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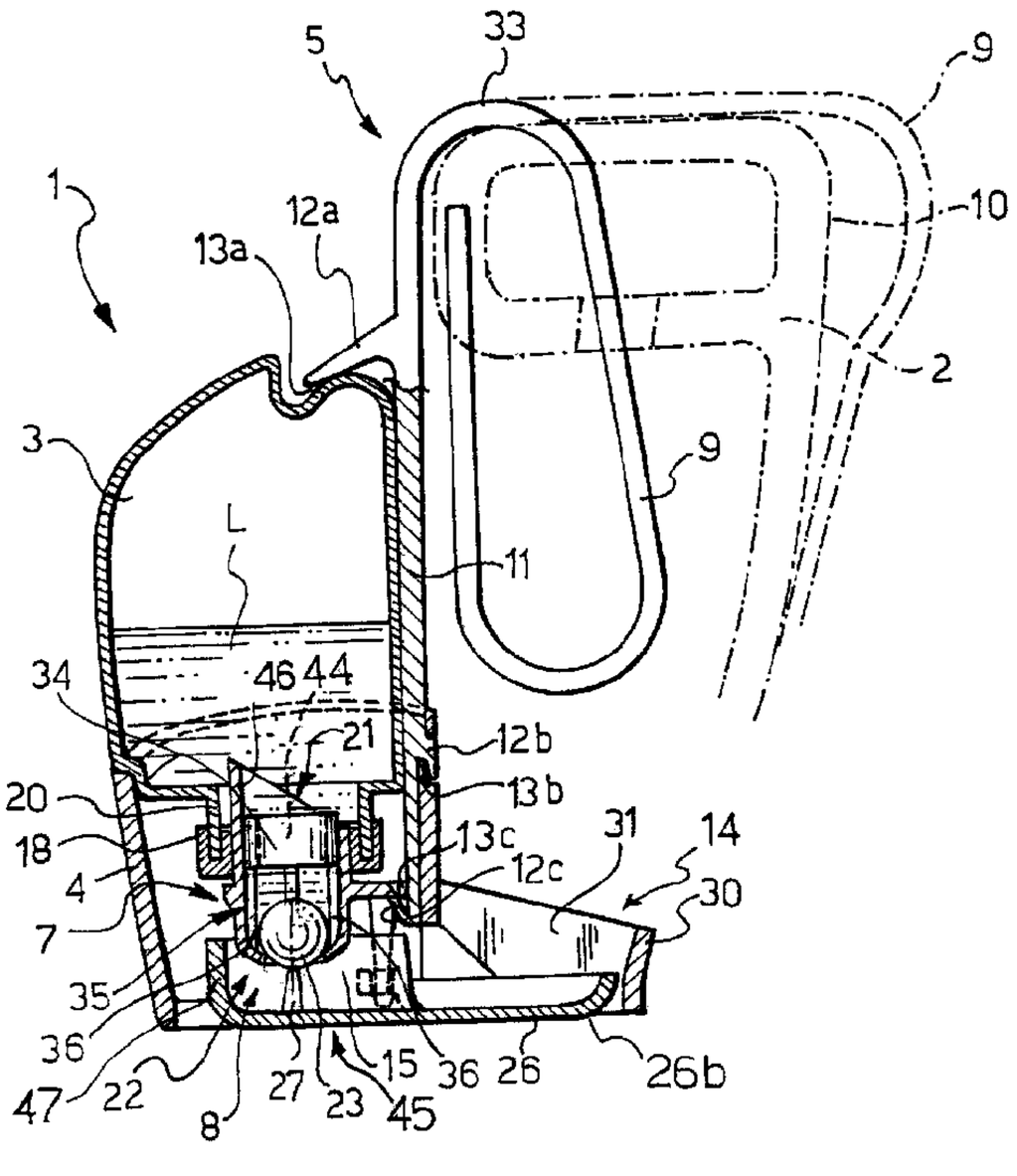
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(71) Demandeur/Applicant:
DEOFLOR S.P.A., IT

(72) Inventeurs/Inventors:
GAZZANIGA, GIANCARLO, IT;
GUENZI, GIAN LUCA, IT

(74) Agent: OYEN WIGGS GREEN & MUTALA

(54) Titre : SYSTEME ET PROCEDE D'APPORT DE COMPOSITION LIQUIDE DANS UNE CHASSE D'EAU
(54) Title: SYSTEM AND METHOD FOR DELIVERING A LIQUID COMPOSITION INSIDE A TOILET BOWL



(57) Abrégé/Abstract:
A system (1) for delivering a liquid composition (L) inside a toilet bowl (2) is described, which comprises: a) a container (3) of the active substance closed in a substantially air-tight manner and wherein said liquid composition (L) is subjected to a predetermined pressure; b) valve means (7) for delivering dosed amounts of said active substance comprising: a valve body (16) wherein a metering chamber (24) of the liquid composition (L) is defined; a shutter (23) displaceable in the metering chamber (24); an opening device (14) cooperating with the shutter (23), and being provided with deflecting means (45) for directing part of the flushing water towards and into the metering chamber (24) opening (8) of the liquid composition (L) and into the metering chamber (24). Advantageously, the system (1) according to the invention allows to deliver dosed and constant amounts of liquid composition (L) at each water flushing independently of both the amount of liquid composition (L) provided in the container (3) and of the frequency of the flushing operations.

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(71) Applicant *(for all designated States except US)*: **DEOFLOR S.P.A.** [IT/IT]; Via Vespolate, 48, I-27030 Confienza (IT).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **GAZZANIGA, Giancarlo** [IT/IT]; Via delle Terme n.3, I-27030 Salice Terme (IT). **GUENZI, Gian, Luca** [IT/IT]; Via del Commercio n.11, I-27038 Robbio Lomellina (IT).

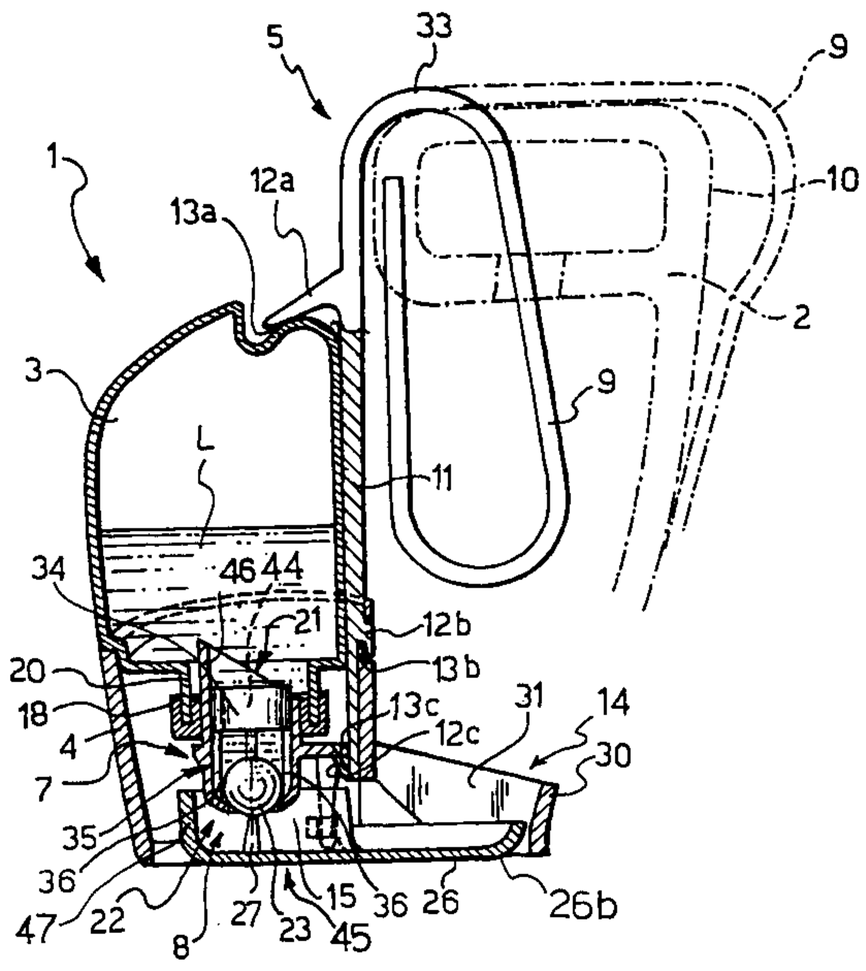
(74) Agents: **BOTTERO, Claudio** et al.; Porta, Checcacci & Associati S.p.A., Viale Sabotino, 19/2, I-20135 Milano (IT).

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(54) Title: SYSTEM AND METHOD FOR DELIVERING A LIQUID COMPOSITION INSIDE A TOILET BOWL



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Title: System and method for delivering a liquid composition inside a toilet bowl

DESCRIPTION

Background of the invention

According to a general aspect thereof, the present invention relates to a system for delivering a liquid composition inside a toilet bowl.

