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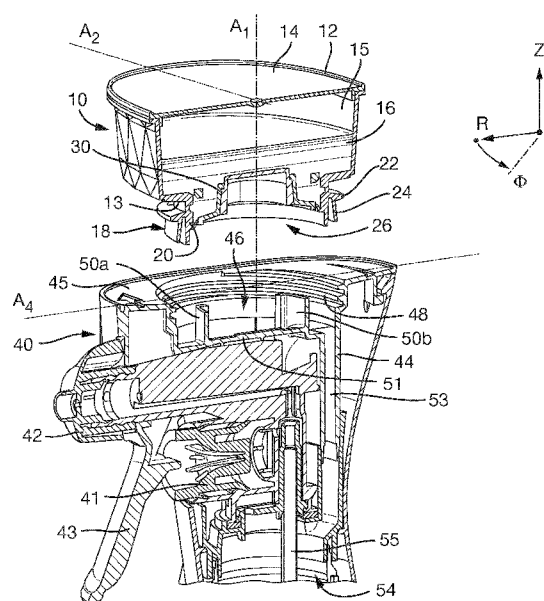
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(54) Title: LIQUID DETERGENT CONTAINER, TRIGGER SPRAYER DEVICE, AND SPRAYER SYSTEM

Fig. 3a



(57) **Abstract**: A sprayer system (1), comprising: a liquid detergent container (10), adapted for connecting to a trigger sprayer (40), the liquid detergent container including a connector (18) and a container body (12) with a reservoir (15) and an outlet orifice (26); a trigger sprayer (40) for generating a spray of aqueous liquid (70), the trigger sprayer including a further connector (48) and a base (44) with an inlet orifice (46); and a bottle (60) that is connected to the base (44), and which encloses a storage chamber (62) for accommodating an aqueous liquid mixture (70); wherein the connector (18) and the further connector (48) are adapted to be mutually attached to establish a liquid-tight passageway between the reservoir and the storage chamber via the inlet orifice and the outlet orifice.



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LIQUID DETERGENT CONTAINER, TRIGGER SPRAYER DEVICE, AND SPRAYER SYSTEM

Field of the invention

- 5 The invention relates to a container for liquid detergent, to a trigger sprayer for generating a spray of aqueous liquid, and to a sprayer system.

Background of the invention

- Detergent containers and trigger sprayers for use in a closed sprayer system are
10 known. Such closed sprayer systems are adapted to avoid direct contact with detergent by the person using the sprayer system.

International patent document WO 2015/188129A2 describes a sprayer system with a trigger sprayer, a spray nozzle, a trigger actuator, a reservoir for accommodating a solvent substance, and a further reservoir for accommodating a concentrate substance.

- 15 The known sprayer system has a pumping mechanism, which is adapted to supply portions of solvent substance from the reservoir and concentrate substance from the further reservoir to a mixing chamber, upon actuation of the trigger. The required pumping and spraying mechanism is relatively complex, and requires careful design to enable automatic extraction of a proper ratio of solvent substance and concentrate
20 substance from the respective reservoirs. There is a risk that the pumping mechanism may fail, either during initial coupling of the reservoirs to the sprayer system, or during spraying operations.

In view of the potentially hazardous nature of the concentrate substance, it would be desirable to provide a sprayer system that is more robust and safer to handle.

25

Summary of the invention

- In accordance with the advantages and effects mentioned herein below with reference to the aspects in relation to a liquid detergent container and trigger sprayer, there is provided a sprayer system, comprising a liquid detergent container including a
30 connector and a container body with a reservoir and an outlet orifice as described herein below, a trigger sprayer including a further connector and a base with an inlet orifice as described herein below, and a bottle, which is connected to the base and encloses a storage chamber for accommodating and an aqueous liquid mixture. The

connector and the further connector are adapted to be mutually attached to establish a liquid-tight passageway between the reservoir and the storage chamber, via the inlet orifice and the outlet orifice.

5 According to an embodiment, the container body defines a wall portion that surrounds the outlet orifice and the connector, and the trigger sprayer defines a further wall portion that surrounds the inlet orifice and the further connector. The wall portion and further wall portion are adapted to abut and extend along each other, when the container and the trigger sprayer are in the coupled state and the valve member is in an opened position.

10 According to a further embodiment, the wall portion of the container body has an outer periphery with an oblate/elongate shape that defines a long axis A2 in a plane perpendicular to the nominal axis A1, and the further wall portion of the trigger sprayer has an outer periphery with an oblate/elongate shape that defines a further long axis A4. Here, the long axes A2, A4 are aligned when the container and trigger sprayer are

15 in the coupled state and the valve member is in the open position.

The wall portion of the container and the further wall portion of the trigger sprayer may for example have congruent elliptical peripheries, which are be aligned with their long axes when the container and trigger sprayer are in the coupled state. Other elongate congruent shapes may be possible, e.g. rectangular, lenticular, stadium-shaped, etc.

20 According to an embodiment, the base of the trigger sprayer is fixed to the bottle in a liquid-tight manner, and the reservoir in the container and the storage chamber in the bottle are in fluid communication when the container, the trigger sprayer, and the bottle are in the coupled state with the valve member in the open position.

In addition to the above-mentioned aspects, the trigger sprayer with inlet orifice on an

25 upper side of the base, and fluidly coupled to the storage chamber to allow filling of the storage chamber with solvent liquid directly via the inlet orifice, may be implemented as an improvement in and of its own, and its various embodiments may be subject of a divisional application.

30 The liquid detergent container adapted for connecting to a trigger sprayer comprises a container body, a valve member, and a connector. The container body encloses a reservoir for accommodating a liquid detergent in a liquid-tight manner, and includes an outlet orifice that extends through the container body between the reservoir and a

region outside the container body. The valve member is arranged on or in the container body at the outlet orifice, and is adapted for transitioning between a closed position and an open position. In the closed position, the valve member seals the outlet orifice to prevent the liquid detergent from passing through the outlet orifice. In the open position, the liquid detergent is allowed to pass through the outlet orifice. The connector is arranged on or in the container body at or near the outlet orifice, and is adapted to cooperate with a further connector on or in an inlet orifice in the trigger sprayer. This cooperation includes establishing a coupled state wherein the inlet orifice and outlet orifice are fluidly coupled and translational displacement of the container body relative to the trigger sprayer transverse to a nominal axis A1 is essentially restricted. In the coupled state, the cooperation further includes transitioning the valve member from the closed position to the open position and allowing the liquid detergent to flow from the reservoir via an inlet orifice into a storage chamber of the trigger sprayer, when the container body is rotated relative to the trigger sprayer about the nominal axis over a non-zero actuation angle $\Delta\Phi_2$ (e.g. by a user).

The container is adapted to be used in cooperation with a trigger sprayer in a system. The container allows storage of liquid detergent in a closed and liquid-tight sealed manner. This liquid-tight sealing is maintainable for as long as the container is separate from the trigger sprayer, and the liquid detergent is only to be released if the container is appropriately coupled to the trigger sprayer. Spilling of and physical contact with the liquid detergent can thus be avoided. The translational restriction in the coupled state implies that inadvertent translation of the container relative to the trigger sprayer transverse to the nominal axis A1 will be prevented, but that small guided translations along the axis resulting from rotation over the actuation angle may still be possible. In embodiments, the connector and further connector may be adapted to cause opening of the valve via rotation over an actuation angle along positive or negative angular directions $\pm\Phi$. The rotation-based opening/unsealing mechanism provides a simple and reliable coupling interface, which allows a user to (re-)fill the sprayer system with liquid detergent via a procedure that is safe and easy to understand and execute.

According to an embodiment, the container comprises a sealing member, which is arranged at or near the connector and around the outlet orifice. The sealing member is adapted to cooperate with the further connector on the trigger sprayer, to establish a liquid-tight coupling between the inlet and outlet orifices. This sealing member may for

example be formed by a flexible annular flange, which extends around the outlet orifice and is centred on the nominal axis.

According to an embodiment, cooperation between the connector and the further connector includes fixing the container body to the trigger sprayer to establish the coupled state, when the container body is rotated relative to the trigger sprayer about the axis A1 over a non-zero coupling angle $\Delta\Phi 1$ (e.g. by the user), before being rotated over the actuation angle $\Delta\Phi 2$.

The connector and further connector may thus cooperate to connect the container to the trigger sprayer, as well as to (subsequently) open the container valve member, by successive rotation operations along the angular direction Φ . Safety and user-friendliness of the container connection mechanism is thus improved further. The connector and further connector may be adapted to cause coupling of the container, via rotation over a coupling angle along either the positive or the negative angular direction $\pm\Phi$. Preferably, the rotations over the coupling angle and actuation angle proceed along the same direction.

According to an embodiment, the valve member is movably coupled to the container body via a screw connection. This screw connection is adapted to cause the valve member to rotate relative to the container body about the axis, and to translate relative to the container body over a distance along the nominal axis, in order to transition from the closed position to the open position, when the container body is rotated relative to the trigger sprayer over the actuation angle $\Delta\Phi 2$ about the nominal axis (e.g. by the user).

The screw connection for transitioning the valve provides a self-braking mechanism that prevents opening of the valve member when only a linear force is exerted on the valve member, e.g. by a user that tries to push the valve body inwards into the container. The probability of unwanted opening of the valve and leakage of detergent is thus reduced. The screw connection allows rotation of the container body relative to the valve member over an angle with the same direction and at least the same extent as the actuation angle $\Delta\Phi 2$ of the container body relative to the trigger sprayer.

Preferably, the valve member and screw connection are arranged inside the outlet orifice. This prevents the valve member and rotatable connection from hampering cooperation between the connectors of the container and trigger sprayer, and makes it more difficult for a user to manipulate the valve of a separated container. The screw

connection may be adapted to cause the valve member to open via outwards translation relative to the reservoir and along the nominal axis A1, when the container body is rotated relative to the trigger sprayer over the actuation angle $\Delta\Phi_2$ (e.g. by the user). In this case, the trigger sprayer may include a structure for preventing excess outwards valve displacement (e.g. a stop surface at the inlet orifice), whereas a structure for preventing excess inwards valve displacement may be omitted from the container. Alternatively, the screw connection may be adapted to open the valve via inwards translation relative to the reservoir and along the axis, when the container is rotated over the actuation angle.

