs. 2-4, in the operational state the liquid air mixture will flow from said receiving chamber 200 into the separating member 500 for separation.

[0042] Fig. 5 is a perspective view of a receiving chamber 200 of a hard surface cleaning device 1000 according to one embodiment of the invention. As shown in Fig. 5, a peripheral concave portion 2023 is provided on the outer periphery of the separation port 202 of the receiving chamber 200, and a molded seal 270 is provided on the peripheral concave portion 2023. After assembly, the molded seal 270 is located between the separation interface 202 and the upper end of the separating member 500 for sealingly connecting the receiving chamber 200 to the separating member 500 for guiding the liquid air mixture received from the nozzle 3 to the separating member 500. In an alternative embodiment of the invention, as shown in Fig. 5, the separation interface 202 includes an inner ring 2021 and spokes 2022 that connect the inner ring 2021 to the separation interface body. In an operating state, a liquid air mixture will flow through the spaces between said spokes 2022. On the inner ring 2021 of the separation interface 202, a connector 260 is snappingly provided, said connector 260 preferably being made of an elastomeric material so as to have a certain elasticity. The connector 260 couples the separating member 500 to the throat portion 135 of the suction housing 130. Preferably, the connector 260 couples the center tube 555 of the separating member 500 (specifically, the gas exit outlet 570) with the throat portion 135 of the suction housing 130, such that separated air or gas is sucked from the separating member 500 into the suction housing 130 and subsequently expelled into the surrounding environment. In addition, the liquid air mixture in the receiving chamber 200 is isolated from the separated gas or air in the center tube 555 of the separating member 500 and the throat portion 135 of the suction housing 130 by the connector 260, helping to prevent contamination of the liquid flowing into the suction housing 130.

[0043] Fig. 6 is an exploded perspective view of a portion of a hard surface cleaning device 1000 according to one embodiment of the invention, showing the connection between a fluid reservoir 2 and a separating member 500. Fig. 7 is a cross-sectional view of a portion of a hard surface cleaning device 1000 according to one embodiment of the invention. Fig. 8 is a perspective view of a separating member 500 of a hard surface cleaning device 1000 according to one embodiment of the invention. In one embodiment of the present invention, the separating member 500 and the fluid reservoir 2 comprise a fixing means and a complementary mating means, respectively, such that the separating member 500 can be releasably fixed to the fluid reservoir 2. The separating member 500 includes a flange 501 extending in a horizontal direction at an upper portion, and the flange 501 is substantially circular. In one embodiment of the present invention, two stopping portions 502 extend axially downward from the peripheral edge of the flange 501 at two diametrically locations of the peripheral edge of the flange 501 to provide circumferential stops for the fluid reservoir 2. In an embodiment of the present invention, the stopping portion 502 includes a recessed portion 503, and the recessed portion 503 is formed as a blind hole at the stopping portion 502 along a circumferential direction for receiving the stopping protrusion 23 of the fluid reservoir 2, as shown in Fig. 10. It will be understood by those skilled in the art that the detachable connection between the fluid reservoir 2 and the separating member 500 may be formed in other ways besides the stopping portions 502 and the stopping protrusions 23, and the number of the stopping portions 502 or the stopping protrusions 23 is not limited to two as shown in

the drawings.

[0044] As shown in Figs. 6-7, the separating member 500 further includes a cylindrical portion 510 extending upward from the flange 501. With reference to Fig. 4, when the hard surface cleaning device 1000 is fully assembled, the molded seal 270 is located between the separation interface 202 of the receiving chamber 200, in particular the peripheral recess 2023, and the cylindrical portion 510 of the separating member 500 for sealingly connecting the receiving chamber 200 to the separating member 500 for directing the liquid air mixture received from the suction nozzle 3 to the separating member 500.

[0045] Also shown in Fig. 6 is a molded seal 280 and an O-ring 290. In one embodiment of the present invention, a molded seal 280 and an O-ring 290 are positioned between the fluid reservoir 2 and the separating member 500 for forming a seal between the fluid reservoir 2 and the separating member 500. A cross-sectional view is shown in Fig. 7. With continued reference to Fig. 8, in one embodiment of the invention, in the body portion of the separating member 500, a projecting wall portion 504 is provided below the flange 501. In one embodiment of the invention, the projecting wall portion 504 is part of an integrally formed separating member 500. The projecting wall portion 504 projects slightly more in the radial direction relative to the body portion of the separating member to form a stopper against the molded seal 280 slipping out in the axial direction. In one embodiment of the present invention, the mold seal 280 is in the shape of a short sleeve, having ring portions 281 spaced apart in the axial direction on the outer circumferential surface thereof. In one embodiment of the invention, the molded seal 280 is made of an elastomeric material so as to be generally resilient so as to be able to be placed across the projecting wall portion 504 onto the separating member 500, between the projecting wall portion 504 and the flange 501 in the axial direction. Since the projecting wall portion 504 projects slightly more in the radial direction with respect to the body portion of the separating member, the mold seal 280 is prevented from falling or slipping out from the separating member 500. In one embodiment of the present invention, an O-ring 290 is positioned between the spaced apart ring portions 281 of the molded seal 280 to form a fluid-tight seal between the fluid reservoir 2 and the separating member 500 when the fluid reservoir 2 is inserted onto the separating member 500 from below.

[0046] When a molded seal 280 and an O-ring 290 are included between the fluid reservoir 2 and the separating member 500, the ring portions 281 and O-ring 290 are compressed to form a fluid-tight seal between the fluid reservoir 2 and the separating member 500, so that fluid in the fluid reservoir 2 does not leak out through the uppermost opening 21 thereof even when the hard surface cleaning device 1000 is inverted upside down, due to the fluid-tight seal formed between the fluid reservoir 2 and the separating member 500.

[0047] In one embodiment of the present invention, only the molded seal 280 is included between the fluid reservoir 2 and the separating member 500. As shown in Fig. 7, the ring portions 281 are shown in an uncompressed state, where the maximum outer diameter of the ring body 281 is greater than the inner diameter of the mouth 22 of the fluid reservoir 2. When the separating member 500 is mounted to the fluid reservoir 2, the ring portions 281 are compressed, thereby forming a fluid-tight seal between the fluid reservoir 2 and the separating member 500. Therefore, even when the hard surface cleaning device 1000 is turned upside down, the liquid in the fluid reservoir 2 does not leak out through the opening 21 at the uppermost end thereof, since a fluid-tight seal is formed between the fluid reservoir 2 and the separating member 500.

[0048] Fig. 9 is a perspective view of a fluid reservoir 2 of a hard surface cleaning device 1000 according to one embodiment of the present invention seen from below. Fig. 10 is a perspective view of a fluid reservoir 2 of a hard surface cleaning device 1000 according to one embodiment of the present invention seen from above. Referring to Figs. 9-10, the fluid reservoir 2 includes a body 20 that serves as a container. The upper part of the fluid reservoir 2 is provided with a bottle mouth 22, and the bottle mouth 22 extends upwards from the upper end of the body 20 of the fluid reservoir 2. The bottle mouth 22 has a cylindrical shape extending upward from the upper end of the fluid reservoir 2. At the upper end of the mouth 22, a stopping protrusion 23 is provided which extends radially outwardly from the mouth 22. In one embodiment of the present invention, the number of the stopping protrusions 23 corresponds to the number of the stopping portions 502 in the separating member 500. When the separating member 500 is rotatably mounted to the fluid reservoir 2, the stopping protrusion 23 is received in the recessed portion 503 of the stopping portion 502. In one embodiment of the invention, the stopping protrusion 23 has a wedge shape in the clockwise direction, i.e. the stopping protrusion 23 has a decreasing height in the clockwise direction. When the separating member 500 is rotated in the clockwise direction onto the fluid reservoir 2, the stopping protrusion 23 is easily and stably inserted into the recessed portion 503 of the stopping portion 502 due to its wedge shape, and is locked in place. In one embodiment of the present invention, indicia are provided on the top surfaces of the fluid reservoir 2 and/or the separating member 500 to indicate that the fluid reservoir 2 and/or the separating member 500 should be rotated in a clockwise and/or counterclockwise direction and/or to indicate that the separating member 500 has been installed in position relative to the fluid reservoir 2.

[0049] Fig. 11 is a partially exploded perspective view of a hard surface cleaning device 1000 according to one embodiment of the present invention, wherein fluid reservoir 2 and separating member 500 are not yet mounted to hard surface cleaning device 1000.