Further, the present invention relates to a method and a kit of parts for delivering a liquid composition inside a toilet bowl, as well as to a liquid composition for use within a toilet bowl.

In the following description and in the subsequent claims the expression "liquid composition" is used to indicate a composition having cleaning and/or descaling properties and/or bactericidal and/or perfuming activity as a function of the active ingredients contained therein.

Prior art

As is known, in the field of systems for delivering cleaning/freshening substances in liquid form inside a toilet bowl, the need has always been felt of delivering at each water flushing a constant amount of liquid substance independently of the amount of liquid present in the container when the flushing occurs and of the frequency of the flushing operations.

In order to comply with the aforesaid need, it has been suggested, as disclosed in US 3,946,448 (Sioufy), the use of an apparatus intended for the disinfection and chemical purification of toilet bowls comprising a storage container spaced from the bowl and containing a disinfecting and purifying liquid, a valve capsule mounted in the cavity of the bowl edge near the discharge opening of the water into the bowl, and fluid conveying means for feeding a disinfecting and purifying liquid into the valve capsule.

According to this patent, the valve capsule consists of a check valve comprising a shutter operated by a flap against the bias of spring means. The flap is actuated by the flush flow so as to open the check valve under the pressure of the incoming water. When the flushing is terminated, the spring means closes the check valve so as to stop the liquid delivering.

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Notably, the valve capsule is in fluid communication with the outer environment so that the disinfecting and purifying liquid is subjected to ambient pressure and is delivered from the valve capsule by gravity, while new liquid is continuously fed to the valve capsule from the storage container which is preferably arranged at a higher level for gravity flow of the liquid.

Another system for delivering a cleaning/purifying substance in liquid form inside a toilet bowl comprising a storage container of a disinfecting and purifying liquid which is provided with a check valve is also disclosed by German patent application DE 25 32 963. In this case, the storage container is mounted upstream of the toilet bowl aside of a conduit for conveying the flushing water towards the bowl.

A lever actuated by the flushing water flowing in this conduit operates a spherical shutter so as to open a lower discharge opening of a metering chamber defined within a cast body of the check valve. In operation and due to the closed nature of the system downstream of the check valve, a simultaneous sucking action of the flushing water (Venturi effect) flowing aside of the storage container and acting on the lever withdraws a dosed amount of liquid from the metering chamber. The liquid sucked in this way is then admixed with the water in the conduit before reaching the toilet bowl.

A similar system for delivering a conditioning substance in liquid form inside a toilet bowl comprising a storage container of a conditioning liquid which is provided with a check valve is also disclosed by German Utility Model DE 299 02 066. In this system as well, a lever actuated by the flushing water operates a spherical shutter so as to open a lower discharge opening of a metering chamber extending from the bottom portion of the storage container. In operation a dosed amount of conditioning liquid is discharged from the metering chamber into the flushing water and mixes with the same so as to condition the toilet bowl.

Although the delivering devices disclosed by the aforementioned documents may be capable of discharging dosed amounts of liquid into the bowl, they are mechanically complex and require a special design of the lavatory bowl and of the discharge system of the flushing water, which render these devices costly and usable only with a specifically designed lavatory system.

In order to address the need of delivering cleaning/freshening substances in liquid form inside a toilet bowl while avoiding suck drawbacks, it was then proposed in the art - as disclosed for instance by European patent application EP 0 538 957 - to use delivering

devices capable to be suspended from the rim of the toilet bowl and comprising a container of the liquid substance closed in a substantially air-tight manner, a supporting structure for the container and means of the so-called blotter type for delivering dosed amounts of said liquid substance.

Although the delivering devices disclosed by this latter document aims at discharging dosed amounts of liquid into the bowl, the reproducibility of such discharges may be affected by a pressure decrease which ensues within the storage container of the liquid. Such a decrease is mainly due to the difficulty of introducing into the storage container

of the liquid and through the delivering means of the liquid substance, a volume of ambient air suitable to replace the volume of liquid which has been discharged into the toilet bowl by the device.

This phenomenon limits the draining of the storage container and may lead to a reduced release of liquid per unit of time and, in some cases, to a complete block of the liquid delivery.

In order to solve this drawback, European Patent Application EP 0 785 315 discloses a device intended for suspension from a rim of a toilet bowl, comprising a container containing a cleaning and perfuming liquid substance and closed in a substantially air-tight manner, a supporting structure and a porous mass, supported in said structure and in constant fluid communication with the container of the substance itself, which device is provided with a specially designed delivering means which allows to introduce ambient air into the liquid container.

More particularly, the delivering means of the liquid comprises at least one liquid passage opening and at least one air supply opening communicating with the ambient pressure, which openings have a size so adjusted with respect to each other and to the viscosity of the liquid contained in the container, so that the liquid pressure on the porous mass is always substantially equal and independent of the liquid level in the container.

However, the design of such a device is quite complicated, especially as to the portion wherein the openings for the liquid passage outside of the container and the air supply inside the container are provided. Additionally, and in view of the fact that the delivering system of such device essentially operates due to an absorption mechanism, a series of drawbacks which could compromise its correct operation may occur during use of the same.

If, for instance, the water flushes are very frequent, it may occur that the liquid substance absorbed by the porous mass between a flushing and the following one does not saturate the porous mass itself thus being unable to stop the substance flow from the container towards the mass itself.

In this way, the amount of liquid absorbed by the porous mass and released to the flushing water, is lower than the amount which would be attained in case of saturation of the porous mass. In this condition, furthermore, the flow of liquid substance from the container towards the porous mass is not stopped, so that an excessive use of liquid

substance occurs, which causes in turn a decrease of the service life of the device.

On the contrary, if the water flushes are pretty unfrequent, a partial drying of the liquid substance absorbed in the porous mass may occur, with the formation of a dry residue that hampers a correct delivering of the liquid substance itself during the flushing operations. Specifically, the delivery of amounts of liquid substance, which are smaller than the predetermined ones or, in extreme cases, a substantial block of the liquid delivery, may occur.

A similar drawback may occur in case of a hard and/or iron-containing flushing water, since the porous mass may build up scale deposits with the ensuing delivery of reduced amounts of liquid substance.

Lastly, it is possible that upon flushing part of the water penetrates inside the container of the liquid substance, causing an undesired dilution of the same. In this case, it is possible that the diluted liquid substance, besides flowing towards the porous mass through the passage ducts, may also flow through the air outlets, phenomenon which was previously prevented by the viscosity and vapor pressure properties of the undiluted liquid substance, so that the correct operation of the device may be jeopardized.

Summary of the invention

The technical problem underlying the present invention is therefore that of providing a system for delivering metered amounts of a liquid composition inside a toilet bowl which may be suspended from the rim of the toilet bowl and which is capable of effectively preventing the formation of a reduced pressure within the container of the liquid, thus ensuring the delivery of dosed amounts of liquid composition independently of the amount of liquid composition present in the system and of the frequency of the flushing operations.

According to the present invention, the aforesaid technical problem is solved by a system for delivering a liquid composition in a toilet bowl as defined in attached claim 1.

Thanks to these combination of features, the delivering system of the invention is advantageously capable by means of a suitably shaped valve means to ensure the delivery of dosed amounts of liquid composition at each water flushing independently of both the amount of liquid provided in the container and of the frequency of the flushing operations.

Most surprisingly, in fact, the Applicant has observed that the pressure within the container and in the free space above the liquid level may be effectively restored after each liquid delivery, by providing the opening device of the valve means with deflecting means which are capable of directing part of the flushing water towards the delivering opening of the liquid composition so as to effectively wash away the latter from a metering chamber of the valve means itself and allow the intake of fresh air from the outside environment.

In this way and without recurring to any complicated mechanical means of introducing ambient air into said free space, the valve means of the invention advantageously allows, once the desired dosed amount of the liquid composition has been washed away from the metering chamber, to introduce into the system and during the return stroke of the shutter which closes the metering chamber a quantity of ambient air sufficient to prevent the formation of a reduced pressure within the liquid container.

Most advantageously, furthermore, the delivery of dosed amounts of liquid composition at each water flushing may be ensured by the system of the invention even in wholly open operating environment.

Preferably, the system of the invention is provided with valve means comprising a valve body defined at a lower portion of a tubular element vertically extending in the supporting structure of the container and adapted to be longitudinally inserted for a portion of predetermined length inside said container itself.

Preferably, the container of the liquid composition is releasably associated to the supporting structure. In this way, it is advantageously possible to recharge the device by only replacing the container of the liquid composition, with evident advantages of usefulness and cost reduction with respect to the case where it is necessary to replace the device as a whole.

Preferably, furthermore, the container of the liquid composition is made of a transparent material, in such a way as to allow the user to constantly detect the level of liquid composition contained therein and to provide for the recharge of the system when this is totally empty.