10 The connector and further connector may cooperate to provide a reversible coupling mechanism for the container and opening mechanism for the valve, which allows the above-mentioned operations to be reversed. The coupling and opening mechanisms may for example be implemented by screw connections. Hence, from a coupled state with opened valve, the valve member can be transitioned back into the closed position by rotating the container body back over an inverse actuation angle $-\Delta\Phi_2$ along the angular direction Φ , and the container can subsequently be decoupled from the base by rotating the container body further back over a decoupling angle $-\Delta\Phi_1$. This reversible attachment mechanism ensures that the container will automatically be re-sealed, before it is removed from the trigger sprayer. User-safety is thus further improved.

20 According to an embodiment, the connector and further connector allow rotation of the container body relative to the trigger sprayer over the coupling angle $\Delta\Phi_1$ with a value in a range between 80° to 100° , and preferably about 90° , to establish the coupled state. Alternatively or in addition, the connector and further connector allow rotation of the container body relative to the valve member over the actuation angle $\Delta\Phi_2$ with a value substantially equal to 180° , to transition the valve member from the closed position to the open position.

30 In general, trigger sprayers may be formed with an outer surface shape that is substantially symmetric with respect to a plane that extends through the spray nozzle and in a vertical direction (i.e. "left-right symmetry"). This symmetrical shape allows ambidextrous handling of the trigger sprayer (i.e. independent of left- or right-handedness of the user). Especially for symmetric trigger sprayer designs, a coupling angle $\Delta\Phi_1$ with a value in a range between 80° to 100° (e.g. about 90°) and/or an

actuation angle $\Delta\Phi 2$ with a value substantially equal to 180° may be easily identifiable and executable by a user, thus providing a reproducible and user-friendly connection procedure.

According to an embodiment, the connector includes a substantially toroidal portion, which surrounds the outlet orifice and the valve member, and which protrudes outwards from the container with a component along the nominal axis. Complementary to this, the inlet orifice on the trigger sprayer may define a recessed void in the base with a shape that is predominantly cylindrical. This void may for example be defined by an annular inner wall, which is centred on the axis A1 and has an inner side that is form fitting with an outer side of the toroidal portion of the container. These shapes facilitate mutual alignment between container and the trigger sprayer, and allow the use of connector means of rotatable type. Preferably, the connector includes a male screw thread or flange, which extends around the toroidal portion and allows rotation of the container body relative to the trigger sprayer over a combined angle $\Delta\Phi t$ along the angular direction Φ . The combined angle includes at least the coupling angle $\Delta\Phi 1$ and the actuation angle $\Delta\Phi 2$.

According to an embodiment, the valve member includes an engagement member, which is adapted for interlocking with a further engagement member provided on or in the trigger sprayer, to prevent further rotation of the valve member relative to the trigger sprayer when the container and trigger sprayer are in the coupled state.

The engagement member and further engagement member may thus cooperate, to provide a blocking mechanism that stops the valve member from rotating relative to the trigger sprayer, once the container body in the coupled state is rotated further with respect to the trigger sprayer. Such further relative rotation can be effectively used for transitioning the valve between the closed position and the open position. The engagement member may for example be formed by a recess in the valve member, which opens into a surface of the valve member that faces outward along the nominal axis A1. Such an engagement recess is not easily manipulated by a human hand or standard tools, and prevents inadvertent opening of the detergent container in a disengaged state. The further engagement member may be formed by a rigid protrusion at the inlet orifice, which projects outwards and has a shape that is form fitting with respect to the recess. The protrusion may be formed as an annular segment, which extends from the guide surface parallel with the nominal axis outwards

towards the inlet orifice, and which has a finite radial and angular extent and the nominal axis at a centre of curvature. The engagement recess may form a complementary blind hole in the valve member. One or more pairs of such engagement members and further engagement members may be present on the valve and the trigger sprayer respectively.

The reservoir of the container may be partially or entirely filled with the liquid detergent.

The trigger sprayer comprises a nozzle, a pump mechanism, a handle and a base. The nozzle is adapted for discharging a spray of aqueous liquid. The pump mechanism is adapted for conveying the aqueous liquid from a storage chamber towards the nozzle. The handle is adapted for actuating the pump mechanism. The base defines an inlet orifice, which is fluidly coupled to the storage chamber. The base includes a further connector, which is adapted to cooperate with a connector and a valve member in or on a liquid detergent container. The cooperation includes establishing of a coupled state, wherein the inlet orifice and outlet orifice are fluidly coupled and translation of the container body relative to the trigger sprayer transverse to a nominal axis A1 is essentially restricted. In the coupled state, the cooperation includes transitioning of the valve member from the closed position to the open position and allowing the liquid detergent to flow from the reservoir via the inlet orifice into a storage chamber of the trigger sprayer, when the container body is rotated relative to the trigger sprayer about the nominal axis over a non-zero actuation angle $\Delta\Phi 2$ (e.g. by the user).

In this coupled state, a liquid-tight passageway is established between the reservoir and the storage chamber via the inlet orifice and the outlet orifice.

According to an embodiment, the base is mechanically connectable to a bottle, which encloses the storage chamber for accommodating the aqueous liquid, and the inlet orifice is fluidly coupled to the storage chamber when the trigger sprayer and the bottle are mechanically connected.

According to a further embodiment, the inlet orifice opens into a wall portion of the base that faces substantially upwards during operation, and the storage chamber is located on a side of the base that is substantially opposite to the base wall portion.

The high position and upwards orientation of the inlet orifice allows a user to refill the storage chamber with solvent liquid (e.g. water) via the inlet orifice, without needing to disconnect the trigger sprayer from the bottle. A dip tube coupled to the pump

mechanism of the trigger sprayer may thus remain inside the storage chamber during refill. Refilling of solvent liquid into the storage chamber is rendered hassle-free, and the likelihood of spilling liquid from the storage chamber and/or dripping from a dip tube during refill is reduced. Safety and user-friendliness of the system is further improved.

- 5 Preferably, the trigger sprayer comprises an internal conduit, which extends through the base and forms a direct fluid passage between the inlet orifice and a further orifice, and which opens into the storage chamber.

According to embodiments, the inlet orifice defines a void in the base that has a predominantly cylindrical shape centred on the axis A1.

- 10 According to a further embodiment, the further connector is provided at or near the inlet orifice, and comprises a female screw thread or recess that is adapted to cooperate with the connector in or on the liquid detergent container, to allow rotation of the container body relative to the trigger sprayer over a combined angle $\Delta\Phi_t$ that includes at least the coupling angle $\Delta\Phi_1$ and the actuation angle $\Delta\Phi_2$.

15

Brief description of Drawings

Embodiments will now be described, by way of example only, with reference to the accompanying schematic drawings, in which corresponding reference symbols indicate corresponding parts. In the drawings, like numerals designate like elements.

- 20 Figure 1 schematically shows an exploded side view of a sprayer system according to an embodiment;

Figure 2 schematically shows a cross-sectional front view of a sprayer system according to an embodiment, and

- 25 Figures 3a-3d schematically present perspective cross-sectional views of a container and trigger sprayer according to embodiments.

The figures are meant for illustrative purposes only, and do not serve as restriction of the scope or the protection as laid down by the claims.

Description of Embodiments

- 30 The following is a description of certain embodiments of the invention, given by way of example only and with reference to the figures. In the next figures, cylindrical coordinates will be used to describe spatial characteristics and relations for exemplary embodiments of the sprayer system.

The “(nominal) axis A1” refers herein to a line through the body of the sprayer system, which is centred on the valve and orifices that are associated with the coupling between the container and the trigger sprayer. In an operational position of the sprayer system, this axis A1 extends substantially vertical. The “axial direction” Z is used herein to refer to the direction parallel with this axis A1. The term “upstream” is used herein to designate the direction parallel with the positive axial direction +Z. Conversely, the term “downstream” is used herein to designate the negative axial direction -Z.

The term “radial direction” R refers herein to the directions that point radially away from the axis A1 (i.e. perpendicular to the axial direction Z) and which lie in a transversal plane for which a surface normal vector points along the axial direction Z.

The “angular direction” Φ (also called “azimuthal direction”) corresponds to a unit-vector that initiates at a local radial position, and which points anti-clockwise along an (infinitesimal) angle of rotation about the axis A1, and perpendicular to both the (local) radial and axial directions R, Z.

It should be understood that the directional definitions and preferred orientations presented herein merely serve to elucidate geometrical relations for specific embodiments. The concepts of the invention discussed herein are not limited to these directional definitions and preferred orientations. Similarly, directional terms in the specification and claims, such as “top,” “bottom,” “left,” “right,” “up,” “down,” “upper,” “lower,” “proximal,” “distal” and the like, are used herein solely to indicate relative directions and are not otherwise intended to limit the scope of the invention or claims. The term “surface” is used herein to generally refer to a two-dimensional parametric surface region, which may have either an entirely or piece-wise flat shape (e.g. a plane or polygonal surface), a curved shape (e.g. cylindrical, spherical, parabolic surface, etc.), a recessed shape (e.g. stepped or undulated surface), or a more complex shape. The term “plane” is used herein to refer to a flat surface defined by three non-coinciding points.

Figure 1 schematically shows an exploded side view of an embodiment of a sprayer system 1. The sprayer system 1 comprises a detergent container 10, a trigger sprayer 40, and a bottle 60. In the exploded configuration depicted in figure 1, the container 10, trigger sprayer 40, and bottle 60 are disconnected.

Figure 2 schematically shows a cross-sectional front view of the sprayer system 1 from figure 1, but now in an operational configuration. In this operational configuration, the

container 10, the trigger sprayer 40, and the bottle, 60 are interconnected in a liquid-tight manner. In this configuration, the container 10 is attachable to the trigger sprayer 40 on one side thereof. This side is associated with a container attachment region 2.