[0050] In one embodiment of the present invention, the

fluid reservoir 2 has an opening 26 in a side wall, as shown in Fig. 11. The fluid reservoir 2 further comprises a plug, not shown, for closing the opening 26. When it is needed to pour the liquid stored in the fluid reservoir 2, the liquid stored in the fluid reservoir 2 can be dispensed through the opening 26 by simply pulling off the plug and tilting the hard surface cleaning device 1000 forward, without the step of removing the fluid reservoir 2 from the hard surface cleaning device 1000.

[0051] In one embodiment of the invention, the hard surface cleaning device 1000 comprises a bottom wall housing 16, the bottom wall housing 16 being provided with a locking element. The fluid reservoir 2 is provided with complementary locking means at its bottom side, and the fluid reservoir 2 is releasably lockable to the hard surface cleaning device 1000 by means of the locking element and the complementary locking means. With continued reference to Figs. 9-10, the bottom wall of the fluid reservoir 2 has an inclined shape to facilitate mounting and dismounting the fluid reservoir 2 to and from the hard surface cleaning device 1000. The fluid reservoir 2 includes a groove 24 at the bottom thereof, and the groove 24 is recessed inwardly from the bottom wall of the body 20 of the fluid reservoir 2. At a substantially middle position of the groove 24, a receiving portion 25 is provided which is recessed further inward toward the accommodation space of the fluid reservoir 2. In an alternative embodiment of the invention, the fluid reservoir 2 comprises a receiving portion 25 at its bottom wall without a groove 24 recessed inwardly towards the bottom wall.

[0052] Referring to Fig. 11, the hard surface cleaning device 1000 comprises at a lower portion a bottom wall housing 16 which also has an inclined shape. When the fluid reservoir 2 is mounted to the hard surface cleaning device 1000, the bottom wall of the fluid reservoir 2 rests on the bottom wall housing 16. A tongue 17 is formed on the bottom wall housing 16 to project upwardly therefrom, and the tongue 17 is configured to be received by the groove 24. In one embodiment of the present invention, the tongue 17 slides within the groove 24 when the fluid reservoir 2 is mounted to the hard surface cleaning device 1000. The tongue 17 has a width corresponding to the width of the groove 24 to guide the alignment of the fluid reservoir 2 to the bottom wall housing 16 when mounting the fluid reservoir 2 to the hard surface cleaning device 1000. The tongue 17 can also act as a lateral movement stop for the fluid reservoir 2 to prevent lateral movement of the fluid reservoir 2 relative to the hard surface cleaning device 1000 after the fluid reservoir 2 is installed on the hard surface cleaning device 1000.

[0053] Fig. 12 is a longitudinal cross-sectional view of a portion of a hard surface cleaning device 1000 according to one embodiment of the present invention, showing a cross-sectional view through the tongue 17 and locking cap 18. Fig. 12 shows in detail in a sectional view the structures of the tongue 17 and the locking cap 18 on the bottom wall housing 16. An opening 171 is included on the tongue 17. The locking cap 18 is biased upwardly, for example in a floating configuration, within the space enclosed by the bottom wall housing 16 and the tongue 17. As shown in Fig. 12, the locking cap 18 includes a crown 181 in the form of a dome and a brim 182 extending outwardly from the bottom of the crown 181. In an embodiment of the present invention, the crown 181 is movable through the opening 171 but the brim 182 is not movable through the opening 171. A resilient member 183, such as a spring, is compressed between the bottom-wall housing 16 and the crown 181, so that the crown 181 can extend beyond the opening 171 of the tongue 17 to expose the crown 181, and the crown 181 can be pressed into the accommodation space 160 which is enclosed by the bottom-wall housing 16 and the tongue 17 under the influence of an external force, so that the crown 181 is not exposed from the opening 171. As shown in Fig. 12, the brim 182 has a width greater than that of the opening 171 to prevent the brim 182 from leaving the opening 171 by the elastic member 183. In one embodiment of the invention, the tongue 17 may be omitted, that is to say, the locking cap 18 is formed directly in the bottom-wall housing 16, and the bottom-wall housing 16 forms an accommodating space 160 to receive said locking cap 18.

[0054] The assembly of the fluid reservoir 2 is described below. First, as shown in Fig. 7, a separating member 500 is mounted to the fluid reservoir 2, with a molded seal 280 (optionally, an O-ring 290) disposed between the separating member 500 and the fluid reservoir 2. The assembled separating member 500 and fluid reservoir 2 are then inserted onto the hard surface cleaning device 1000 from below, so that the cylindrical portion 510 (or outer cylinder) of the separating member 500 is inserted over the molded seal 270 and aligned and in fluid communication with respect to the separation interface 202 (in particular, the peripheral concave portion 2023), and so that the gas exit outlet 570 of the center tube 555 (or inner cylinder) of the separating member 500 is inserted over the resilient connector 260 to align and fluidly communicate the center tube 555 (or gas exit outlet 570, in particular) of the separating member 500 with the throat portion 135 of the suction housing 130 and is sealed with respect to the mixture inlet 580 to prevent the liquid air mixture from flowing into the center tube 555 or throat portion 135 as it enters the separating member 500.

[0055] As schematically illustrated by arrow A1 in Fig. 12, when the assembled separating member 500 and fluid reservoir 2 are inserted from below onto the hard surface cleaning device 1000, the groove 24 abuts the locking cap 18 to move it downward so as not to impede the mounting of the combination of the fluid reservoir 2 and separating member 500 onto the hard surface cleaning device 1000. As shown in Fig. 2, when the combination of the fluid reservoir 2 and separation element 500 is mounted to the hard surface cleaning device 1000, the locking cap 17 is moved upward into the receiving portion

25 in the bottom wall of the fluid reservoir 2 by the resilient member 183 and held in place, to help lock the fluid reservoir 2 in place, to provide support for the fluid reservoir 2 at the bottom, and to prevent the fluid reservoir 2 from swinging or loosening, thereby it is better ensured that the fluid reservoir 2 is sealed, and it is ensured that the hard surface cleaning device has good cleaning effects and an overall service life of the hard surface cleaning device is extended .

[0056] When it is needed to remove fluid reservoir 2 from hard surface cleaning device 1000, the fluid reservoir 2 is forced in a downward direction to disengage the combination of fluid reservoir 2 and separating member 500 from the separation interface 202 and throat portion 135, so that the locking cap 17 moves downward against the force of the resilient member 183, thereby so that the locking cap 17 is disengaged from the receiving portion 25, and then the combination of fluid reservoir 2 and separating member 500 is removed in a direction opposite to arrow A1. The separating member 500 is then rotated, for example, in a counterclockwise direction relative to the fluid reservoir 2, such that the stopping protrusion 23 at the mouth 22 of the fluid reservoir 2 is rotated out of engagement with the stopping portion 502, and in particular out of engagement with the recessed portion 503, thereby separating and removing the separating member 500 from the fluid reservoir 2, such that the fluid reservoir 2 may be emptied, cleaned, and the like.

[0057] Referring to Figs. 3 and 10-11, in a hard surface cleaning device 1000 according to an embodiment of the present invention, the fluid reservoir 2 further includes a guide block 27 protruding outward from the outer periphery of the upper end, and the shell 1 also includes a notch (not shown) for receiving the guide block, so that the fluid reservoir 2 and the shell 1 can be quickly positioned and thus quickly assembled. When the fluid reservoir and the separating member are assembled and the entire assembly is assembled to the hard surface cleaning device, the guide block is engaged with the notch, and the fluid reservoir 2 is then rotated, and the fluid reservoir 2 is then pressed. The fluid reservoir 2 is locked to the hard surface cleaning device 1000, for example by means of a locking element of the hard surface cleaning device 1000 and complementary locking means provided on the bottom side of said fluid reservoir 2. In one embodiment of the present invention, as illustrated in Figs. 10-11, the fluid reservoir 2 further includes a longitudinally extending raised portion 28. The raised portion may increase the capacity of the fluid reservoir 2 and may also cooperate with a corresponding recess (not shown) in the shell 1. The guide block 27 and the raised portion 28 cooperate with the shell respectively, to prevent movement of the fluid reservoir 2 in a lateral direction (a direction perpendicular to the plane of the drawing in Fig. 2). This further ensures that the fluid reservoir 2 can be held firmly in place, preventing the fluid reservoir from loosening and leaking from the fluid reservoir, improving the cleaning effectiveness of the hard surface cleaning device and extending the overall service life of the hard surface cleaning device.