Preferably, the container is provided in its lower part with an opening coaxially provided with a breakable closure membrane and is removably associated to the supporting structure by engaging the tubular element into the opening of the container with interposition of said membrane.

In this way, during the storage of the container, the breakable membrane acts as a closure member of the container preventing the outflow of the liquid composition, whereas, during use, the membrane acts as a gasket preventing leaks of liquid composition at the contact area between the tubular element and the opening of the container, once the container is associated to its supporting structure.

Preferably, the opening of the container is formed at one end of a substantially cylindrical neck extending from the container and the tubular element may be longitudinally inserted up to a predetermined extent inside said neck. In this way, the engagement of the tubular element in the container opening is made more stable reducing to the minimum the risk of accidental displacements.

Preferably, the tubular element is cantilevered from the supporting structure and is provided with an essentially beveled free end.

Thanks to this feature, it is advantageously possible to easily break the closure membrane of the container when the container is associated to its supporting structure.

Conveniently, the supporting structure of the container is associated to hooking means for supporting the container/ supporting structure assembly inside the toilet bowl.

Preferably, the valve means essentially consists of a ball valve including a substantially spherical shutter displaceable within the metering chamber between the upper and lower openings thereof, i.e. between a first position wherein it closes the lower delivering opening of the liquid composition and a second position wherein it opens said opening and closes in turn the upper opening of the metering chamber provided for establishing the fluid communication with the air-tight closed container.

According to the invention, the upper and lower openings of the metering chamber constitute respective upper and lower valve seats against which the shutter abuts at the end of its ascending or descending stroke as the case may be.

Advantageously, the alternate displacement of the shutter inside the metering chamber between the upper and lower openings thereof, allows both to store in the aforesaid chamber dosed amounts of liquid composition to be delivered and to permit ambient air to enter the system reaching the air-tight closed container via the metering chamber.

Preferably, the upper opening of the metering chamber is axially defined within an annular sealing ring associated to an inner wall of the valve body. Thanks to this feature,

when the shutter opens the lower delivering opening of the metering chamber and abuts against the annular sealing ring, the liquid composition previously stored within the metering chamber may be released and effectively washed away by the flushing water which enters the metering chamber, while preventing the flushing water from entering the container and diluting the liquid contained therein.

Preferably, the opening device of the valve means comprises a plate rotatably mounted under the supporting structure and provided with an actuator, cantilevered therefrom and adapted to cooperate with the shutter of the valve means.

More preferably, the plate is rotatably mounted on the supporting structure by engagement of two pivoting arms downwardly extending from said structure in respective slots, which are laterally formed at opposite parts of said plate. In this way, the plate is bound to the supporting structure and acts on the valve means according to a first-class lever mechanism.

In a preferred embodiment of the invention, the deflecting means provided in the system for directing part of the flushing water towards the delivering opening of the liquid composition and into the metering chamber advantageously comprises the aforementioned plate of the opening device.

In this way, it is advantageously possible to carry out with one and the same element, i.e. the plate itself, the twofold function of operating the valve shutter and of directing part the flushing water towards the metering chamber for rinsing the same and washing out the liquid stored therein.

Still more preferably, furthermore, the deflecting means conveniently comprises a lateral wall extending from a rear edge of the plate which effectively contributes to direct the flushing water into the metering chamber.

Preferably, the metering chamber is internally provided with means adapted to guide the displacement of the shutter in the metering chamber. Still more preferably, said means comprises a plurality of longitudinal ribs angularly spaced from each other preferably at right angles.

Advantageously, this guiding means allows to achieve a substantially rectilinear displacement of the spherical shutter in the metering chamber along a direction which is essentially perpendicular to the plane of the upper and lower openings of the metering chamber (upper and lower valve seats). In this way, the spherical shutter may be

correctly positioned in abutting relationship in the upper valve seat irrespective of any side forces to which the shutter may be subjected both because of the turbulence of the flushing water entering and rinsing the metering chamber and of the radial movement of the opening device.

Advantageously, the spherical shutter may be correctly positioned in abutting relationship in the lower valve seat also when the flow of the flushing water ceases: in this case the guiding means properly directs the displacement of the spherical shutter into the lower valve seat, allowing at the same time fresh air to enter the gap defined between the shutter and the walls of the tubular element and to reach therefrom the free space defined in the container after crossing the liquid composition stored therein.

Thanks to these features, therefore, an air supply into the container may advantageously be attained without providing the system with a further opening intended for the air, as disclosed by EP 0 785 315.

Preferably, the delivering system further comprises a protection wall, cantilevered from the supporting structure and surrounding the plate. In this way, it is advantageously possible to prevent that, as a consequence of any displacement of the delivering system, the plate may impinge against the inner wall of the bowl, damaging and/or blocking itself.

Preferably, the delivering system according to the present invention further comprises stop means for limiting the stroke of the plate and extending from the protection wall to the supporting structure. Such stop means, furthermore, advantageously allows both to direct the water flow onto the plate, thereby reducing its impact force, and to stiffen the supporting structure.

According to a preferred embodiment, the liquid composition of the system of the invention comprises the following ingredients:

a) from 10 to 60% by weight of a suitable surfactant,

b) from 2 to 25% by weight of at least one volatile substance adapted to evaporate at room temperature from the liquid composition,

c) from 1 to 25% by weight of at least one perfuming substance, and

d) balance solvent.

According to the experimental tests carried out by the Applicant, it has been observed that the pressure within the container and in the free space above the liquid level may be restored in an even more effective manner after each liquid delivery, thanks to the evaporation of part of the volatile substance adapted to evaporate at room temperature from the liquid composition.

Advantageously, the evaporation of the volatile substance effectively contributes to restore the pressure in the container after each delivery of the liquid composition and advantageously sums its effects to the mechanism of air introduction into the container via the valve means of the system illustrated hereinabove.

Advantageously, furthermore, the evaporation of the volatile substance takes place automatically up to the extent necessary to restore above the liquid level the vapor pressure value of the substance which is in equilibrium with the liquid at the temperature conditions of use.

Additionally, the evaporation of the volatile substance is self-regulating, i.e. may occur to a greater or lesser extent as a function of the amount of air which is capable to reach the free space above the liquid level via the valve means provided for delivering the liquid composition.

In this way, the volume decrease of the liquid composition, due to the delivery of a dosed amount thereof, may be effectively and rapidly compensated by evaporation of the volatile substance even if a small amount of ambient air is able to enter the container through the valve means. As said above, in fact, the evaporation of the volatile substance continues until the pressure level above the liquid is restored substantially to the initial value.

Additionally, the Applicant has found that once the chemical-physical properties of the liquid composition are set, it is advantageously possible to deliver dosed amounts of the liquid composition which are substantially constant in time.

For the purposes of the invention, the liquid composition comprises from 10 to 60% by weight and, more preferably, from 12 to 50% by weight of a suitable surfactant.

Preferably, the surfactant is selected from the group comprising anionic, non-ionic and amphoteric surfactants, and mixtures thereof.

For the purposes of the invention, the anionic surfactant, or primary surfactant, is

preferably selected from the group comprising: dodecylbenzenesulfonic acid and salts thereof, ethoxylated and/or sulfated fatty alcohols, C8-C16 sodium alkylsarcosinates, C8-C16 sodium alkylsulfosuccinates, and mixtures thereof.

Advantageously, the anionic surfactant produces a voluminous foam and is preferably contained in the liquid composition in an amount comprised between 0.5 and 50% by weight and, more preferably, between 15 and 40% by weight.

For the purposes of the invention, the non-ionic surfactant is preferably selected from the group comprising: amides, coconut diethanolamide, ethoxylated and propoxylated fatty alcohols, and mixtures thereof.

Advantageously, the non-ionic surfactant boosts the foam and renders the same long lasting and is preferably contained in the liquid composition in an amount comprised between 0 and 15% by weight and, more preferably, between 1 and 10% by weight.

For the purposes of the invention, the amphoteric surfactant is preferably selected from the group comprising: alkylamidopropyl betaine, alkylamidopropyl oxide, and mixtures thereof.

Advantageously, the amphoteric surfactant boosts the foam and makes the foam persistent in particular pH conditions and is preferably contained in the liquid composition in an amount comprised between 0 and 15% by weight and, more preferably, between 1 and 10% by weight.

In a preferred embodiment of the invention, the liquid composition includes anionic, non-ionic and amphoteric surfactants within the aforementioned lower and upper limits and in proportions which may be easily determined by those skilled in the art as a function of the characteristics of the means for delivering the liquid composition.

For the purposes of the invention, the volatile substance adapted to evaporate at room temperature from the liquid composition and which contributes to restore the pressure within the container of the liquid composition after each delivering thereof, may be selected among any substance compatible with the other ingredients of the composition and having a sufficient vapor pressure at room temperature.