The bottle 60 is attached to the trigger sprayer 40 on another side thereof. This side is
5 associated with a bottle attachment region 6 that is essentially opposite to the container attachment region 2.

The detergent container 10 forms a storage unit that is separable from the trigger sprayer 40. The detergent container 10 comprises a container body 12 with an outlet orifice 26, a valve member 30, and a connector 18.

10 The container body 12 encloses an internal reservoir 15 for accommodating liquid detergent 16, and for sealing the liquid detergent 16 from the surroundings of the container 10. The container body 12 forms a material barrier that prevents liquid detergent 16 inside the reservoir 15 from flowing out. The container body 12 is non-permeable at least for the liquid detergent 16, and is made of suitable material(s) that is
15 (are) not chemically reactive with the liquid detergent 16. The container body 12 may also be non-permeable and/or chemically non-reactive with respect to other substances, like water. Exemplary suitable construction materials for the container body 12 are polymers, for example polypropylene (PP).

In the example of figures 1 and 2, the container body 12 forms a relatively flat structure,
20 with an elliptical lateral wall portion that curves around the axis A1, a flat lower wall portion 13 that includes the outlet orifice 26, and a flat upper wall portion 14. At least a section of the lateral wall portion may be formed of a translucent or transparent material, to allow a user to determine a remaining quantity of liquid solvent 16 inside the reservoir 15 through visual inspection.

25 The outlet orifice 26 in the container body 12 extends through the container body 12, between the reservoir 15 inside the container body 12 and the region outside the container 10. The outlet orifice 26 is located at the lower wall portion 13 of the container body 12, so that the lower wall portion 13 radially surrounds the outlet orifice 26.

30 In the example of figures 1 and 2, the lower wall portion 13 has a substantially elliptical shape in a radial-angular plane. Other shapes may be possible in alternative embodiments, e.g. circular, rectangular, lenticular, stadium-shaped, etc. The container 10 may have characteristic sizes in this radial-angular plane in the order of a human

hand, in order to facilitate handling. A major axis associated with the elliptical lower wall portion 13 may for example be in a range of 50 millimetres to 150 millimetres, and preferably within 70 millimetres to 100 millimetres. A height of the container along the vertical direction Z may for example be in a range of 10 millimetres to 40 millimetres, preferably within 20 millimetres to 30 millimetres.

The reservoir 15 is sealable from the region outside the container 10 via actuation of the valve member 30. The valve member 30 is arranged in the container body 12 of the container 10, at the location of the outlet orifice 26. The valve member 30 is movable with respect to the container body 12, and adapted to allow transitioning between a closed position and an open position. In the closed position, the valve member 30 closes off the outlet orifice 26 in a liquid-tight manner, thus preventing the liquid detergent 16 inside the reservoir 15 from passing through the outlet orifice 26. In the open position of the valve member 30, the valve member is (at least partially) removed from the outlet orifice 26, so that the liquid detergent 16 inside the reservoir 15 is allowed to pass through the outlet orifice 26.

In this example, the upper wall portion 14 of the container 10 may be formed of a solid impermeable material that is slightly flexible. Flexing of the upper wall portion 14 may provide compensation for compressional forces exerted on the container 10, e.g. during transit or squeezing by a user, without compromising the liquid-tight seal established by the valve member 30 in the closed position.

The connector 18 is provided on the container body 12, and extends directly around the outlet orifice 26. This connector 18 is of the male screw connection type, and is adapted to cooperate with a further connector 48 on the trigger sprayer 40, to establish a liquid-tight connection.

The trigger sprayer 40 includes a base 44, a pump mechanism 41, a spray nozzle 42, and a handle 43. The base 44 forms a relatively rigid structure for protecting and supporting internal components, among which the pump mechanism 41. In this example, a casing surrounds the base 44 in the radial/axial directions, and vertically extends along a gripping region 4 that is bounded on opposite sides by the container attachment region 2 and the bottle attachment region 6 respectively. The casing forms an aesthetic shroud around the base 44, and provides a grip interface for the user. In alternative embodiments, the casing may form an integral part of the base.

The base 44 defines an upper wall portion 45 in the container attachment region 2. This upper wall portion 45 faces substantially upwards along the positive vertical direction +Z, when the sprayer system 1 is in the operational position.

The base 44 defines an inlet orifice 46 and a further orifice 54. The inlet orifice 46
5 opens into the upper wall portion 45, and defines a recessed void in the base 44 that has a predominantly cylindrical shape centred on the axis A1. The further orifice 54 is located on a lower side of the base 44 in the bottle attachment region 6.

The base 44 defines a liquid guiding surface 51 inside the inlet orifice 46. This guide surface 51 includes an inverted U-shape, which curves around the pump mechanism
10 41. The guide surface 51 is adapted to guide fluid, which is supplied via the inlet orifice 46, inwards into the base 44 (see figure 2). The base 44 defines internal conduits 52a, 52b, which extend from the guide surface 51 downstream through the base 44 and along lateral sides of the pump mechanism 41. A further internal conduit 53 also extends from the guide surface 51 downstream through the base 44, but at a rear side
15 of the pump mechanism 41 (see figure 1). The internal conduits 52, 53 form direct fluid passages between the inlet orifice 46 and the further orifice 54. The further internal conduit 53 is separated from the internal conduits 52 by two vertical bounding walls (not shown). The conduits 52, 53 define liquid-tight passageways through the base 44 and between the inlet orifice 46 and the further orifice 54. These passageways are
20 unobstructed, meaning that solvent liquid and/or liquid detergent that is supplied via the inlet orifice 46 may flow directly through the base 44, via the inner conduits 52, 53 towards the further orifice 54, without encountering intermediate structures for actively controlling flow (e.g. pumps, valves, etc.) in these passageways.

The bottle 60 encloses a storage chamber 62 for accommodating an aqueous liquid
25 mixture 70, and defines a bottle orifice 64 at an upper side. Preferably, the aqueous liquid 70 is composed of liquid detergent that is dissolved in or mixed with solvent liquid, for example water. The water may include at least one of tap water, mineral water, distilled water, de-ionized water, or other type of water appropriate for use as solvent liquid. The bottle 60 is non-permeable at least for the aqueous liquid 70 (which
30 may include the liquid detergent 16), and is made of suitable material(s) that is (are) not chemically reactive with the aqueous liquid 70. In this example, the bottle 60 is formed by a single body of plastic material that surrounds the storage chamber 62. In general, the bottle may be made with any shape, size, and/or material, provided that

the bottle 60 is suitable for accommodating the aqueous liquid 70 in a liquid-tight manner (provided the bottle orifice 64 is properly connected or sealed).

The inlet orifice 46 in the trigger sprayer 40 is exposed when the container 10 is not connected to the trigger sprayer 40. This allows the storage chamber 62 in the bottle
5 60 to be refilled with solvent liquid (e.g. water) via the inlet orifice 46, the internal conduits 52, and the further orifice 54. The guide surface 51 and internal conduits 52 convey this solvent liquid downstream into the storage chamber 62. The further internal conduit 53 is adapted to facilitate venting of air from inside the storage chamber 62, during filling. Such filling does not require the bottle 60 to be removed from the trigger
10 sprayer 40 and the dip tube 55 to be removed from the storage chamber 62. The proposed sprayer system 1 thus allows easy hassle-free (re-)filling of solvent liquid, and significantly reduces the probability of spilling liquid from the storage chamber 62 and/or of dripping residual liquid from the trigger sprayer 40 during refill.

The pump mechanism 41 is accommodated in the base 44, and is fluidly and
15 mechanically coupled to one distal end of a dip tube 55. The dip tube 55 is adapted to be inserted with an opposite distal end into the storage chamber 62 of the bottle 60. In an operational position, the dip tube 55 protrudes predominantly downwards, and extends along a substantial vertical portion of the storage chamber 62, to allow drawing of aqueous liquid 70 (preferably including liquid water and liquid detergent) from the
20 storage chamber 62. The pump mechanism 41 is adapted to convey portions of the aqueous liquid 70 from the storage chamber 62, via the dip tube 55, towards and through a further conduit 56 that extends inside and through the nozzle 42.

The handle 43 is connected to an outer side of the base 44, in the gripping region 4. The handle is movably coupled, to allow the user to exert manual force on and displace
25 (e.g. rotate, deflect, translate) the handle 43 relative to the base 44. The handle 43 is also operatively connected to the pump mechanism 41, to allow the pump mechanism 41 to be actuated by displacement of the handle 43. The noun "handle" is used herein to broadly refer to actuation mechanisms that are displaceable by manual force, to actuate the pump mechanism. In the example of figures 1 and 2, the handle 43 is
30 formed by a lever structure that is ergonomically shaped and pivotably connected to the base 44 on one end. In other embodiments, the handle may be implemented differently e.g. in the form of a button, crank, or wheel.

The spray nozzle 42 projects from the base 44, and forms an outlet for discharging a directed spray of aqueous liquid (e.g. including a portion of the liquid detergent 16) into the environment. The spray nozzle 42 may be connected to the trigger sprayer 40 in a manner that allows the nozzle's position and/or orientation to be adjustable by user manipulation, in order to change the characteristics of the generated spray jet. The nozzle 42 may for example be adjustable between two or more of a "stream position" wherein the nozzle can generate a concentrated stream spray pattern, a "fog position" wherein the nozzle can generate a dispersive fan spray pattern, and a "locked position" wherein the nozzle is blocked to prevent any spraying, so that leaking during transport/storage or accidental operation (e.g. by a child) are avoided.

The further connector 48 in the base 44 is of a female screw connection type, and surrounds the inlet orifice 46. This further connector 48 is adapted to cooperate with the connector 18 of the container 10, to establish a coupled state between the trigger sprayer 40 and the container 10. In this coupled state, a liquid-tight connection is established between the outlet orifice 26 of the container 10 and the inlet orifice 46 of the base 44.