[0058] With a hard surface cleaning device according to embodiments of the present invention, the fluid reservoir can be locked to and removed from the hard surface cleaning device without tools at its upper and lower ends, and can be supported at both the upper and lower ends in use, helping to ensure that the fluid reservoir is held firmly in place, preventing it from loosening and leaking from the fluid reservoir, thus ensuring good cleaning of the hard surface cleaning device and extending the overall service life of the hard surface cleaning device.

[0059] Although the description herein is based on various embodiments, it is by no means the case that each embodiment includes only one independent technical solution. This manner of presentation is adopted herein purely for the sake of clarity. Those skilled in the art should consider the specification in its entirety; the technical solutions in the various embodiments may also be suitably combined to form other embodiments understandable to those skilled in the art. The scope of the present invention is defined by the attached claims, rather than by the above description. Thus, it is intended that all modifications falling within the meaning and scope of equivalent elements of the claims shall be included in the present invention.

[0060] To those skilled in the art, the present invention is not limited to the details of the above exemplary embodiments, and may be implemented in other specific forms without deviating from the spirit or basic features of the present invention. Therefore, the above embodiments should be considered as exemplary and not restrictive.

Claims

1. A hard surface cleaning device comprising:

a suction assembly for creating a suction flow, the suction assembly comprising a suction unit and an electric motor for driving the suction unit;
a suction nozzle in fluid communication with the suction assembly for sucking the liquid air mixture from the hard surface;
a cleaning flow path between the suction nozzle and the suction assembly, and a separating member for separating liquid from the sucked liquid air mixture is provided in the cleaning flow path; and
a fluid reservoir for containing the separated liquid, the fluid reservoir being detachably mounted to the separating member;
wherein the fluid reservoir and the separating member are integrally attachable to and detachable from the hard surface cleaning device.

2. The hard surface cleaning device according to claim

1, wherein the separating member comprises a double cylinder structure in an upper portion, and a mixture inlet is formed between an outer cylinder and an inner cylinder and the inner cylinder is formed as a gas exit outlet, and the sucked liquid air mixture enters the fluid reservoir via the mixture inlet and the gas exits the hard surface cleaning device via the gas exit outlet.

3. The hard surface cleaning device according to either claim 1 or claim 2, wherein the separating member and the fluid reservoir respectively comprise a fixing means and a complementary mating means, such that the separating member is releasably fixed to the fluid reservoir.

4. The hard surface cleaning device according to any one of claims 1 to 3, wherein the separating member comprises a flange at an upper portion, and the flange comprises a stopping portion extending axially downwardly from its peripheral edge, wherein the stopping portion comprises a recessed portion which is formed circumferentially as a blind hole in the stopping portion.

5. The hard surface cleaning device according to claim 4, wherein the fluid reservoir is provided with a stopping protrusion at the mouth extending radially outwards from the mouth, and the stopping protrusion is configured to engage the stopping portion, in particular the recessed portion.

6. The hard surface cleaning device according to claim 5, wherein the stopping portions are provided at diametrically opposite positions of the flange, and the number of stopping protrusions is the same as the number of stopping portions.

7. The hard surface cleaning device according to claim 5 or 6, wherein the stopping protrusion has a wedge shape along a clockwise direction.

8. The hard surface cleaning device according to any one of claims 5 to 7, wherein the hard surface cleaning device is provided with a locking element, and the fluid reservoir is provided with complementary locking means at its bottom side, and the fluid reservoir is releasably lockable to the hard surface cleaning device by means of the locking element and complementary locking means.

9. The hard surface cleaning device according to claim 8, wherein said complementary locking means is a receiving portion recessed inwardly towards the accommodating space of the fluid reservoir, and said hard surface cleaning device comprises a bottom wall housing, and said locking element is a locking cap which biased into said receiving portion and held in place.

10. The hard surface cleaning device of either claim 8 or claim 9, wherein the fluid reservoir comprises a groove at a bottom thereof, and the groove is recessed inwardly from a bottom wall of the fluid reservoir, and the receiving portion is further recessed inwardly from the groove; the bottom wall housing is formed with a tongue projecting upward therefrom, and the groove is configured to slide on the tongue, and the locking cap is floatable to be exposed from the tongue.

11. The hard surface cleaning device of claim 10, wherein the tongue comprises an opening, and the locking cap comprises a crown in the form of a dome and a brim extending outwardly from a bottom of the crown, and the crown is movable through the opening but the brim is not movable through the opening, and a resilient member is compressively disposed between the bottom wall housing and the crown.

12. The hard surface cleaning device according to any preceding claim, wherein a molded seal is provided between the fluid reservoir and the separating member, and the molded seal is located in a radial direction between a mouth of the fluid reservoir and a body of the separating member.

13. The hard surface cleaning device according to claim 12, wherein a projecting wall portion is provided below the flange, and the projecting wall portion projects slightly more in a radial direction relative to the body of the separating member to form a stopper against the molded seal sliding out in an axial direction.

14. The hard surface cleaning device according to claim 12 or 13, wherein the molded seal is made of an elastomeric material, and the molded seal has ring portions on its outer peripheral surface which are spaced apart in the axial direction, and preferably O-rings are positioned between the spaced apart ring portions of the molded seal.

15. The hard surface cleaning device according to any one of claims 1 to 14, wherein the fluid reservoir further comprises a guide block projecting outwardly from an outer periphery of the upper end, and the shell of the hard surface cleaning device comprises a notch for receiving the guide block; preferably, the fluid reservoir further comprises a longitudinally extending raised portion, and the shell of the hard surface cleaning device comprises a recess for mating with the raised portion; preferably, the fluid reservoir is made of a transparent or translucent material.