For the purposes of the invention, the volatile substance is contained in the liquid composition in an amount comprised between 2 and 25% by weight and, more preferably, between 2 and 15% by weight.

Preferably, the volatile substance is water soluble and has a vapor pressure at room temperature comprised between 2000 and 13500 Pa (15-100 mmHg) and, still more preferably, between 2600 to 8000 Pa (20-60mmHg).

Preferably, the volatile substance is selected from the group comprising: C1-C4 alcohols, ethers of C1-C4 alcohols, glycol ethers, and mixtures thereof.

Preferred examples are ethyl alcohol, isopropyl alcohol and bis-propyl methyl ether.

Advantageously, such volatile substances have the further function of adjusting the viscosity of the liquid composition, which enables to improve the liquid rheologic properties.

For the purposes of the invention, the liquid composition further comprises from 1 to 25% by weight and, preferably, from 2 to 12% by weight of a suitable perfuming substance.

For the purposes of the invention, the solvent of most preferred use is water although other solvent systems, such as mixtures of water and one of the volatile substances mentioned hereinabove may also be used. Clearly, in this latter case the composition of the solvent system should be properly balanced so as to provide the required amounts of volatile substance and water to the liquid composition.

Conveniently, both the perfuming substance and the solvent may evaporate to some extent at room temperature and may contribute to the restoration of the pressure within the container after each liquid delivery exerted by the entry of fresh ambient air via the valve means and optionally by evaporation of the volatile substance.

Preferably, the liquid composition further comprises a viscosity regulator selected from the group comprising: glycols, glycol ethers, and mixtures thereof.

Among them, viscosity regulators of preferred use are ethylene glycol, propylene glycol and mixtures thereof.

Advantageously, the viscosity regulator allows to adjust the rheological properties of the liquid and attain the most suitable values of the same, particularly by properly choosing the weight ratio between the volatile substance and the viscosity regulator, since, as already said, the volatile substance possesses itself viscosity-adjusting properties.

In fact, an excess of volatile substance evaporating from the composition may cause the

formation of deposits in the metering chamber and/or at the points where the opening device is hinged to the supporting structure, which deposits may in turn negatively affect the proper functioning of the system; on the other hand, with an excess of the viscosity regulator the flowability characteristics of the liquid composition may be altered to the point that liquid leakages from the metering chamber may occur.

In this connection, the Applicant has found that optimal rheologic properties of the liquid composition are achieved if the weight ratio between the volatile substance and the viscosity regulator is selected within the range comprised between 1:2 and 1:8 as a function of the chemical-physical properties of the perfume used.

Preferably, the liquid composition additionally comprises at least one pH adjusting agent selected among organic acids such as maleic acid, citric acid, tartaric acid, and mixtures thereof.

Conveniently, the pH adjusting agent is included in the composition in an amount suitable to stabilize the pH of the liquid composition in a pH range comprised between 3 and 7.

In this way, the liquid composition may carry out an advantageous descaling action and achieve a better performance of some surfactants at isoelectric point.

Additionally, the pH adjusting agent also exerts the useful function of regulating the viscosity of the liquid composition within the range specified hereinabove.

For the purposes of the invention, in fact, the liquid composition should preferably be formulated so as to have a viscosity at room temperature comprised between 10 and 2000 mPa·s and, still more preferably, between 20 and 200 mPa·s.

In this latter case, the liquid composition gave optimum results in conjunction with the valve means used for delivering the liquid from the system.

According to a second aspect, the present invention also relates to a method for delivering a liquid composition inside a toilet bowl as defined by the attached claim 22.

According to a third aspect, the present invention also relates to a kit of separate parts for combined use for delivering a liquid composition inside a toilet bowl as defined by the attached claim 23.

According to a fourth aspect, the present invention also relates to the liquid composition

described above for use inside a toilet bowl.

Brief description of the drawings.

Additional features and advantages of the present invention will become more readily apparent from the following detailed description of some preferred embodiments thereof, made with reference to the attached drawings for illustrative and not limiting purposes. In such drawings:

- figure 1 shows a perspective and exploded view of a first embodiment of the system according to the invention;

- figure 2 shows a perspective view from below and in partial section of some details of the system of preceding figure 1;

- figure 3 shows a side view, in partial cross-section, of the system of figure 1 in a non-operative condition;

- figure 4 shows a side view in partial cross-section, of some details of the system of the previous figure 3 in an operative condition.

Detailed description of preferred embodiments

With reference to figures 1-4, a system for delivering a liquid composition L inside a toilet bowl 2 according to a first embodiment of the present invention, is generally indicated with reference numeral 1.

The system 1 comprises a container 3 of the liquid composition L closed in a substantially air-tight manner, a supporting structure 4, hooking means 5 of the container 3 and of the supporting structure 4 for suspending the same from the rim of the bowl 2 and means 6 for delivering dosed amounts of the liquid composition L.

The container 3, the supporting structure 4, the hooking means 5 and the delivering means 6 are mass-produced at low costs by molding suitable plastics materials.

The container 3 is substantially shaped as a spherical segment and is provided, in its lower part, with an opening 17, co-axially provided with a breakable closure membrane 18 formed at one end 19 of a substantially cylindrical neck 20 extending from the container 3 itself.

The hooking means 5, which allows to releasably suspend the system 1 from the rim of

the bowl 2 is structurally independent both from the container 3 and from the supporting structure 4, and comprises an arm 33 including a substantially curvilinear portion 9, elastically deformable and folded on itself, adapted to engage an outer portion 10 of the bowl 2.

The curvilinear portion 9 is connected to a substantially rectilinear portion 11, which may be releasably associated to the supporting structure 4. The portion 11 comprises, cantilevered therefrom, three respectively upper 12a, intermediate 12b and lower 12c hooks the function of which will be described hereinbelow.

More specifically, the upper hook 12a allows to associate the arm 33 to the container 3 by means of a snap engagement in a respective seat 13a formed in the upper portion of the container 3, whereas the remaining intermediate 12b and lower 12c hooks respectively allow to fix the arm 33 to the supporting structure 4 by engaging corresponding openings 13b and 13c formed therein.

The means 6 for delivering the liquid composition L comprises valve means 7 for delivering dosed amounts of the latter which comprises in turn a valve body 16 wherein a metering chamber 24 of the liquid composition L is defined between a lower opening for delivering 8 the liquid composition L and an upper opening 44 for fluid communication with the air-tight closed container 3.

The valve body 16 is defined at a lower portion of a tubular element 46 vertically extending in the supporting structure 4 and adapted to be longitudinally inserted for a portion of predetermined length inside the container 3.

More particularly, the tubular element 46 is cantilevered from the supporting structure 4 and is provided with an essentially beveled free end 21, which is longitudinally inserted inside the neck 20 of the container 3 up to a predetermined extent.

In particular, the container 3 is releasably associated to the supporting structure 4 by engaging the tubular element 16 in the opening 17 of the container 3 with interposition of the membrane 18 and by engaging the upper hook 12a of the arm 33 in the seat 13a.

In the illustrated embodiment, the valve means 7 is essentially constituted by a ball valve 22 which includes a substantially spherical shutter 23, preferably formed of a suitable metal and having a weight comprised between 0.65 and 0.95g.

The valve means 7 is provided with an opening device 14, operable at each flushing by

the water introduced into the bowl 2 and cooperating with said shutter 23.

According to the invention, the opening device 14 is provided with deflecting means, generally indicated at 45 and which will be described in more detail hereinafter, for directing part of the flushing water towards said delivering opening 8 of the liquid composition L and into the metering chamber 24.

The shutter 23 is displaceable by means of said opening device 14 within the metering chamber 24, from a first position wherein it closes the delivering opening 8 of the liquid composition to a second position wherein it opens the delivering opening 8.

More particularly, the shutter 23 is alternatively movable in the metering chamber 24 between the lower delivering opening 8 of the liquid composition L, at which a lower valve seat is defined, and the upper opening 44 for fluid communication with the air-tight closed container 3 at which an upper valve seat is defined at predetermined distance from the delivering opening 8.

According to a preferred embodiment, the upper valve seat is defined within an annular sealing ring 34, which prevents the flushing water to flow through the upper opening 44 of the metering chamber 24 into the container 3 and to dilute the liquid composition L stored therein.

Preferably, the metering chamber 24 is internally provided with means 35 adapted to guide the displacement of the shutter 23 therein. For example, such means 35 comprises a plurality of longitudinal ribs 36, which serve as guide means for the shutter 23 both when it moves upwards as a result of the action exerted by the opening device 14 and by the flushing water flow, and when it moves downwards towards the lower valve seat once the flush of the flushing water is terminated.

In this preferred embodiment, a gap 37 is therefore defined between the shutter 23 and the inner walls of the valve body 16 by the longitudinal ribs 36. Most advantageously, such a gap 37 allows both to store a predetermined amount of liquid composition L in the metering chamber 24 and to permit an air supply to enter the container 3 following a delivery of liquid composition L as will be explained hereinafter.