The base 44 includes coupling apertures 58 along the further orifice 54. The bottle 60 includes tabs 66 at an upper side, which are arranged around and along the bottle orifice 64. The tabs 66 and coupling apertures 58 are adapted to cooperate and interlock, to fix the bottle 60 to the trigger sprayer 40 in the bottle attachment region 6. Alignment members 65 (e.g. tapered embossments) are provided on the bottle 60 near the bottle orifice 64, for rotationally aligning the bottle 60 and the trigger sprayer 40. When the bottle 60 and trigger sprayer 40 are interconnected, and the inlet orifice 46 and the storage chamber 62 are fluidly coupled via the further orifice 54 and the internal conduits 52, 53 in a liquid-tight manner.

The container 10 and the bottle 60 need to be fixed to the trigger sprayer 40, to establish an operational configuration of the sprayer system 1. The sprayer system 1 may be available in an integrally connected and pre-filled state, wherein the container 10 and storage chamber 62 already include liquid detergent 16 and solvent liquid, respectively. Alternatively, only the trigger sprayer 40 and the bottle 60 may be provided in a pre-connected state. A user may then opt to fill the storage chamber 62 with solvent liquid, and subsequently connect a container 10 pre-filled with liquid detergent 16 to the trigger sprayer 40.

For spraying operation, the sprayer system 1 is to be held in an orientation wherein the spray nozzle 42 projects with at least a substantial component along the horizontal plane, and wherein the bottle 60 projects with a substantial component downwards along the negative vertical direction -Z. The bottle 60 is mechanically connected to trigger sprayer 40 at the bottle attachment region 6, to allow the pump mechanism 41 to draw liquid 70 from the storage chamber 62 and to convey this liquid 70 towards the nozzle 42.

When the container 10 is not coupled to the trigger sprayer 40, the inlet orifice 46 in the base 44 is exposed. In the operational position, the bottle 60 and storage chamber 62 are located below the trigger sprayer 40 and downstream of the pump mechanism 41. The filling orifice 46 is then located above the storage chamber 62 and the pump mechanism 41. In this position, the storage chamber 62 can be filled with solvent liquid (e.g. water), by supply from an external source (e.g. a tap) that is situated above the inlet orifice 46. With the proposed sprayer system 1, it is not necessary to decouple the trigger sprayer 40 from the bottle 60 in order to (re-)fill the storage chamber 62.

Prior to spraying operation, the reservoir 15 of the container 10 is at least partially filled with the liquid detergent 16. The container 10 may for example be commercially available in a pre-filled state, with liquid detergent 16 in the reservoir 15 and the valve member 30 in the closed position. The container 10 with liquid detergent 16 is to be connected in the container attachment region 2 to the base 44 at the upper wall portion 45, so that the container 10 will be located on a top side of the sprayer system 1. The container wall portion 13 and the base wall portion 45 are adapted to abut and extend along each in the coupled state of the container 10 and the trigger sprayer 40.

Connection of the liquid detergent container 10 to the trigger sprayer 40 requires cooperation between the connector 18 and the further connector 48. The connector 18 and further connector 48 are provided with geometrical properties that allow the container 10 to be moved from a disengaged state, along a predominantly linear trajectory along the axis A1 relative to and towards the trigger sprayer 40, into an engaged state. The engaged state marks the transition point after which the connector 18 and further connector 48 interlock to prevent linear motion between container body 12 and base 44 in directions transverse to the axis A1.

The geometrical properties of the connector 18 and further connector 48 still allow relative motion between the container 10 and the trigger sprayer 40 from the engaged

state into a coupled state, via rotation of the container 10 relative to the trigger sprayer 40 along the angular direction Φ about the axis A1. In this exemplary embodiment, rotation of the container 10 towards the coupled state proceeds along the negative angular direction $-\Phi$ (i.e. clock-wise).

5 In the coupled state, the container 10 is fixed to the base 44 of the trigger sprayer 40, and a liquid-tight coupling between the outlet orifice 26 and the inlet orifice 46 is established. The closed valve member 30 still prevents the liquid detergent 16 in the reservoir 15 from entering the inlet orifice 46.

By transitioning the valve member 30 to the open position, the reservoir 15 and the
10 storage chamber 62 become fluidly connected via the outlet and inlet orifices 26, 46, the internal conduits 52, the further orifice 54, and the bottle orifice 64. As is illustrated by the thick arrows in figure 2, liquid detergent 16 in the reservoir 15 may then freely flow downwards by gravitational pull into the storage chamber 62, and mix with the solvent liquid to obtain the aqueous liquid mixture 70. The sprayer system 1 does not
15 need to be shaken or turned upside down, in order to let the liquid detergent 16 reach the storage chamber 62. Once the storage chamber 62 is filled with the aqueous liquid mixture 70, the user may manipulate the handle 43, to actuate the pump mechanism 41 and discharge a portion of the aqueous liquid mixture 70 via the spray nozzle 42. Due to this coupling interface between container 10 and trigger sprayer 40, the system
20 may be described as a "top load system".

Figures 3a-3d illustrate in more detail the coupling properties of the sprayer system 1 from figures 1 and 2. In the example of figures 3a-3d, the container wall portion 13 has an elliptical outer periphery with a long axis A2, defined in a plane that is substantially perpendicular to the nominal axis A1. Similarly, the base wall portion 45 has an
25 elliptical outer periphery with a further long axis A4, also defined in a plane that is substantially perpendicular to the axis A1.

The connector 18 includes a toroidal portion 20, which forms a predominantly cylindrical structure that surrounds the outlet orifice 26 and the valve member 30, and which protrudes outwards from the container body 12 with a component along the axis
30 A1. The connector 18 includes a screw thread 22, which extends around and outwards from the toroidal portion 20. The further connector 48 on the trigger sprayer 40 includes a complementary screw thread, which extends along an inwards surface inside the inlet orifice 46. The screw thread 22 and complementary screw thread 48 cooperate to allow

the container body 12 to be rotated relative to the trigger sprayer 40 over a combined angle $\Delta\Phi t$. In this example, the combined angle is at least 270° .

The connector 18 on the container 10 and the further connector 48 on the trigger sprayer 40 can be coupled, to establish a liquid-tight connection between the outlet orifice 26 and the inlet orifice 46. As a result, reservoir 15 becomes fluidly coupled with the internal conduits 52, 53 of the trigger sprayer 40. The connector 18 includes a sealing member 24, and the further connector 48 includes an inner surface that is adapted to abut the sealing member 24. In this example, the sealing member 24 is formed as an inclined annular flange 24, which is fixed at one annular edge to the toroidal portion 20, and which is slightly flexible to allow radial deflection of a free opposite annular edge. In the coupled state, the free annular edge of the flange 24 cooperates with the inner surface, to provide the liquid-tight connection between inlet and outlet orifices 26, 46.

Figure 3a shows the container 10 and trigger sprayer 40 in a disengaged state. In this state, the valve member 30 of the container is in the closed position, the container 10 and the trigger sprayer 44 are disconnected, and the long axis A2 of the container body 12 may have any orientation relative to the further long axis A4 of the base 44. In the disengage state, the container 10 may be entirely removed from the trigger sprayer 40, leaving the inlet orifice 46 exposed. This allows the user to fill the storage chamber 62 with solvent liquid (e.g. water) via the inlet orifice 46, without having to remove the trigger sprayer 40 from the bottle 60. In the disengaged state, the user may move the container 10 towards the inlet orifice 46 and further connector 48, via rectilinear movement along the nominal axis A1, to establish an engaged state.

Figure 3b shows the container 10 and the trigger sprayer 40 in the engaged state. The valve member 30 is still in the closed position, but the toroidal portion 20 of the connector 18 is inserted into the inlet orifice 46. In this engaged state, the container wall portion 13 extends substantially parallel with the base wall portion 45, but at a non-zero vertical distance therefrom.

In this state, the container body 12 and valve member 30 remain jointly rotatable relative to the trigger sprayer 40. The container body 12 may be rotated relative to the base 44, until the axes A2, A4 are oriented at an initial angular offset of essentially 90° (see figure 3b). Further relative rotation along the negative angular direction $-\Phi$ about the axis A1 will cause the screw threads 22, 48 to interlock. Relative rotation over a

non-zero coupling angle $\Delta\Phi 1$ will bring the system into the coupled state. In this example, the coupling angle $\Delta\Phi 1$ is preferably equal to 90° along the negative angular direction $-\Phi$.

Figure 3c shows the container 10 in the coupled state, with the valve member 30 still in the closed position ("coupled-closed"). Figure 3c shows that the long axis A2 of the container body 12 and the further long axis A4 of the sprayer base 44 become oppositely aligned, after the container 10 has been rotated over the coupling angle $\Delta\Phi 1$. In this coupled-closed state, the container wall portion 13 extends at a non-zero vertical distance ΔZc along the base wall portion 45. This vertical distance ΔZc may for example be in a range of 1 millimetre to 10 millimetres. In this example, the vertical distance ΔZc is about 4 millimetres. In this coupled-closed state, the annular flange 24 of the connector 18 abuts the inner surface of the inlet orifice 46, to ensure that a liquid-tight coupling is established between the inlet orifice 26 and the outlet orifice 46, before the valve is opened.

The valve member 30 includes engagement members 38, which cooperate with further engagement members 50 on the trigger sprayer 40, to prevent further rotation of the valve member 30 relative to the base 44 when in the coupled state. The engagement members 38 are formed by two recesses 38a, 38b in the valve member 30. These recesses 38 form semi-annular blind holes that open into a lower surface of the valve member 30, and which extend along a finite angle around the nominal axis A1. The further engagement members 50 are formed by two rigid protrusions 50a, 50b, which are provided on the base 44 inside the inlet orifice 46, and which project outwards from the guide surface 51. Each protrusion 50 has a shape that fits inside a corresponding recess 38, and has a finite angular extent similar to the corresponding recess 38.