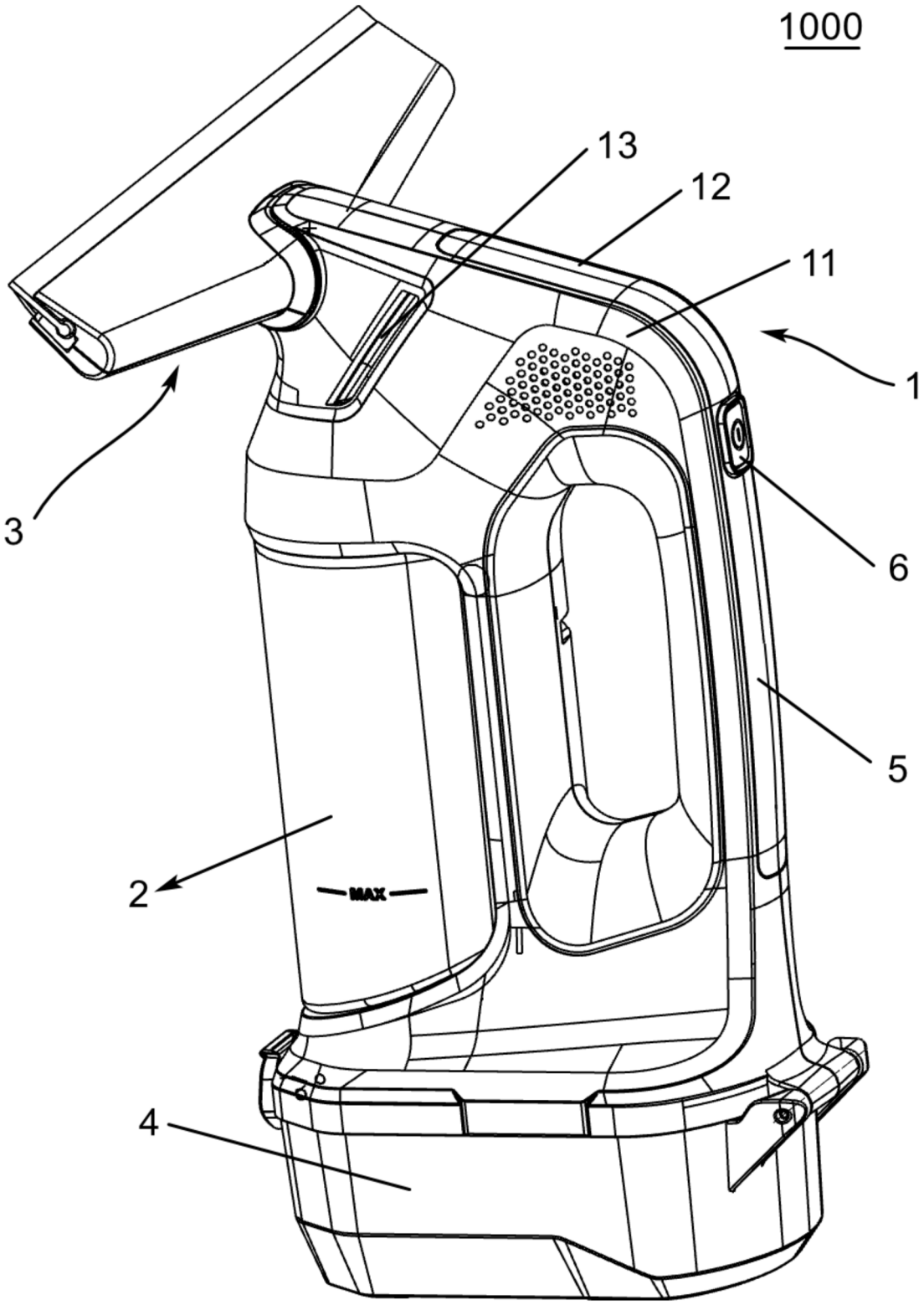

FIG. 1

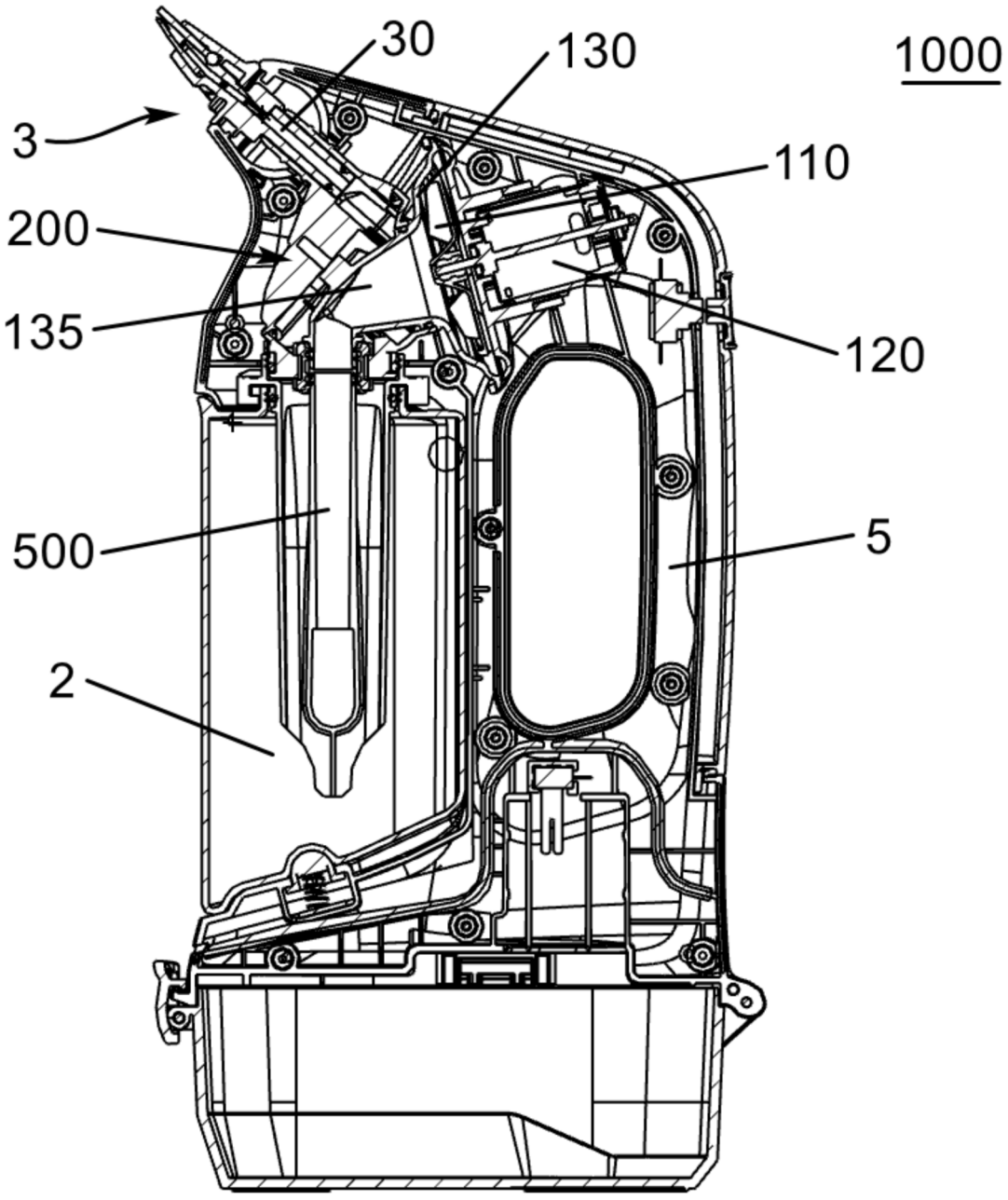

FIG. 2

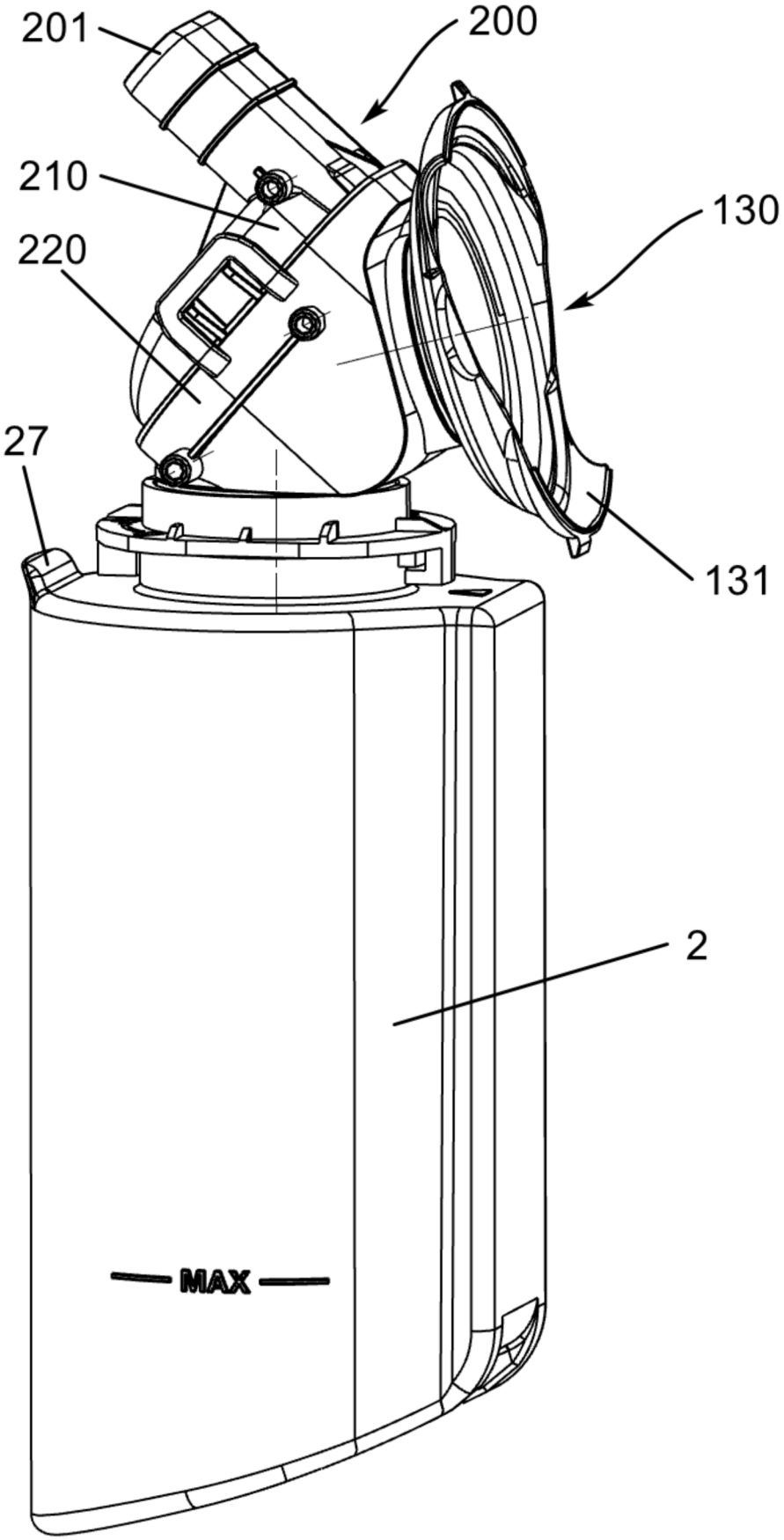

FIG. 3

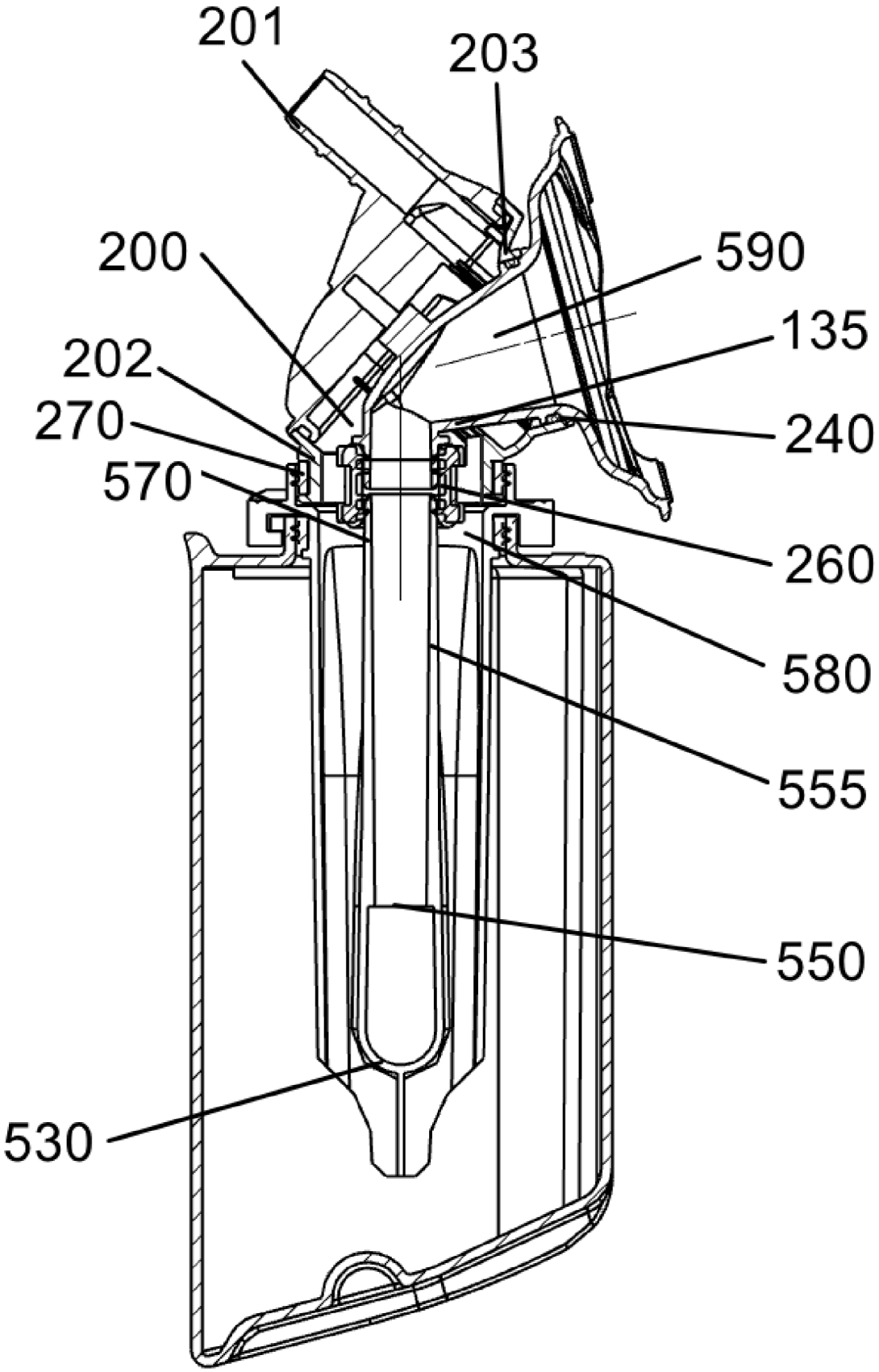