The opening device 14 of the valve means 7 comprises a plate 26 rotatably mounted on the supporting structure 4 and provided with an essentially conical actuator 27, cantilevered therefrom and adapted to cooperate with the valve means 7.

More particularly, the plate 26 is rotatably mounted on the supporting structure 4 by means of a snap engagement of two pivoting arms 28a, 28b, downwardly extending from the supporting structure 4, in corresponding slots 29a, 29b, laterally provided at opposite portions of the plate 26.

In the illustrated embodiment, the deflecting means 45 for directing part of the flushing water towards the delivering opening 8 of the liquid composition L and into the metering chamber 24 comprises the plate 26.

In this case, the plate 26 further comprises a lateral wall 47 extending from its rear edge 26a which acts as a further element of the deflecting means 45 which advantageously allows to effectively direct part of the flushing water towards the delivering opening 8 of the liquid composition L and into the metering chamber 24.

For the sake of clarity, the terms "rear" and "front" will be used within this description to indicate those parts of the plate 26 distal and, respectively, proximal to the flow of the flushing water (i.e. distal and, respectively, proximal to the inner wall of the bowl 2).

In the illustrated embodiment, the plate 26 further comprises a rim 48 extending from its front peripheral edge 26b which acts as a further element of the deflecting means 45 which may advantageously allow to effectively direct part of the flushing water towards the delivering opening 8 of the liquid composition L and into the metering chamber 24.

Advantageously, the system 1 further comprises a protection wall 30 which is cantilevered from the supporting structure 4, all around the plate 26 and stop means for limiting the stroke of the plate 26, essentially consisting of a baffle 31 extending between the protection wall 30 and the supporting structure 4.

The baffle 31 advantageously allows both to direct the water flow onto the plate 26, thereby reducing its impact force, and to stiffen the supporting structure 4.

Two non limitative examples of liquid compositions L which may be used in combination with the delivering system 1 of the present invention are now given in the following.

In both following examples, the various compositions will be defined by indicating the parts by weight of each component, unless otherwise specified.

EXAMPLE 1

A first liquid composition, illustrated in Table I, was prepared by cold mixing in a conventional manner the various ingredients together until a clear solution was obtained. The solution thus obtained was then filled into a container 3 of the delivering system 1.

The ingredients used were the following:

anionic surfactant = sodium laureth sulfate and sodium dodecylbenzensulfonate

non-ionic surfactant = coconut diethanolamide

amphoteric surfactant = lauramido propyl betaine

perfuming substance of known type available on the market

volatile substance = ethanol

viscosity regulator = monopropylene glycol

solvent = water

pH adjusting agent = citric acid

EXAMPLE 2

A second liquid composition, illustrated in Table II was prepared by cold mixing in the same manner of preceding example 1 and then filled into a container 3 of the delivering system 1.

anionic surfactant = sodium laureth sulfate and sodium dodecylbenzensulfonate

amphoteric surfactant = lauramido propyl amine oxide and lauramido propyl betaine

perfuming substance of known type available on the market

volatile substance = ethanol

viscosity regulator = monopropylene glycol

solvent = water

pH adjusting agent = citric acid

A method for delivering a liquid composition L, for example the compositions disclosed in the aforementioned examples 1 and 2, inside a toilet bowl 2 essentially comprises the steps of attaching to the toilet bowl 2 a system 1 as described hereinbefore and of causing flushing water to impinge onto the opening device 14 of the valve means 7 of the system 1.

More specifically, such a method may be carried out as follows.

Once the container 3 has been inserted in the supporting structure 4, the system 1 is hanged in a way known *per se* to the rim of the bowl 2 so as to be ready for use according to a non-operative condition shown in figure 3 with broken lines.

In particular, in said non-operative condition, the shutter 23 of the ball valve 22 is forced by its own weight and by the weight of the liquid L present in the container 3 in a first position wherein it closes the lower delivering opening 8 of the metering chamber 24, while the plate 26 abuts against the baffle 31 and lies substantially perpendicularly to the inner wall of the bowl 2.

In this case, a dosed amount of liquid composition L is stored in the metering chamber 24 and within the gap 37 since the latter is in fluid communication with the container 3 via the upper opening 44 of the metering chamber 24.

When the water flushing inside the toilet bowl 2 is operated, part of the flushing water impinges upon the plate 26 onto which is directed thanks to the presence of the baffle 31, as indicated by the arrows F in figure 4.

As a result of the action exercised by the water on the plate 26, the latter is made to rotate in a clockwise direction as shown in figure 4, thus bringing the system 1 in an operative position wherein the actuator 27 causes a displacement of the shutter 23 from the delivering opening 8 towards the upper opening 44 of the metering chamber 24 which is consequently closed in a fluid tight manner.

At the same time, the plate 26 together with its front rim 48 and rear wall 47 - all of which form part of the deflecting means 45 - direct part of the flushing water - indicated by the arrows W in figure 4 - towards the delivering opening 8 of the liquid composition L and into the metering chamber 24.

In this way, this part of the flushing water is able to enter in a turbulent way the

metering chamber 24 from where it effectively washes away the amount of liquid composition L stored in the metering chamber 24 which may be thoroughly rinsed.

At the same time, the shutter 23, in cooperation with the annular sealing ring 34, effectively interrupts the fluid communication between the container 3 and the metering chamber 24 and prevents the penetration of water inside the container 3 and hence the possibility of dilution of the liquid composition L, since the shutter 23 abuts against the upper opening 44 of the metering chamber 24 sealed by the annular sealing ring 34.

Thanks to the longitudinal ribs 36, the displacement of the shutter 23 takes place along a direction substantially perpendicular to the upper and lower openings 44 and 8 (i.e. upper and lower valve seats) irrespective of the actual direction of the pushing forces exerted against the shutter 23 by the flushing water entering into the metering chamber 24 and by the actuator 27.

When the pushing action of the flushing water ceases, the shutter 23, forced by its own weight and by the weight of the liquid composition L, if any, present inside the container 3, and guided by the guide means 35, returns to the lower valve seat, i.e. in a position wherein it closes the delivering opening 8.

Most advantageously, during the return downward stroke of the shutter 23, the residual water drips away from the metering chamber and a dosed supply of fresh air from the outer environment may enter the container 3 via the temporarily open passageway defined by the gap 37.

According to the method of the invention, such a dosed supply of fresh air which enters the container reaches the free space above the liquid composition still stored therein, so as to restore the pressure existing within the container and compensate the volume decrease of the liquid composition L due to the delivery of a dosed amount thereof.

According to a preferred embodiment of the method of the invention, the pressure-restoring action of the fresh air entering the container 3 via the metering chamber 24 may be effectively supplemented by the evaporation of part of the volatile substance provided in the liquid composition L.

Advantageously, the evaporation of the volatile substance takes place only if the amount of air entering the container 3 is not entirely sufficient to compensate the volume decrease of the liquid composition L and continues until the pressure level above the liquid is restored substantially to the initial value.

In this way, a further amount of liquid composition L flows through the upper opening 44 and into the metering chamber 24 wherein the same is accumulated inside the gap 37 for a subsequent delivery.

Repeated tests carried out by the Applicant, have shown that the operation of the valve means 7 and in particular of the opening device 14, is regular in all filling conditions of the container 3 and with all the liquid formulations tested.

From the above description, the advantages of the invention are immediately clear, among which the following may be cited:

- possibility, for predetermined physical-chemical properties of the liquid composition L present in the container, to deliver dosed and constant amounts of the liquid composition L, independently of the amount of liquid composition L provided in the container and of the frequency of the flushing operations;

- regularity and reliability of operation;

- low cost.

Clearly, a skilled man in the art may introduce changes and variants to the invention described hereinabove in order to satisfy specific and contingent application requirements, changes and variants which anyhow fall within the scope of protection as defined by the following claims.

TABLE I

(Example 1)

Ingredients	parts by weight
sodium dodecylbenzensulfonate	5
sodium laureth sulfate	30
coconut diethanolamide	2
lauramido propyl betaine	6
perfuming substance	5
ethanol	12
monopropylene glycol	4
water	balance to 100
citric acid	0.1

TABLE II

(Example 2)

Ingredients	parts by weight
sodium dodecylbenzensulfonate	34
sodium laureth sulfate	5
lauramido propyl amine oxide	1
lauramido propyl betaine	4
perfuming substance	7
ethanol	10
monopropylene glycol	3
water	balance to 100
citric acid	0.1

CLAIMS

1. A system (1) for delivering a liquid composition (L) inside a toilet bowl (2) comprising:

a) a container (3) of the liquid composition (L) wherein said liquid composition (L) is subjected to a predetermined pressure,

b) a supporting structure (4) for the container (3),

c) hooking means (5) associated to the supporting structure (4) for supporting the container (3) and the supporting structure (4) inside the bowl (2),

d) valve means (7) for delivering dosed amounts of said liquid composition (L) comprising:

- a valve body (16) wherein a metering chamber (24) of the liquid composition (L) is defined between a lower opening for delivering (8) the liquid composition (L) and an upper opening (44) for fluid communication with said air-tight closed container (3);

- a shutter (23) displaceable in said metering chamber (24) between said upper (44) and lower (8) openings;

- an opening device (14) operable at each flushing by the water introduced into the bowl (2) and cooperating with said shutter (23);

characterised in that said container (3) is closed in a substantially air-tight manner and in that said opening device (14) is provided with deflecting means (45) for directing part of the flushing water towards said delivering opening (8) of the liquid composition (L) and into the metering chamber (24).