In the coupled-closed state from figure 3c, each rigid protrusion 50 is aligned and interlocks with a corresponding recess 38, so that further rotation of the valve member 30 relative to the trigger sprayer 40 will be blocked. Nevertheless, the screw thread 22 and complementary screw thread 48 allow further rotation of the container body 12 relative to the trigger sprayer 40 over an actuation angle $\Delta\Phi 2$ along the (negative) angular direction Φ and about the nominal axis A1.

In this exemplary embodiment, the moveable connection between the valve member 30 and the container body 12 is formed by a further screw connection 28, 32. This screw connection 28, 32 causes the valve member 30 to translate relative to the

container body 12 over a distance ΔZ_v along the axis A1, when the container body 12 is rotated relative to the trigger sprayer 40 over the actuation angle $\Delta\Phi_2$ about the axis A1, while the valve body 30 is kept rotationally fixed by the engagement members 38, 50. In this example, rotation over the actuation angle $\Delta\Phi_2$ also proceeds along the
5 negative angular direction $-\Phi$ (i.e. clockwise). This relative translation causes the valve member 30 to remove its sealing engagement with the outlet orifice 26, and to transition from the closed position to the open position. During such further rotation, the annular flange 24 of the connector 18 remains engaged with the inner surface of the inlet orifice 46, to maintain the liquid-tight coupling between the inlet orifice 26 and the
10 outlet orifice 46. In this case, the sealing is maintained by forming the annular flange 24 and the inner surface with heights at least equal to the vertical distance ΔZ_c .

In this example, the helical trajectories of the screw threads 22, 48 extend oppositely to the trajectories of the screw recess 28 and screw flange 32. This causes the valve member 30 to open and translate relative to the reservoir 15 over a distance ΔZ_v in a
15 negative axial direction $-Z$, when the container body 12 is rotated over the actuation angle $\Delta\Phi_2$.

Figure 3d shows the container 10 and trigger sprayer 40 in the coupled state, with the valve member 30 in the fully opened position ("coupled-opened"). In this coupled-opened state, the liquid detergent 16 inside the reservoir 15 is allowed to flow along the
20 opened valve member 30 through the outlet orifice 26, downstream via the inlet orifice 46, the internal conduits 52, and the further orifice 52 in the trigger sprayer 40, into the storage chamber 62 of the bottle 60, through gravitational pull alone. (as discussed with reference to figure 2).

The actuation angle $\Delta\Phi_2$ also has a non-zero value. In this exemplary embodiment, the
25 actuation angle $\Delta\Phi_2$ is about 180° along the negative angular direction $-\Phi$. In the coupled-opened state, the long axis A2 of the container body 12 and the further long axis A4 of the base 44 are co-aligned, and the container wall portion 13 abuts the base wall portion 45 (i.e. $\Delta Z_c \approx 0$).

The cooperating screw threads 22, 48, and the screw connection 28, 32 jointly provide
30 a reliable attachment mechanism, which allows the above-mentioned operations to be reversed. Hence, starting from a coupled-opened state (figure 3d), the valve member 30 can be transitioned back into the closed position to re-seal the container 10 (figure 3c), by rotating the container body 12 relative to the trigger sprayer 40 back over an

inverse actuation angle $-\Delta\Phi 2$ (e.g. anti-clockwise along the positive angular direction $+\Phi$). Subsequently, the container 10 may be decoupled from the base 44, by rotating the container body 12 further back over a decoupling angle $-\Delta\Phi 1$ (anti-clockwise). This reversible attachment mechanism ensures that the container 10 is automatically re-sealed, before it is removed from the trigger sprayer 40.

A method for preparing the system 1 for spraying operation comprises:

- holding the sprayer system 1 in an operational position wherein the bottle 60 is located substantially below the trigger sprayer 40;
- providing the container 10 comprising the outlet orifice 26, the reservoir 15 with liquid detergent 16, and the valve member 30 in the closed position 12;
- causing the container body 12 to engage the base 44, and letting the outlet orifice 26 approach the inlet orifice 46 along the nominal axis A1;
- rotating the container body 12 relative to the base 44 over a coupling angle $\Delta\Phi 1$ about the axis A1, to establish the coupled state;
- in the coupled state, further rotating the container body 12 relative to the base 44 over the actuation angle $\Delta\Phi 2$ about the axis A1, to transition the valve member 30 from the closed position to the open position;
- letting the liquid detergent 16 discharge from the reservoir 15 via the outlet orifice 26, and flow via the inlet orifice 46 and the internal conduits 52, into the storage chamber 62, to mix with the solvent liquid to form an aqueous liquid mixture 70.

Once prepared for spraying operation, the system 1 may be operated by actuating the pump mechanism 41, and generating a spray jet of a portion of aqueous liquid mixture 70 from the nozzle 42.

The method for preparing the system 1 may further comprise: filling the storage chamber 62 of the bottle 60 with solvent liquid (e.g. water), by supplying the solvent liquid through the inlet orifice 46, prior to providing the container 10 with liquid detergent 16. The storage chamber 62 may thus be filled to a selected volume.

After spraying operation, further steps for closing the valve 30 and removing the container 10 from the trigger sprayer 40 may be executed. The method may thus further comprise:

- In the coupled state, rotating the container body 12 relative to the base 44 over an inverse actuation angle $-\Delta\Phi 2$ about the axis A1, to cause the valve member 30 to transition from the open position back to the closed position;

- Rotating the container body 12 relative to the base 44 over a decoupling angle $-\Phi_1$ about the axis A1, to cause the container 10 and trigger sprayer 40 to transition from the coupled state back to the engaged state;

- Removing the container body 12 from the base 44 along the axis A1 (e.g. by translation) to cause the container 10 and trigger sprayer 40 to transition from the engaged state to the disengaged state.

Alternatively or in addition, similar steps may be executed prior to the preparing of the system 1 for spraying operation. For example, another container may initially be present on the trigger sprayer 40, and this other container needs to be re-sealed and removed before the above-mentioned preparations.

The present invention may be embodied in other specific forms without departing from its essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. It will be apparent to the person skilled in the art that alternative and equivalent embodiments of the invention can be conceived and reduced to practice. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

20 List of Reference Symbols

- | | |
|-------|--|
| 1 | sprayer system |
| 2 | container attachment region |
| 4 | gripping region |
| 6 | bottle attachment region |
| 25 10 | liquid detergent container |
| 12 | container body |
| 13 | container wall portion (e.g. lower container wall) |
| 14 | further container wall portion (e.g. upper container wall) |
| 15 | reservoir |
| 30 16 | liquid detergent |
| 18 | connector (e.g. male screw connector) |
| 20 | toroidal portion |
| 22 | first screw thread or flange |

- 24 first sealing member (e.g. conical sealing flange)
- 26 outlet orifice (container opening)
- 27 second sealing member (e.g. radially inward sealing flange)
- 28 screw recess
- 5 30 valve member
- 32 second screw thread or flange
- 34 further second sealing member (e.g. radially outwards sealing flange)
- 36 engagement member
- 38 engagement recess
- 10 40 trigger sprayer
- 41 pump mechanism
- 42 spray nozzle
- 43 trigger handle
- 44 base
- 15 45 base wall portion (e.g. upper trigger sprayer surface)
- 46 inlet orifice (e.g. upper fill opening)
- 48 further connector (e.g. female screw connector)
- 50 further engagement member (e.g. protrusion)
- 51 guide surface (e.g. inverted U-shape)
- 20 52 internal conduit (base conduit)
- 53 further internal conduit (air vent)
- 54 further orifice (e.g. lower discharge opening)
- 55 dip tube
- 56 further conduit (nozzle conduit)
- 25 58 bottle coupling (e.g. coupling aperture)
- 60 bottle
- 62 storage chamber
- 64 bottle orifice
- 65 alignment member
- 30 66 further bottle coupling (e.g. coupling tab)
- 70 liquid mixture (e.g. spray liquid)
- A1 rotation axis
- A2 long axis (e.g. long axis of container surface)

	A4	further long axis (e.g. long axis of sprayer surface)
	Z	axial direction
	R	radial direction
	Φ	angular direction (azimuthal direction)
5	ΔZ_c	container-trigger sprayer translation
	ΔZ_v	valve-container translation
	$\Delta \Phi_1$	first rotation angle (coupling angle)
	$\Delta \Phi_2$	second rotation angle (actuation angle)
	$\Delta \Phi_t$	combined angle ($\Delta \Phi_t = \Delta \Phi_1 + \Delta \Phi_2$)
10		

Claims

1. A sprayer system (1), comprising:
 - a liquid detergent container (10), adapted for connecting to a trigger sprayer (40), the liquid detergent container including a connector (18) and a container body (12) with a reservoir (15) and an outlet orifice (26);
 - a trigger sprayer (40) for generating a spray of aqueous liquid (70), the trigger sprayer including a further connector (48) and a base (44) with an inlet orifice (46); and
 - a bottle (60) that is connected to the base (44), and which encloses a storage chamber (62) for accommodating an aqueous liquid mixture (70);

wherein the connector (18) and the further connector (48) are adapted to be mutually attached to establish a liquid-tight passageway between the reservoir and the storage chamber via the inlet orifice and the outlet orifice;

wherein, the liquid detergent container (10) comprises:

 - a container body (12) enclosing a reservoir (15) for a liquid detergent (16), and including an outlet orifice (26) that extends through the container body between the reservoir and a region outside the container body;
 - a valve member (30), arranged at the outlet orifice, and adapted for transitioning between a closed position wherein the valve member seals the outlet orifice in a liquid-tight manner, and an open position wherein the liquid detergent is allowed to pass through the outlet orifice;
 - a connector (18), arranged on or in the container body at the outlet orifice, and adapted to cooperate with a further connector (48) at an inlet orifice (46) in the trigger sprayer, wherein the cooperation includes:
 - establishing a coupled state wherein the inlet and outlet orifices are fluidly coupled and translation of the container body relative to the trigger sprayer transverse to a nominal axis (A1) is essentially restricted;
 - in the coupled state, transitioning the valve member from the closed position to the open position and allowing the liquid detergent (16) to flow from the reservoir (15) via the inlet orifice into a storage chamber (62) of the trigger sprayer, when the container body is rotated relative to the trigger sprayer over a non-zero actuation angle ($\Delta\Phi 2$) about the nominal axis (A1);

wherein, the trigger sprayer (4) comprises:

- a nozzle (42) for discharging the spray of aqueous liquid;
- a pump mechanism (41) for conveying the aqueous liquid from a storage chamber (62) towards the nozzle;
- a handle (43) for actuating the pump mechanism, and
- a base (44) defining an inlet orifice (46), which is fluidly coupled to the storage chamber;

wherein the base includes a further connector (48) that is adapted to cooperate with a connector (18) and a valve member (30) in or on a liquid detergent container (10) in accordance with any one of claims 1 - 7, wherein the cooperation includes:

establishing a coupled state wherein the inlet orifice and outlet orifice are fluidly coupled and translational displacement of the container body relative to the trigger sprayer transverse to a nominal axis (A1) is essentially restricted, to establish a liquid-tight coupling between the reservoir (15) and the storage chamber (62) via the inlet orifice and the outlet orifice;

in the coupled state, transitioning the valve member from the closed position to the open position and allowing the liquid detergent (16) to flow from the reservoir (15) via the inlet orifice (46) into a storage chamber (62) of the trigger sprayer, if the container body is rotated relative to the trigger sprayer about the axis (A1) over a non-zero actuation angle ($\Delta\Phi_2$).