FIG. 4

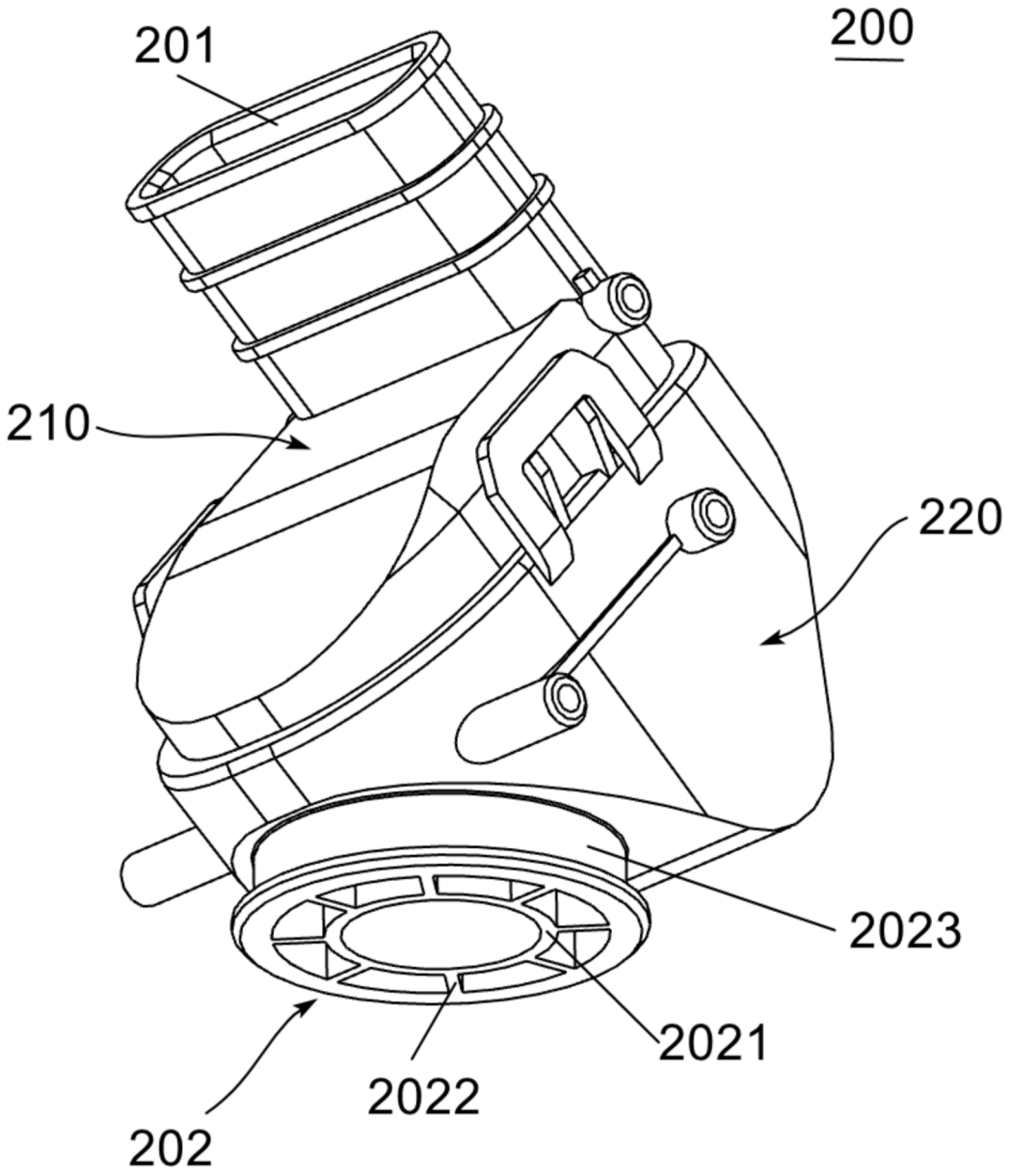

FIG. 5

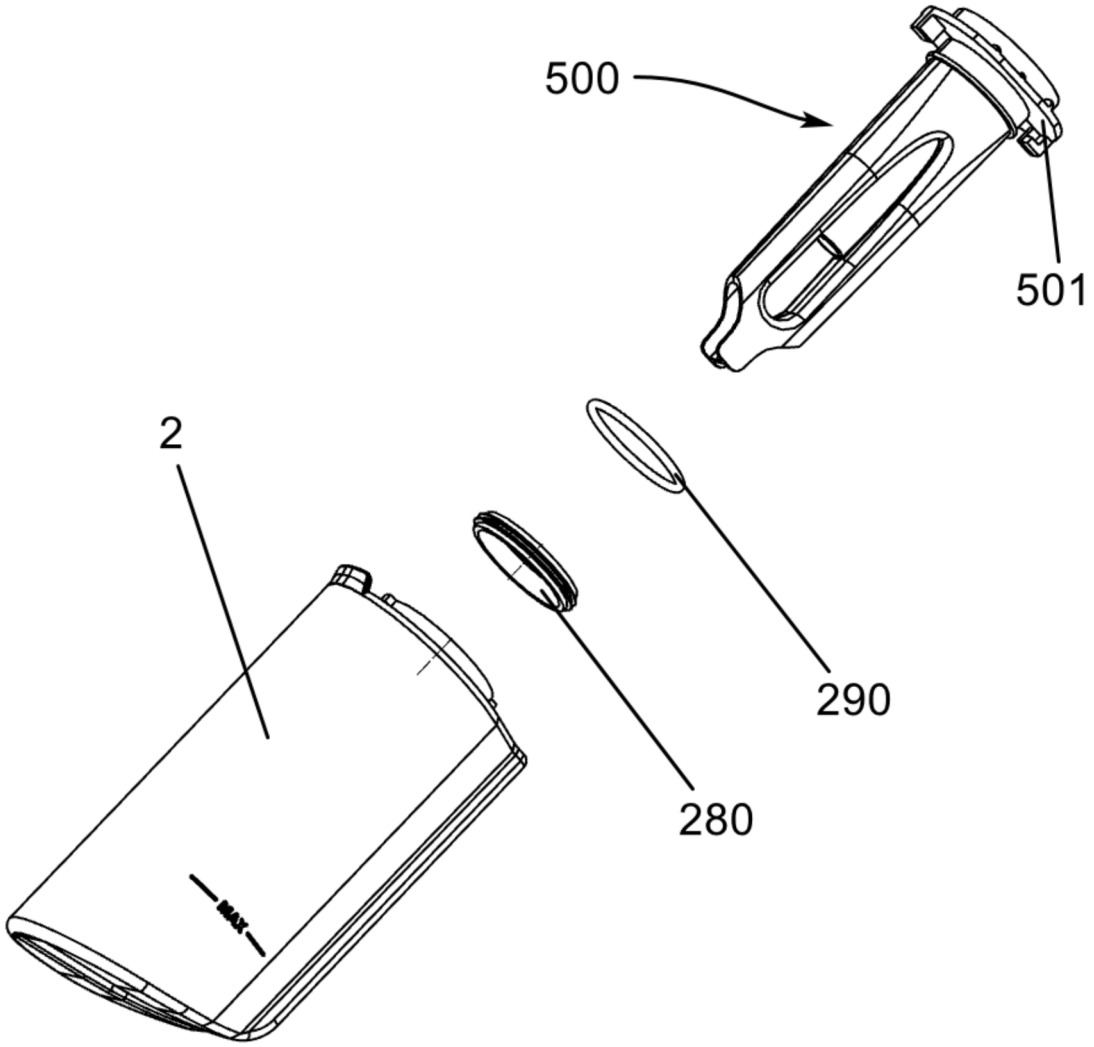

FIG. 6

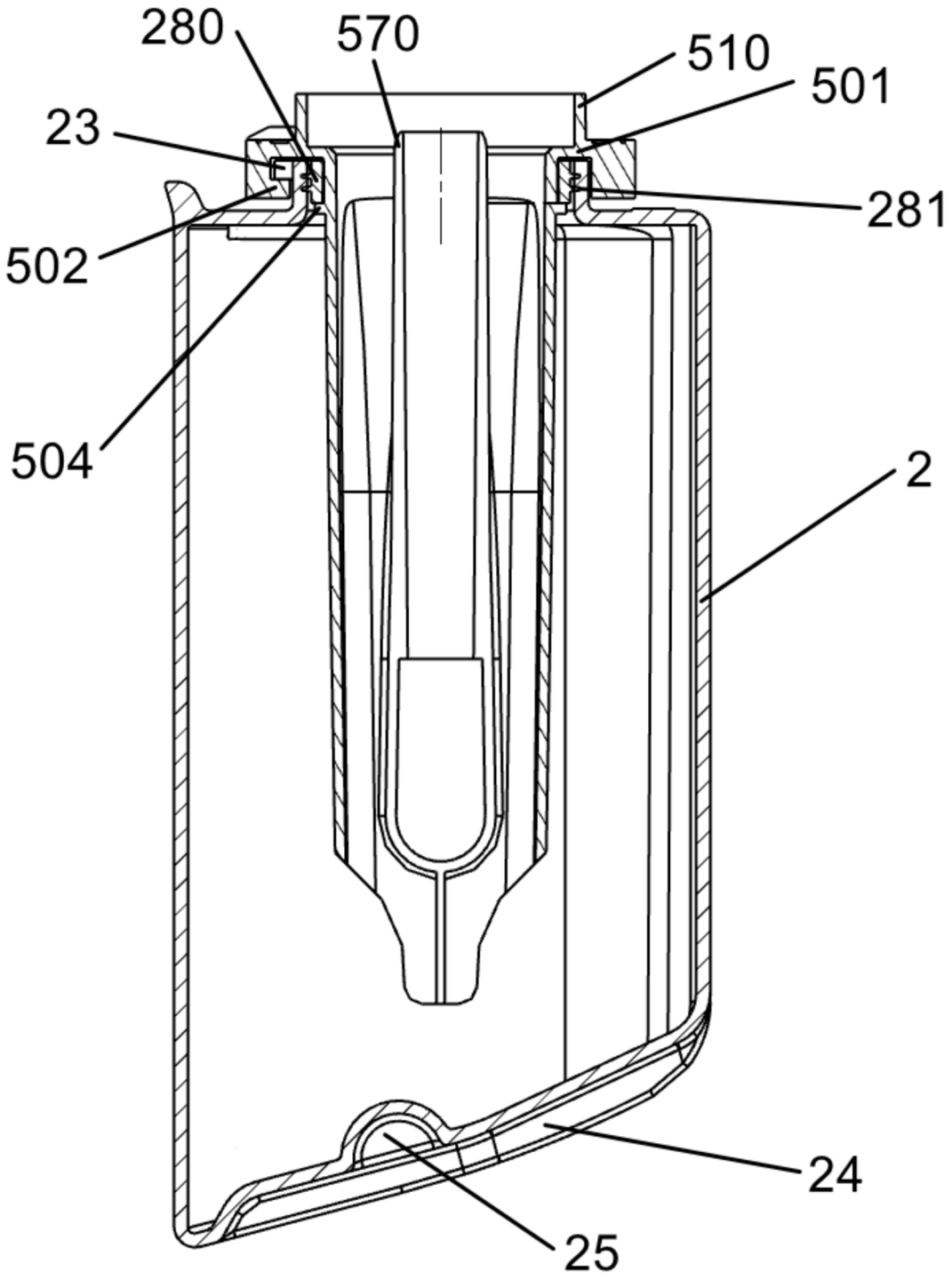