2. System (1) according to claim 1, wherein said valve body (16) is defined at a lower portion of a tubular element (46) vertically extending in said supporting structure (4) and adapted to be longitudinally inserted for a portion of predetermined length inside said container (3).

3. System (1) according to claim 2, wherein said tubular element (46) is cantilevered from the supporting structure (4) and is provided with an essentially beveled free end (21).

4. System (1) according to claim 1, wherein the container (3) of the liquid composition

(L) is releasably associated to the supporting structure (4).

5. System (1) according to claim 1, wherein said upper opening (44) of the metering chamber (24) is axially defined within an annular sealing ring (34) associated to an inner wall of the valve body (16).

6. System (1) according to claim 1, wherein the opening device (14) of the valve means (7) comprises a plate (26) rotatably mounted under the supporting structure (4) and provided with an actuator (27), cantilevered therefrom and adapted to cooperate with the shutter (23) of said valve means (7).

7. System (1) according to claim 6, wherein the plate (26) is rotatably mounted under the supporting structure (4) by engagement of two pivoting arms downwardly extending from said supporting structure (4) in corresponding slots, formed at opposite portions of the plate (26).

8. System (1) according to claim 6, wherein said deflecting means (45) comprises said plate (26).

9. System (1) according to claim 8, wherein said deflecting means (45) further comprises a lateral wall (47) extending from a rear edge (26a) of the plate (26).

10. System (1) according to claim 1, wherein the metering chamber (24) is internally provided with means (35) adapted to guide the displacement of said shutter (23) in the metering chamber (24).

11. System (1) according to claim 6, further comprising a protection wall (30) cantilevered from said supporting structure (4) and surrounding said plate (26).

12. System (1) according to claim 11, further comprising stop means for said plate (26), extending between said protection wall (30) and said supporting structure (4).

13. System (1) according to claim 1, wherein the liquid composition (L) comprises:

a) from 10 to 60% by weight of a suitable surfactant,

b) from 2 to 25% by weight of at least one volatile substance adapted to evaporate at room temperature from the liquid composition (L),

c) from 1 to 25% by weight of at least one perfuming substance, and

d) balance solvent.

14. System (1) according claim 13, wherein the surfactant is selected from the group comprising anionic, non-ionic and amphoteric surfactants, and mixtures thereof.

15. System (1) according claim 13, wherein the volatile substance is water soluble.

16. System (1) according to claim 13, wherein the volatile substance has a vapor pressure at room temperature of 2000 to 13500 Pa (15-100mmHg).

17. System (1) according to claim 13, wherein the volatile substance is selected from the group comprising: C1-C4 alcohols, ethers of C1-C4 alcohols, glycol ethers and mixtures thereof.

18. System (1) according to claim 13, wherein the liquid composition (L) has a viscosity at room temperature of 10 to 2000 mPa·s.

19. System (1) according to claim 11, wherein the liquid composition (L) further comprises a viscosity regulator.

20. System (1) according to claim 19, wherein the viscosity regulator is selected from the group comprising: glycols, glycol ethers, and mixtures thereof.

21. System (1) according to claim 19, wherein the weight ratio between the volatile substance and the viscosity regulator is comprised between 1:2 and 1:8.

22. A method for delivering a liquid composition (L) inside a toilet bowl (2) comprising the steps of attaching to the toilet bowl (2) a system (1) according to anyone of claims 1-21 and of causing flushing water to impinge onto the opening device (14) of the valve means (7) of the system (1).

23. Kit of separate parts for combined use for delivering a liquid composition (L) inside a toilet bowl (2), comprising:

a) a container (3) of the liquid composition (L) closed in a substantially air-tight manner and having at least one opening (17) co-axially provided with a breakable closure membrane,

b) a supporting structure (4) for the container (3) comprising:

b1) hooking means (5) for supporting the container (3) and the supporting

structure (4) inside the toilet bowl (2),

b2) valve means (7) for delivering dosed amounts of said liquid composition (L) from the container (3) comprising:

- a valve body (16) wherein a metering chamber (24) of the liquid composition (L) is defined between a lower opening for delivering (8) the liquid composition (L) and an upper opening (44) for fluid communication with said air-tight closed container (3);

- a shutter (23) displaceable in said metering chamber (24) between said upper (44) and lower (8) openings;

- an opening device (14) operable at each flushing by the water introduced into the bowl (2) and cooperating with said shutter (23), said opening device (14) being provided with deflecting means (45) for directing part of the flushing water towards said delivering opening (8) of the liquid composition (L) and into the metering chamber (24).

24. A liquid composition (L) for use inside a toilet bowl (2) comprising:

a) from 10 to 60% by weight of a suitable surfactant,

b) from 2 to 25% by weight of at least one volatile substance adapted to evaporate at room temperature from the liquid composition (L) and restore said predetermined pressure after each delivering of dosed amounts of said liquid composition (L),

c) from 1 to 25% by weight of at least one perfuming substance, and

d) balance solvent.

25. Liquid composition (L) according claim 24, wherein the surfactant is selected from the group comprising anionic, non-ionic and amphoteric surfactants, and mixtures thereof.

26. Liquid composition (L) according claim 24, wherein the volatile substance is water soluble.

27. Liquid composition (L) according to claim 24, wherein the volatile substance has a vapor pressure at room temperature of 2000 to 13500 Pa (15-100mmHg).

28. Liquid composition (L) according to claim 24, wherein the volatile substance is selected from the group comprising: C_1-C_4 alcohols, ethers of C_1-C_4 alcohols, glycol ethers, and mixtures thereof.

29. Liquid composition (L) according to claim 24, having a viscosity at room temperature of 10 to 2000 mPa·s.

30. Liquid composition (L) according to claim 24, further comprising a viscosity regulator.

31. Liquid composition (L) according to claim 30, wherein he viscosity regulator is selected from the group comprising: glycols, glycolethers, and mixtures thereof.

32. Liquid composition (L) according to claim 30, wherein the weight ratio between the volatile substance and the viscosity regulator is comprised between 1:2 and 1:8.