2. The sprayer system (1) according to claim 1, wherein the container body (12) defines a wall portion (13) that surrounds the outlet orifice (26) and the connector (18), wherein the trigger sprayer (40) defines a further wall portion (45) that surrounds the inlet orifice (46) and the further connector (48), and wherein the wall portion and further wall portion are adapted to abut and extend along each other, when the container (10) and the trigger sprayer are in the coupled state and the valve member (30) is in an opened position.

3. The sprayer system (1) according to claim 2, wherein the wall portion (13) of the container body (12) has an outer periphery with an elongate shape that defines a long axis (A2) in a plane perpendicular to the axis (A1), and wherein the further wall portion (45) of the trigger sprayer (40) has an outer periphery with an elongate shape that defines a further long axis (A4), and wherein the long axes (A2, A4) are aligned when

the container and trigger sprayer are in the coupled state and the valve member (30) is in the open position.

4. The sprayer system (1) according to any one of claims 1 to 3, wherein the base (44) of the trigger sprayer (40) is fixed to the bottle (60) in a liquid-tight manner, wherein the reservoir (15) in the container (10) and the storage chamber (62) in the bottle are in fluid communication when the container, the trigger sprayer, and the bottle are in the coupled state and the valve member (30) is in the open position.

5. The sprayer system (1) according to any one of claims 1 to 4, wherein the cooperation between the connector (18) and the further connector (48) includes:

fixing the container body (12) to the trigger sprayer (40) to establish the coupled state, when the container body (12) is rotated relative to the trigger sprayer about the nominal axis (A1) over a non-zero coupling angle ($\Delta\Phi 1$), prior to being rotated over the actuation angle ($\Delta\Phi 2$).

6. The sprayer system (1) according to any one of claims 1 to 5, wherein the valve member (30) is movably coupled to the container body (12) via a screw connection (28, 32), which is adapted to cause the valve member to rotate relative to the container body about the axis (A1) and to translate relative to the container body over a distance (ΔZ_v) along the axis (A1) to transition from the closed position to the open position, when the container body (12) is rotated relative to the trigger sprayer over the actuation angle ($\Delta\Phi 2$).

7. The sprayer system (1) according to any one of claims 1 to 6, wherein the connector (18) and further connector (48) allow rotation of the container body (12) relative to the trigger sprayer (40) over the coupling angle ($\Delta\Phi 1$) with a value substantially equal to 90° to establish the coupled state, and/or wherein the connector (18) and further connector (48) allow rotation of the container body relative to the valve member (30) over the actuation angle ($\Delta\Phi 2$) with a value substantially equal to 180° to move the valve member from the closed position to the open position.

8. The sprayer system (1) according to any one of claims 1 to 7, wherein the connector (18) includes a substantially toroidal portion (22), which surrounds the outlet orifice (26) and the valve member (30), and which protrudes outwards from the container (12) with a component along the nominal axis (A1), wherein the connector (18) preferably includes a screw thread or flange (22), which extends around the toroidal portion and allows rotation of the container body (12) relative to the trigger sprayer over a combined angle ($\Delta\Phi_t$) that includes at least the coupling angle ($\Delta\Phi_1$) and the actuation angle ($\Delta\Phi_2$).

9. The sprayer system (1) according to any one of claims 1 to 8, wherein the valve member (30) includes an engagement member (36, 38) for interlocking with a further engagement member (50) provided on or in the trigger sprayer (40), to prevent further rotation of the valve member relative to the trigger sprayer when the container and trigger sprayer are in the coupled state.

10. The sprayer system (1) according to any one of claims 1 to 9, wherein the reservoir (15) is at least partially filled with the liquid detergent (16).

11. The sprayer system (1) according to any one of claims 1 to 10, wherein the base (44) is mechanically connectable to a bottle (60), which encloses the storage chamber (62) for accommodating the aqueous liquid (70), and wherein the inlet orifice (46) is fluidly coupled to the storage chamber when the trigger sprayer (40) and the bottle (60) are mechanically connected.

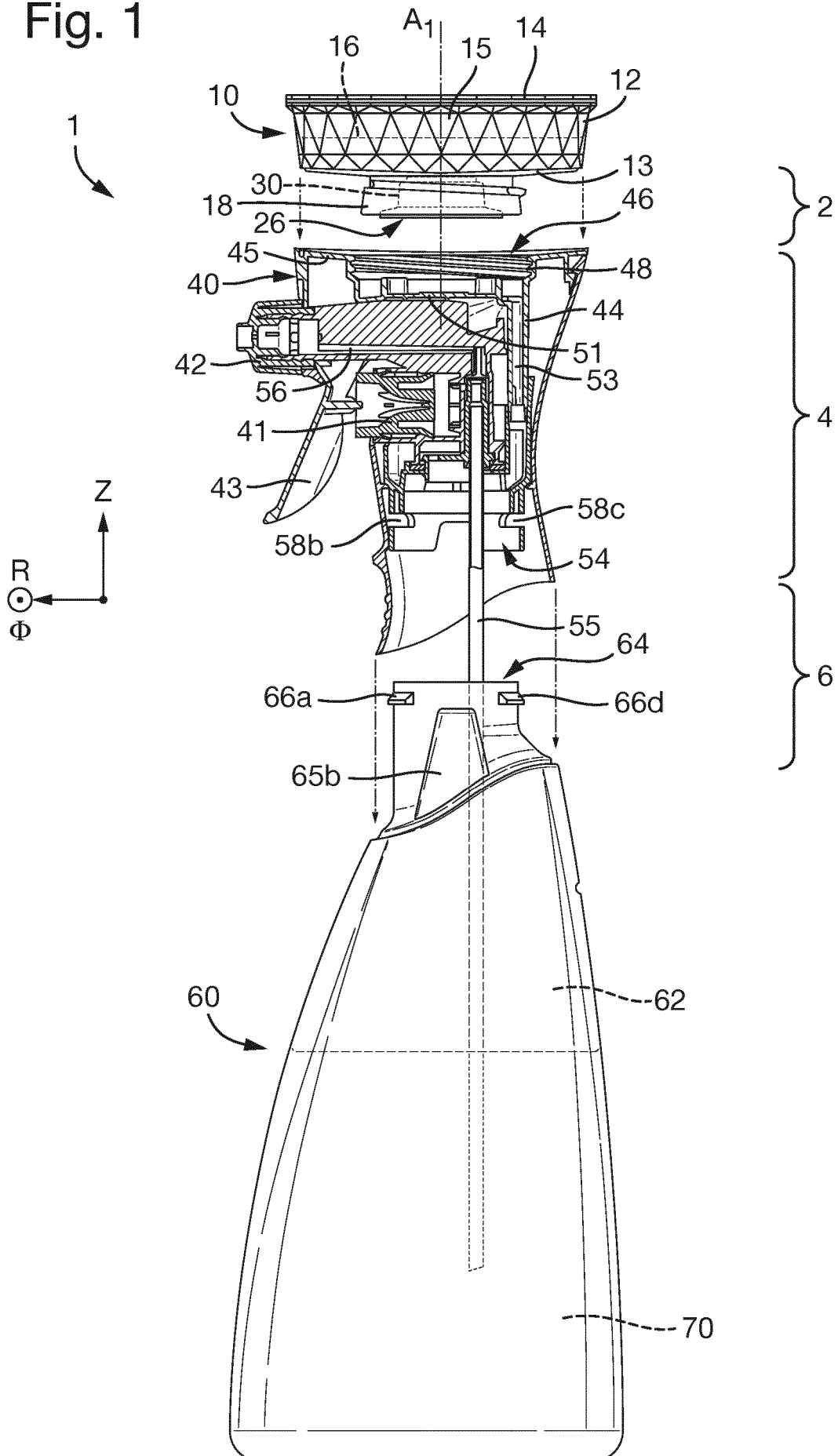
12. The sprayer system (1) according to claim 11, wherein the inlet orifice (46) opens into a wall portion (45) of the base (44) that faces substantially upwards during operation, and wherein the storage chamber (62) is located on a side of the base (44) that is substantially opposite to the base wall portion.

13. The sprayer system (1) according to any one of claims 1 to 12, wherein the further connector (48) is provided at or near the inlet orifice (46), and comprises a further screw thread or recess that is adapted to cooperate with the connector (18) in or on the liquid detergent container (10), to allow rotation of the container body (12)

relative to the trigger sprayer over a combined angle ($\Delta\Phi_t$) that includes at least the coupling angle ($\Delta\Phi_1$) and the actuation angle ($\Delta\Phi_2$).