FIG. 7

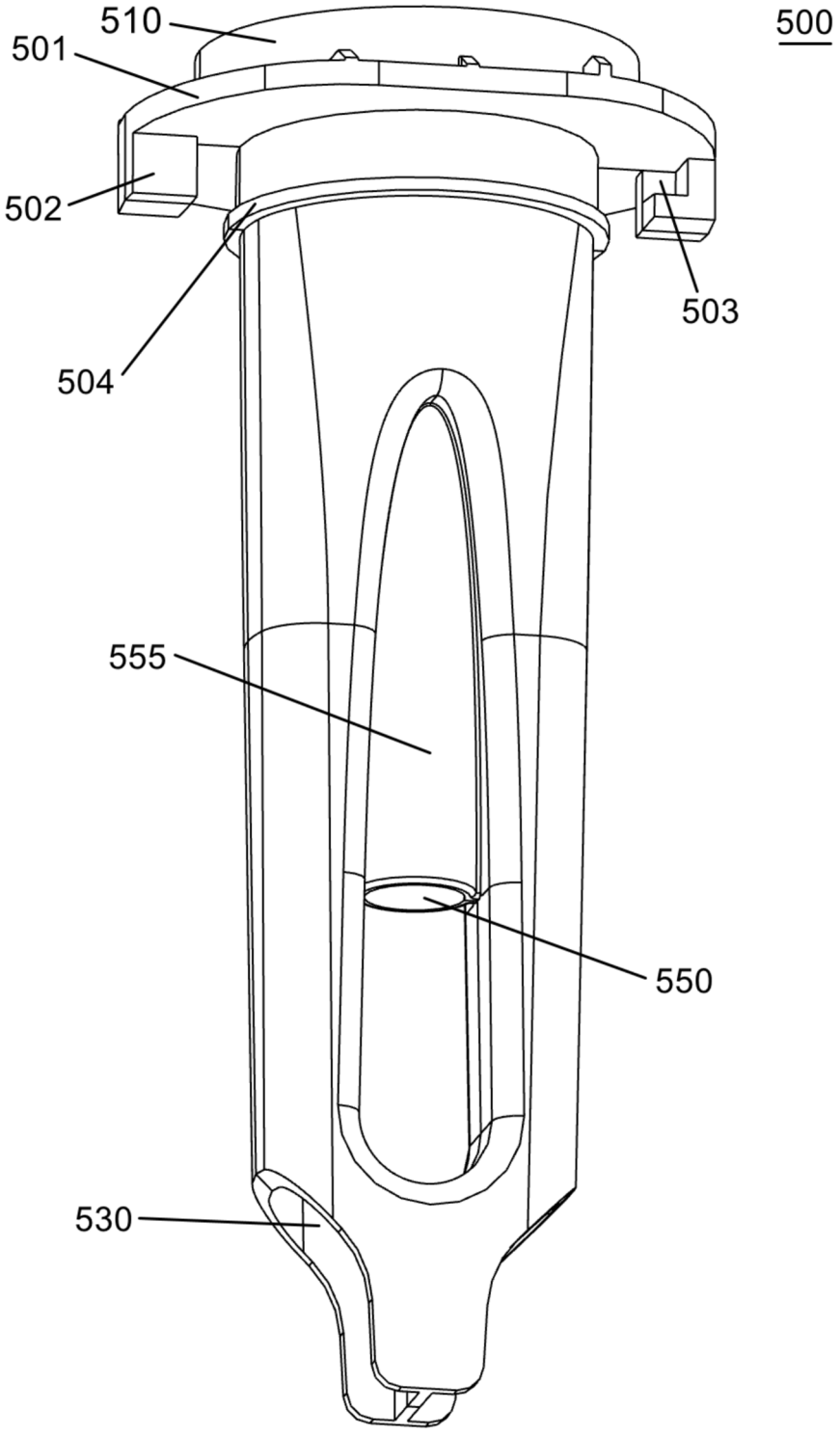

FIG. 8

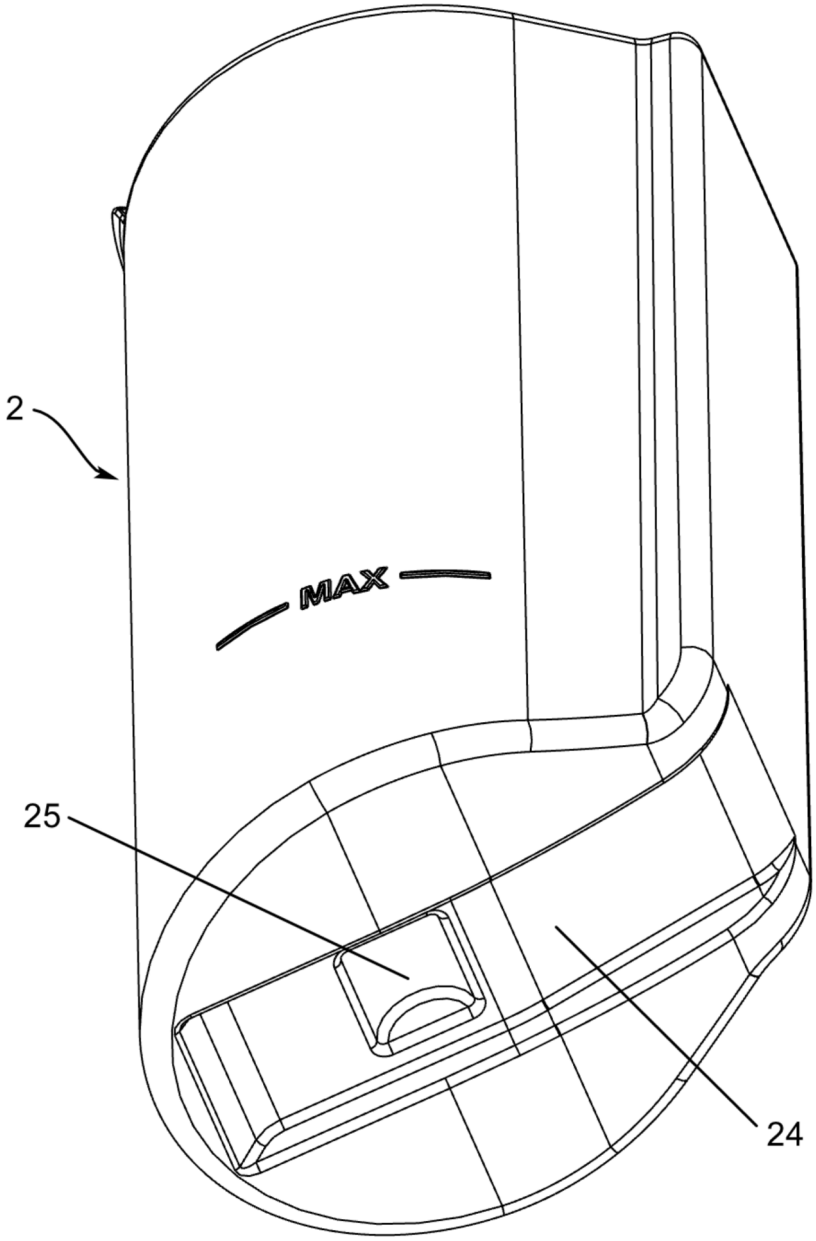

FIG. 9

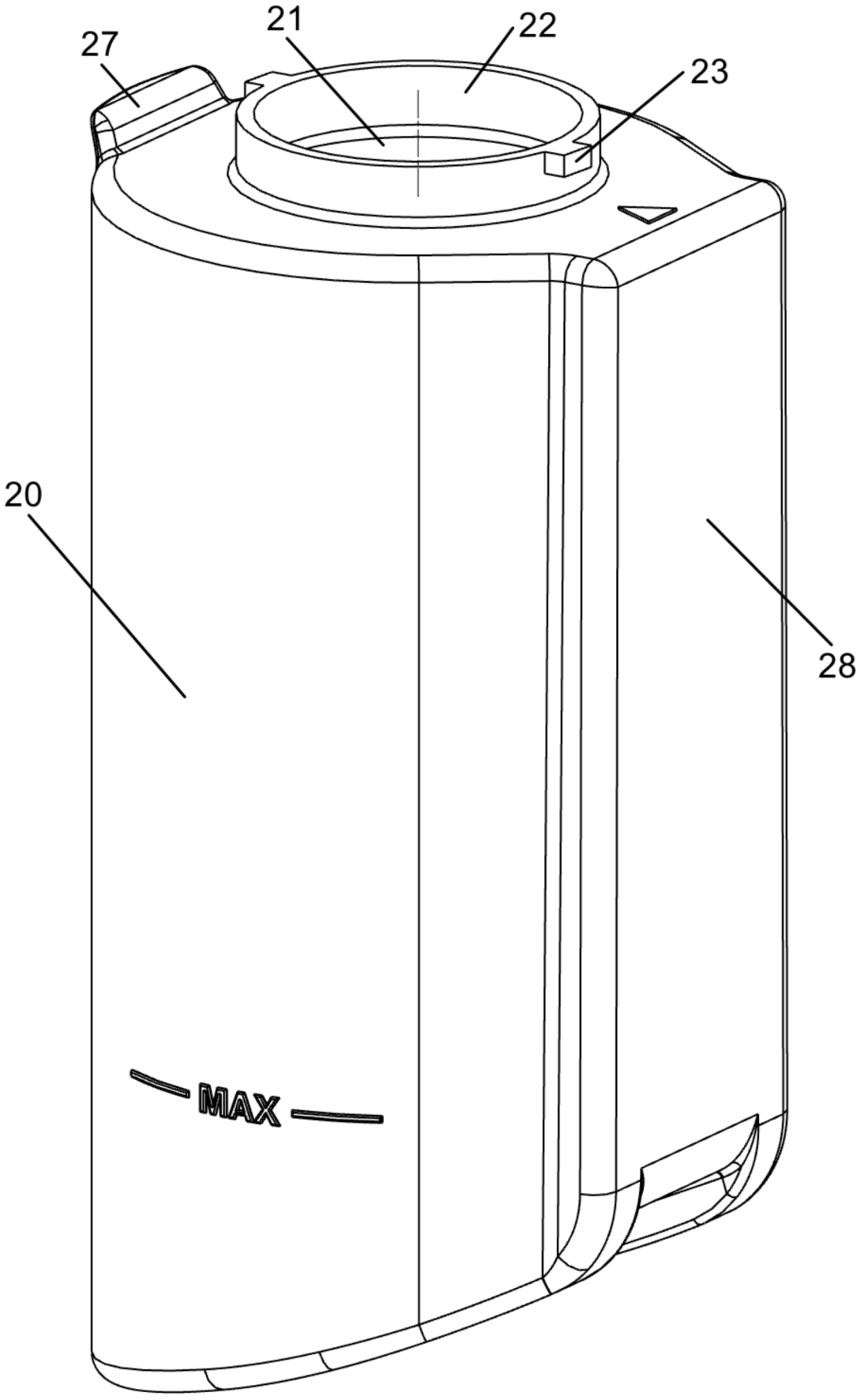

FIG. 10