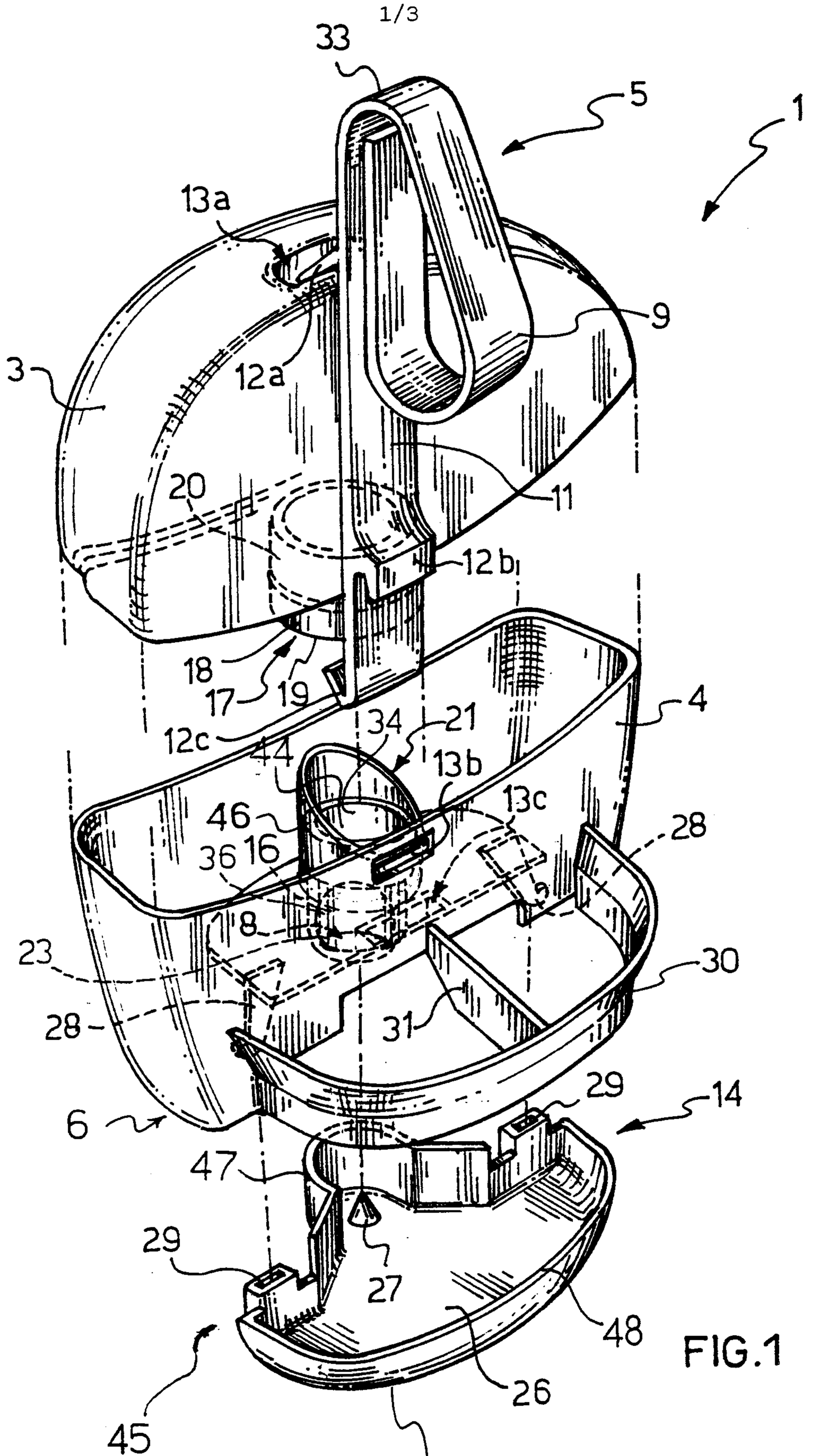

33
5
1
13a
9
3
12a
20
11
12b1
18
17
19
12c
34
21
4
44
13b
13c
46
28
36
16
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23
30
28
31
29
14
6
47
29
27
48
45
26
26b

FIG.1

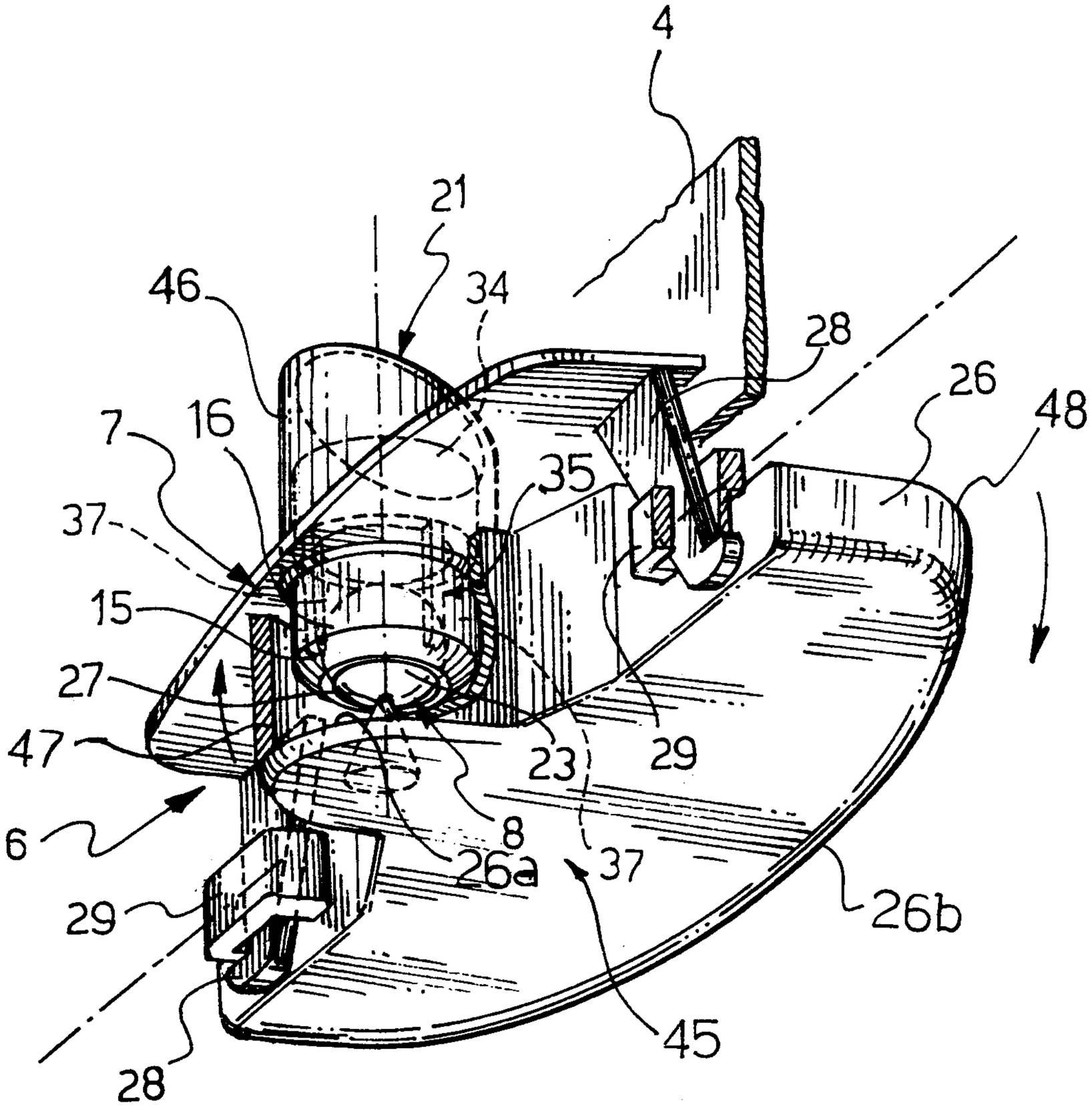


FIG.2

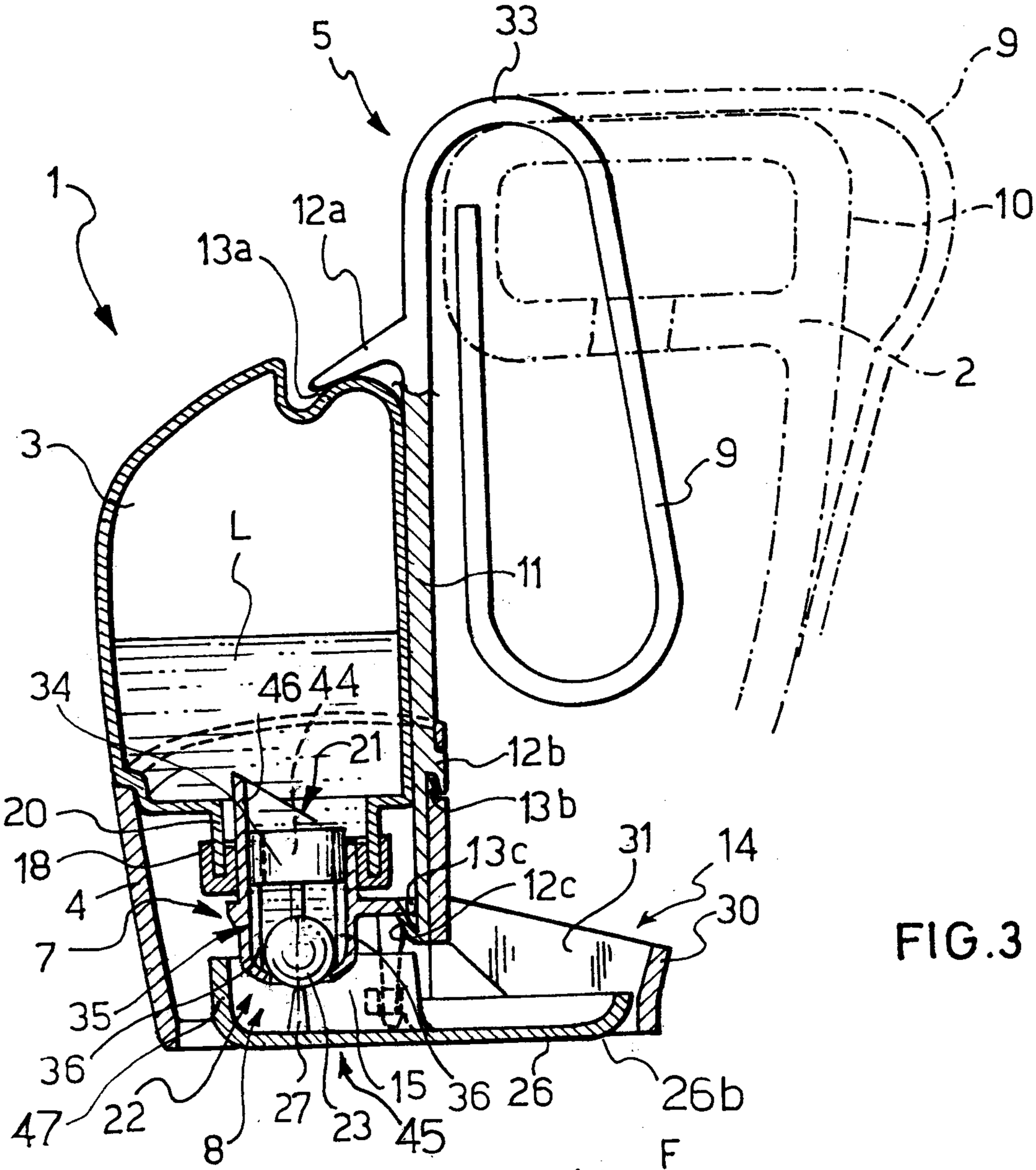

5
33
9
1
12a
13a
10
2
3
L
11
9
34
46
44
21
12b
13b
20
18
13c
31
14
12c
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7
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36
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22
8
27
23
45
15
36
26
26b