1/6

Fig. 1



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Fig. 2

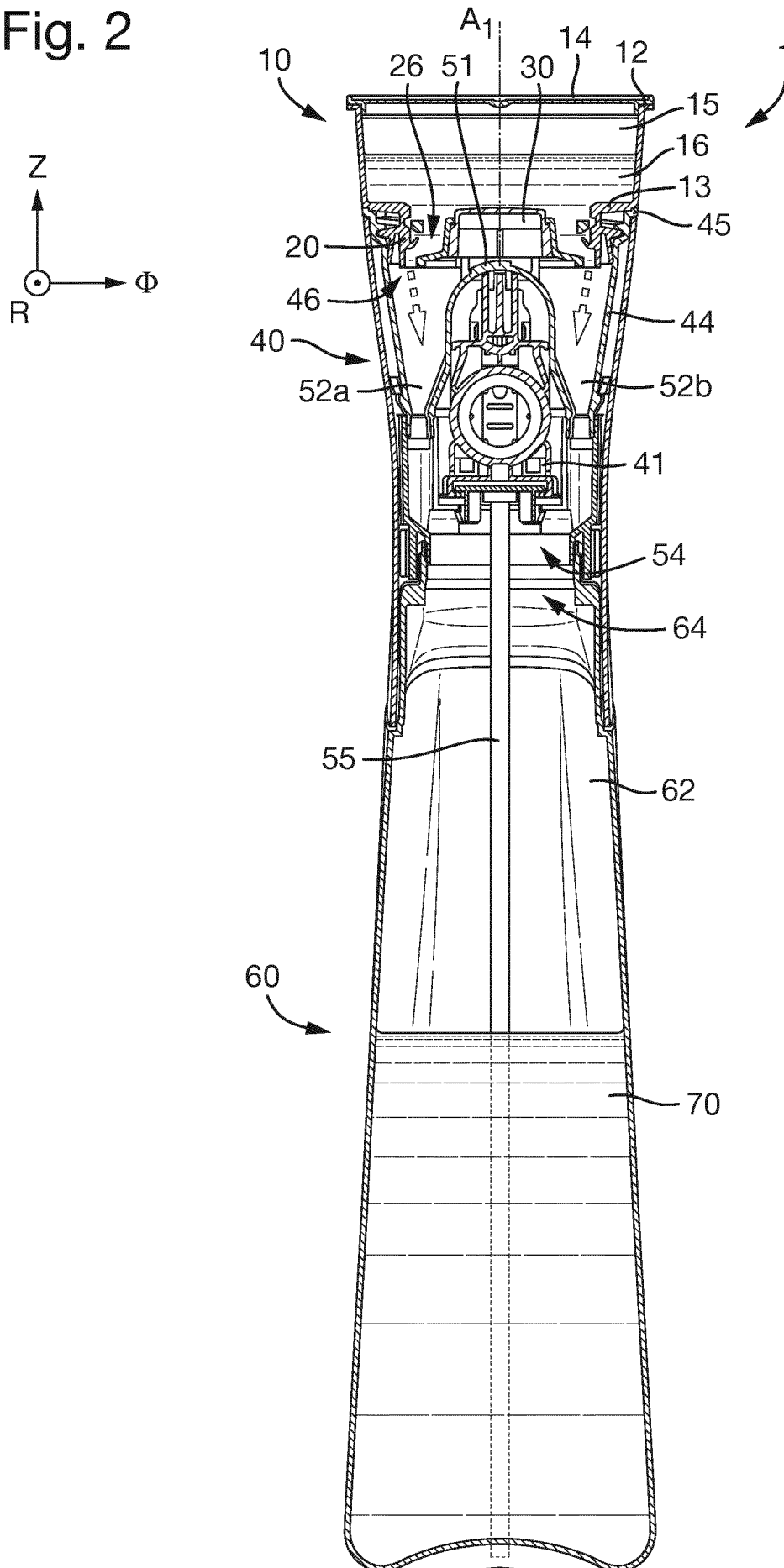


Fig. 3a

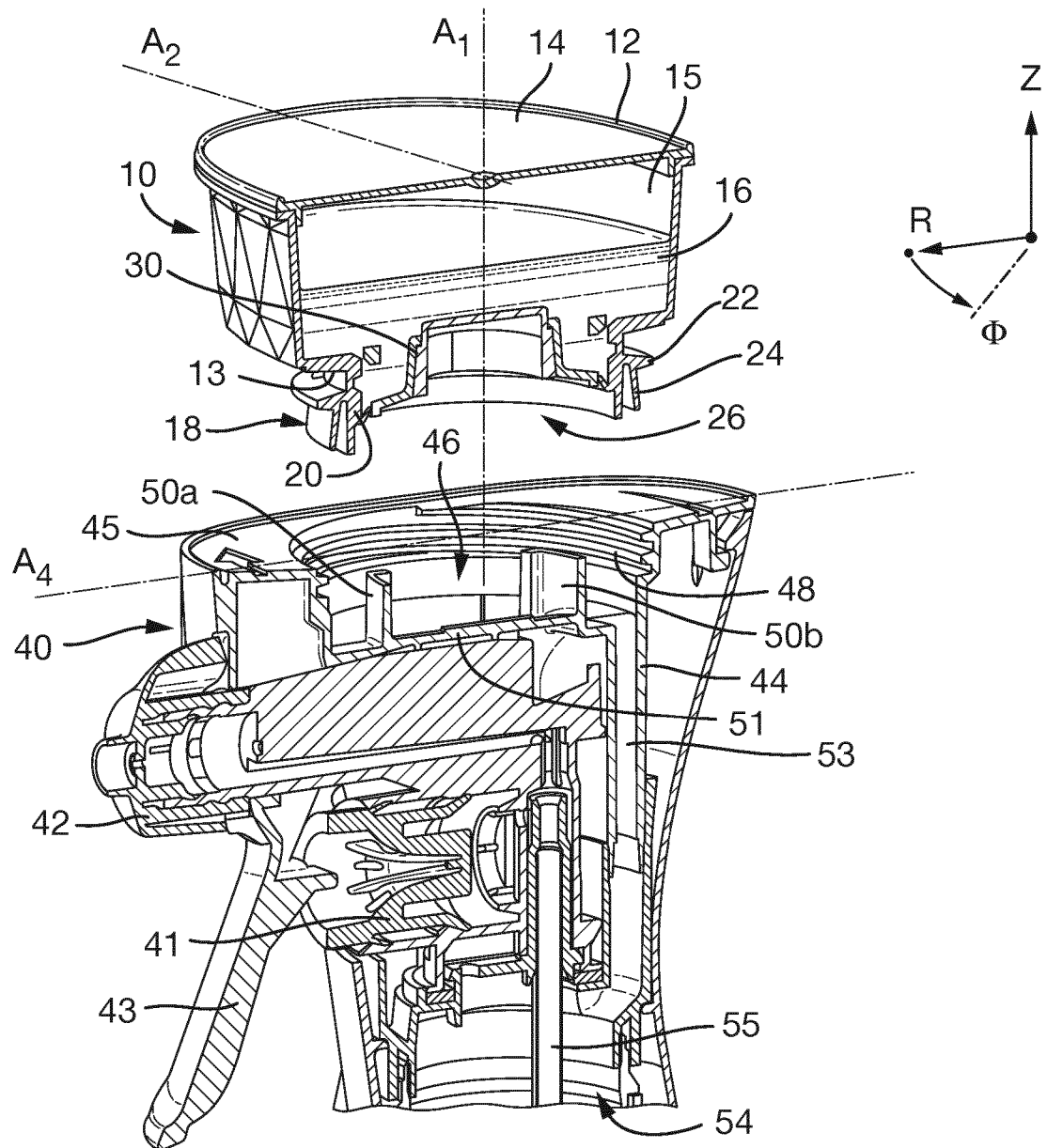


Fig. 3b

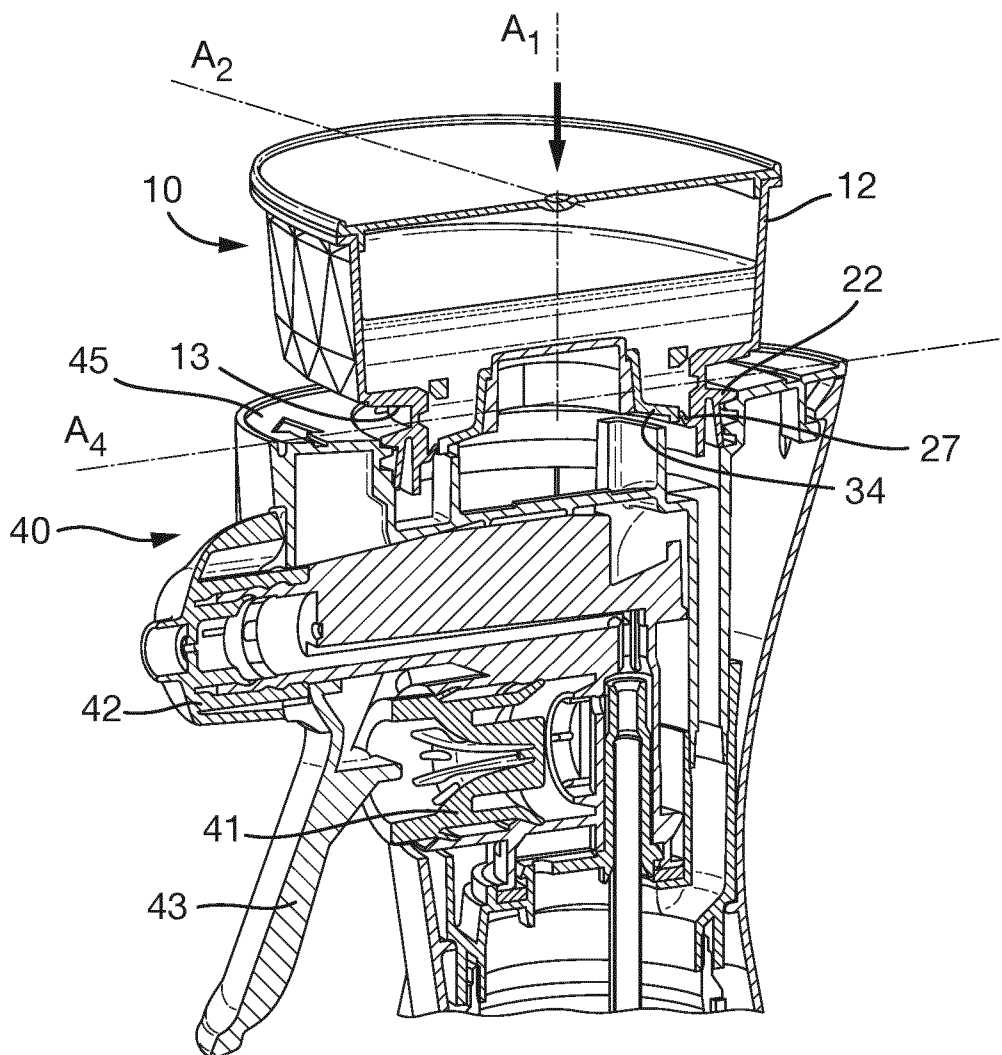


Fig. 3c

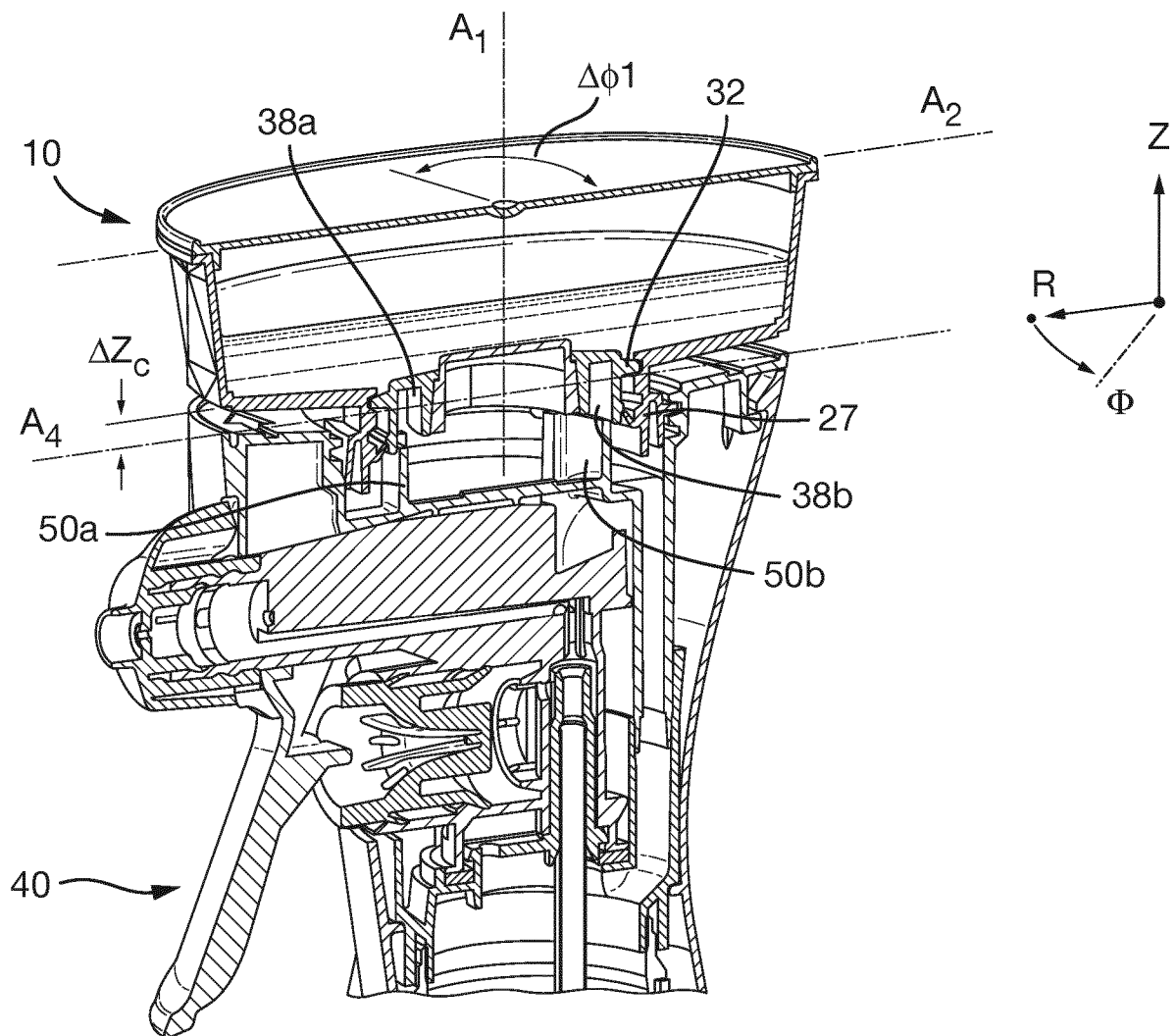
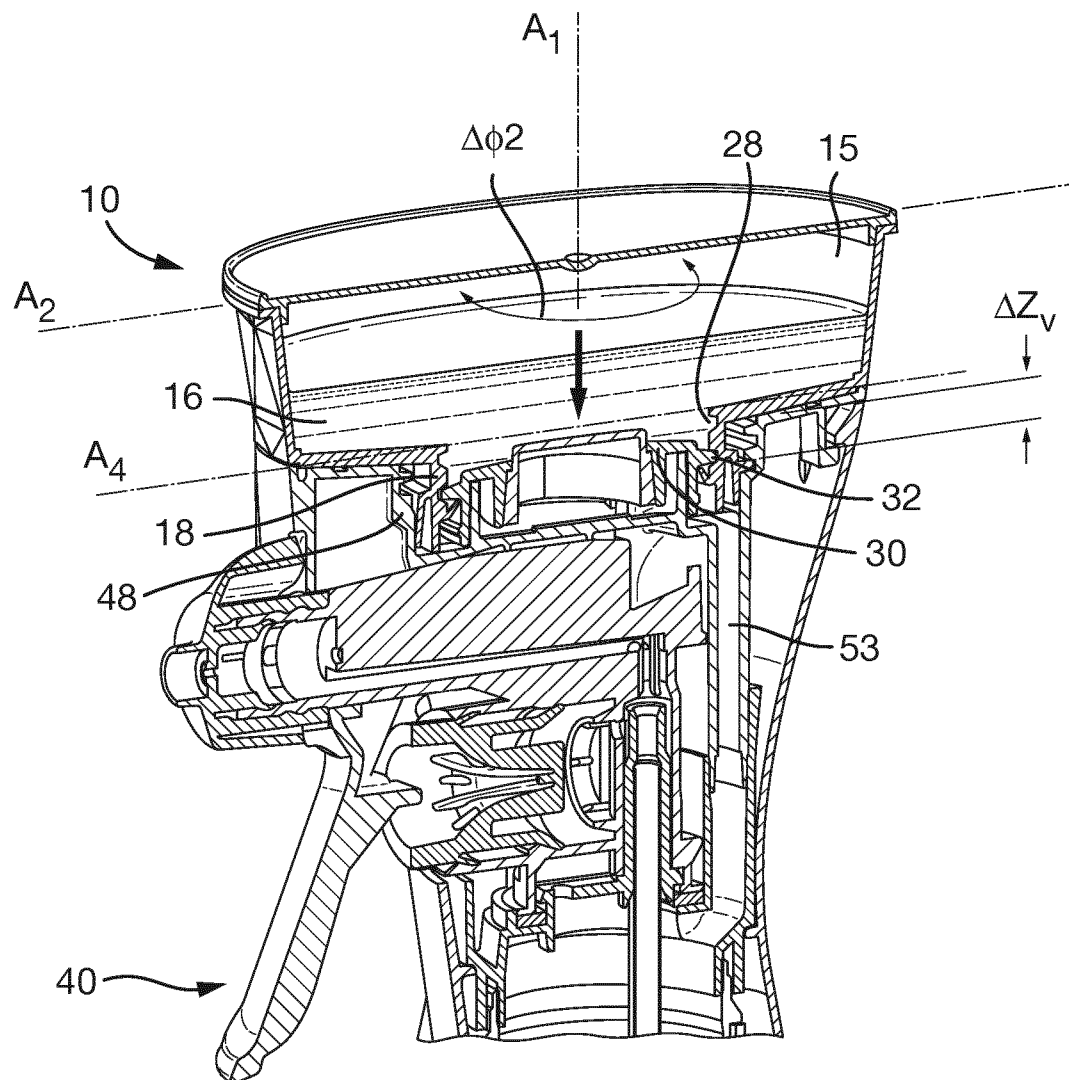


Fig. 3d



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/058963

A. CLASSIFICATION OF SUBJECT MATTER
INV. B05B11/00 B65D81/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B05B B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2009/178940 A1 (SAID JOSE E [US]) 16 July 2009 (2009-07-16) paragraph [0029] - paragraph [0038]; figures	5-10
A	WO 2008/071005 A1 (MARC ANTHONY VENTURE CORP [CA]; LIBERTY JONATHAN D [CA]; DICKIE ROBERT) 19 June 2008 (2008-06-19) page 5, line 17 - page 10, line 24; figures	5-10
A	US 2008/314928 A1 (BANCO MICHAEL J [US] ET AL) 25 December 2008 (2008-12-25) paragraph [0036] - paragraph [0041]; figures	1-4, 11-13
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

1 June 2018

Date of mailing of the international search report

19/06/2018

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/058963

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2014/189994 A2 (JOHNSON & SON INC S C [US]) 27 November 2014 (2014-11-27) paragraph [0081] - paragraph [0106]; figures -----	1-4, 11-13
A	WO 2015/188129 A2 (JOHNSON & SON INC S C [US]) 10 December 2015 (2015-12-10) cited in the application abstract -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/058963

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