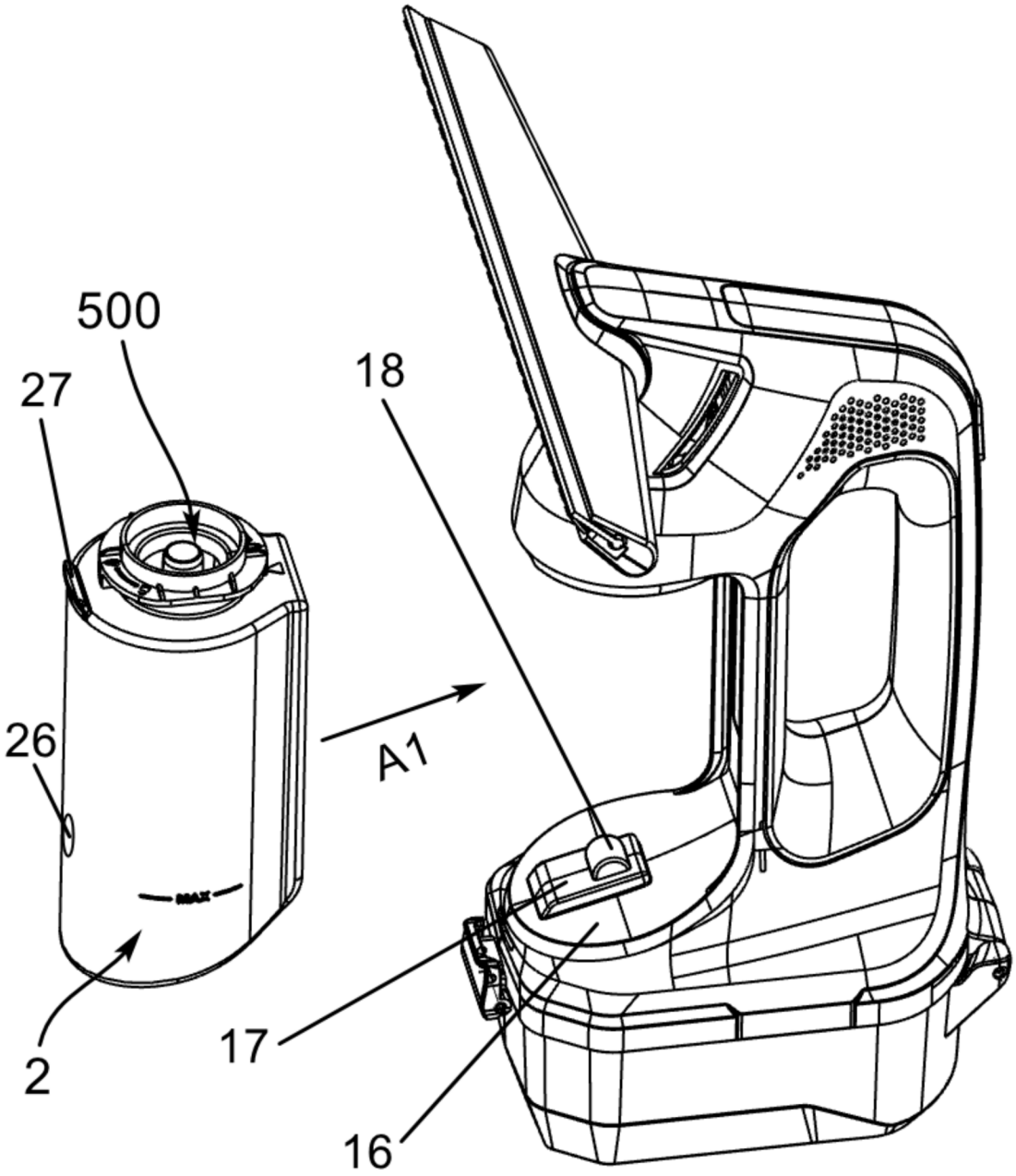

FIG. 11

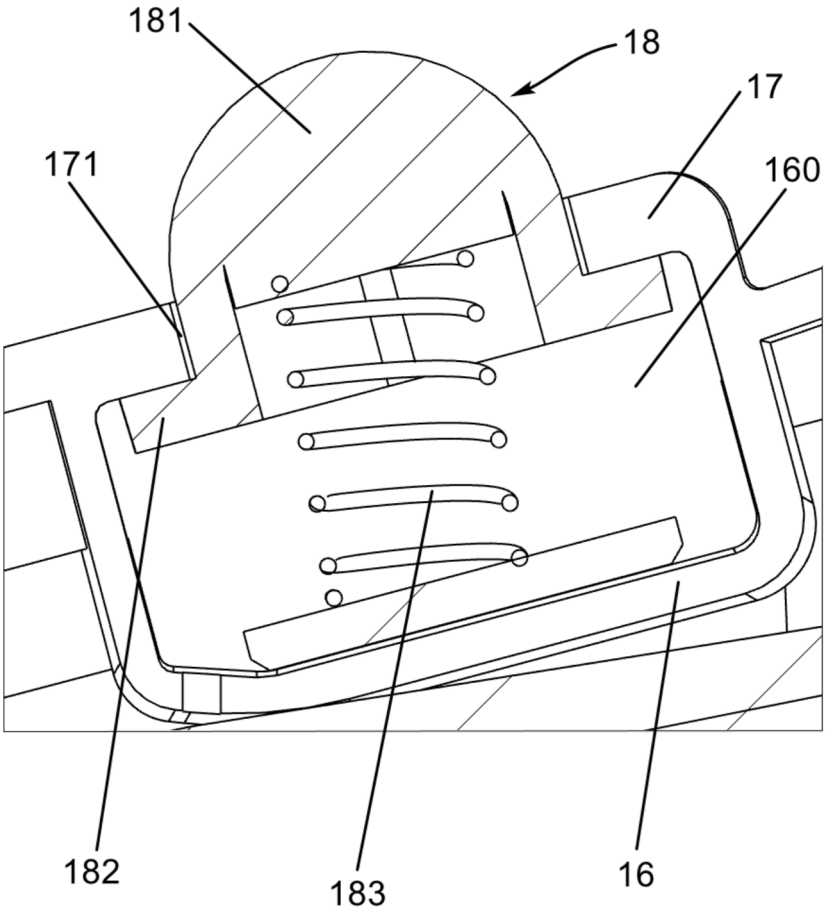

FIG. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 25 21 3587

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			A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 March 2026	Rippel, Andreas

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