FIG.3

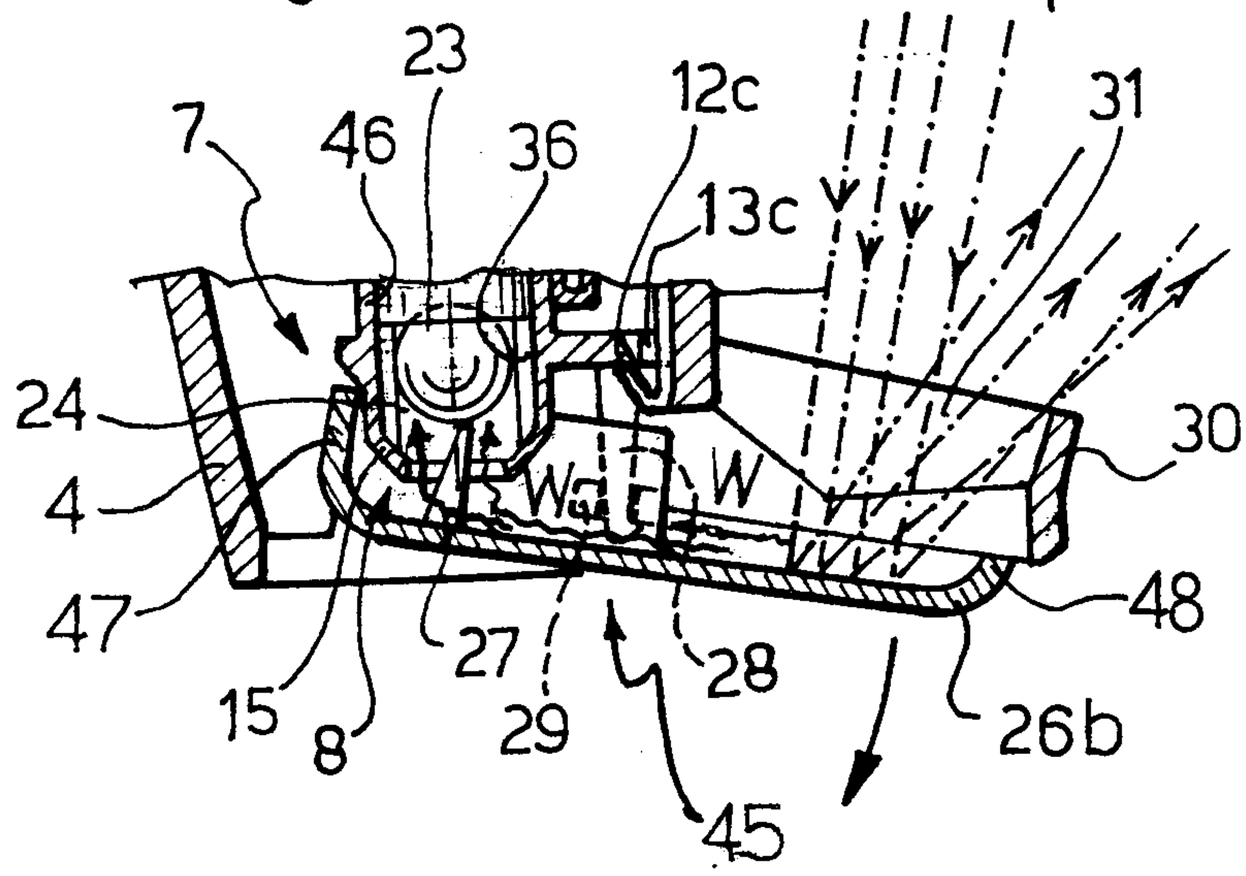
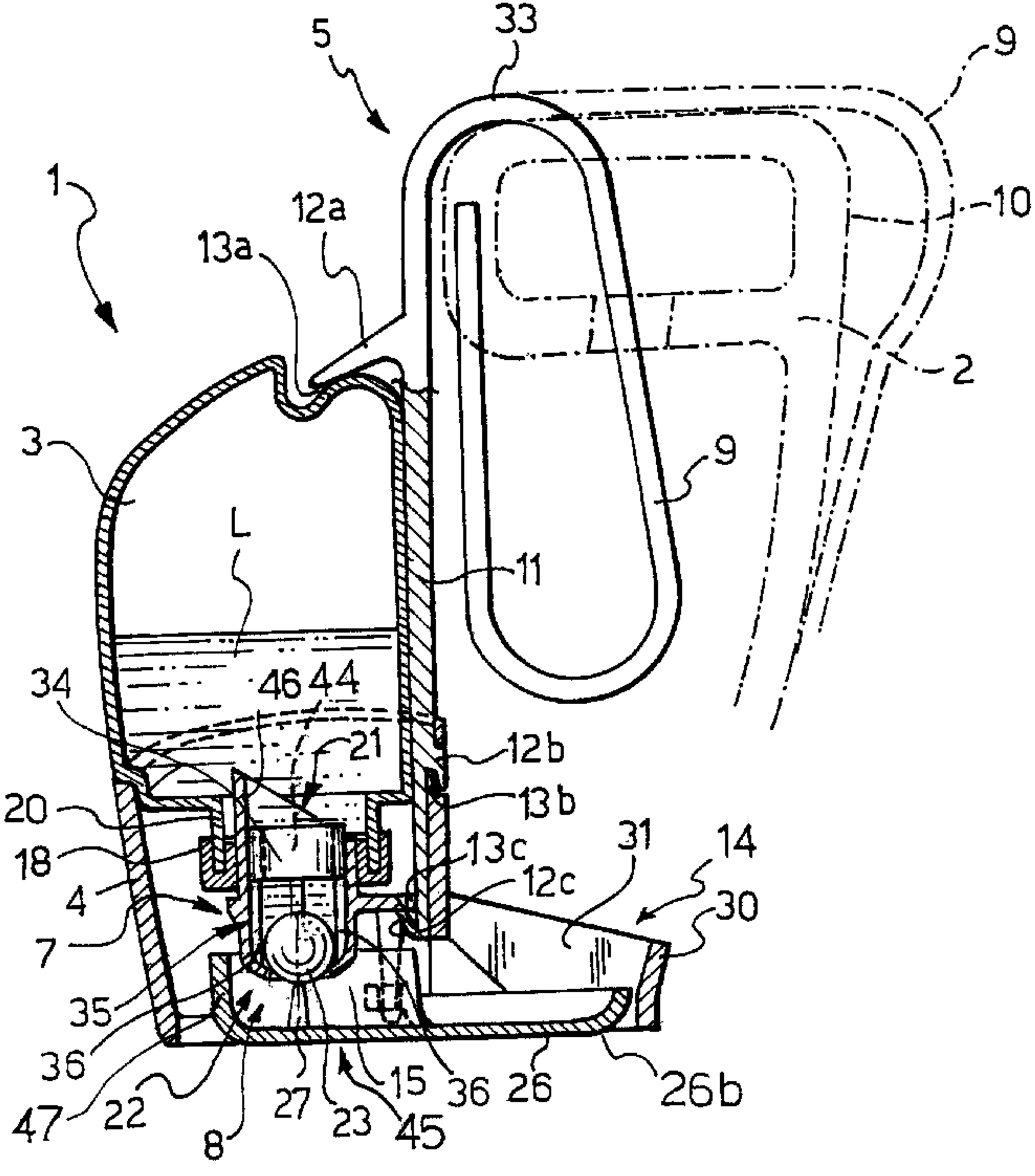

F
23
12c
7
46
36
31
13c
24
30
4
W
47
48
27
28
15
8
29
26b
45

FIG.4


5
33
9
1
12a
13a
10
2
3
9
L
11
34
46
44
21
12b
13b
20
18
13c
31
14
12c
4
30
7
35
36
47
22
8
27
23
45
15
36
26
26b