A delivery device is proposed with an elastically deformable component preferably bounding a pump chamber. In order to achieve improved resetting and/or protection of the component, which is preferably composed of a thermoplastic material, a wall of the component is connected to and/or is covered by an element made of a different material.
DELIVERY DEVICE WITH A REINFORCED FLEXIBLE WALL

[0001] The present invention relates to a delivery device according to the generic term of claims 1 or 16.

[0002] The term “delivery device” as used in the present invention is to be understood particularly as a dosing pump, or a hand-operated pump, respectively, for dispensing a preferably cosmetic liquid. However, it may also be any other delivery device, such as a container, delivery or spray head, dispenser, or such, particularly for a cosmetic liquid.

[0003] The term “cosmetic liquid” includes in a narrow sense any personal hygiene and cleansing product, cosmetics, or such. Generally, it may be a lotion, a gel, a suspension, or any other liquid, optionally also a fluid having a gas phase, or such. Technical liquids and fluids may also be considered. For reasons of simplicity, however, and due to the utilization aspect, reference is often made only to a cosmetic liquid in the following.

[0004] EP 0 442 858 A2 discloses a delivery device having a base part and an elastic upper part. A pump chamber is embossed between the upper part and the base part. By pressing down on the upper part, or at least on an actuating section of the upper part, a liquid can be displaced and dispensed from the pump chamber. Subsequently, a self-actuated, elastic resetting of the upper part, or of the actuation section, respectively, occurs, wherein fresh liquid is suctioned into the pump chamber. It is difficult to find a suitable material for the upper part in order to obtain the desired features—particularly a high chemical stability and high resetting forces.

[0005] DE 1 934 235 U discloses a similar delivery device, wherein an upper part that can be elastically deformed is embodied in an approximately hemispherical manner, and has radial reinforcing ribs on the outside for increasing the resetting force, which end in an annular bulge on the head of the upper part. The annular bulge simultaneously serves for guiding a finger when pressing down on the upper part. The correct choice of material for the upper part, or for achieving the desired properties, also proves problematic in this case.

[0006] WO 001/34485 A1 discloses a delivery device having a pump chamber that can be elastically deformed, which is inserted in a separate compartment for the elastic resetting of the pump chamber. In this case the production is more extensive as opposed to the previously mentioned prior art, due to the separate compartment. Furthermore, the problem exists that a sufficiently chemically resistant material for the liquid to be pumped must be found both for the compartment and for the walls of the pump chamber.

[0007] The present invention is based on the task of providing an improved delivery device, which particularly also enables the delivery of higher viscous or paste-like liquids, or products, and/or an improvement of the elastic properties, such as the resetting, and/or improved protection of a component or material that in particular can be elastically deformed, preferably against the liquid, with a simple and cost-effective construction.

[0008] The above task is solved by means of a delivery device according to claims 1 or 16. Advantageous further embodiments are the object of the sub-claims.

[0009] One aspect of the present invention is to combine a wall, or another section of the component—preferably in the area of a pump chamber, and/or another area that in particular can be elastically deformed, and/or an area contacting the liquid—with an element comprised of a second material. This allows for substantially greater constructive freedoms and a greater freedom in the choice of materials with a simple construction, or simple assembly of the delivery device.

[0010] The element, or the material, respectively, can improve or modify the elastic or resetting properties of the component, and/or protect the same from chemical or other influences.

[0011] A further aspect of the invention, which can also be realized independently, is the covering of the wall, or of the first material, by means of the element, or the second material, respectively, preferably on the liquid side. In particular, according to a preferred embodiment variation the element, or the second material, respectively, forms a continuous material layer or cover of the component, of the wall, or of the first material, particularly at least in the area of the pump chamber, and/or of another surface area that is in contact with the liquid. In this manner the first material can be protected from chemical and/or other influences, and/or an undesired contact of the liquid with the first material can be avoided. Accordingly, such materials, which are usually not suitable for the liquid, or cosmetics, or for food, or are not approved for such, may also be utilized as the first material.

[0012] According to another preferred embodiment the element does not cover the wall comprised of the first material completely—at least in the area of the pump chamber. In particular, the element has arches, and/or rib or bar-shaped sections extending across the wall. In this manner, a particularly optimal or desired resetting or elasticity of the component can be achieved.

[0013] The element is preferably directly injected or molded onto the component, or onto the wall thereof. This enables simple production, for example, by means of so-called “bi-injection,” e.g. particularly by means of extruding in the same extrusion mold, in which the wall, and optionally additional areas of the component are produced.

[0014] Further advantages, features, characteristics, and aspects of the present invention are obvious from the following description of preferred embodiments based on the drawings. They show:

[0015] FIG. 1 a schematic cross-section of a proposed delivery device according to a first embodiment;

[0016] FIG. 2 a schematic cross-section of a proposed delivery device according to;

[0017] FIG. 3 a schematic cross-section of a component and of a base part of the delivery device according to a third embodiment;

[0018] FIG. 4 a schematic perspective top view of a component of the delivery device according to a fourth embodiment; and

[0019] FIG. 5 a schematic perspective bottom view of a component of the delivery device according to a fifth embodiment.

[0020] The same reference symbols are used for the same or similar parts in the merely schematically illustrated figures not drawn to scale, wherein respective or comparative properties and advantages are obtained, even if a repeat description is omitted.

[0021] FIG. 1 illustrates a first embodiment of a proposed delivery device 1 for delivering a preferably cosmetic liquid 2 in the sense stated above. The liquid 2 may be substantially more viscous than water, or may optionally even be pastes.

[0022] A container 3 is preferably associated with the delivery device 1 for supplying the liquid 2, to which the delivery
device 1 is detachably connected, if required. In this manner, an exchange of the container 3 and/or a refilling of the liquid 2 can be accomplished, if desired. As an alternative, the delivery device 1 may also form a reservoir for the liquid 2 or for the container.

[0023] The delivery device 1 has a base part 4 and a component 5, particularly an upper part. In the illustration according to FIG. 1 the terms “base part” and “upper part” correspond the preferred arrangement or alignment of the delivery device 1 during normal use. However, this is not necessarily the case. Accordingly, the base part 4 and the component, or upper part 5, may also be positioned to each other in any spatial alignment, or aligned with each other, depending on requirement, use, embodiment, and such.

[0024] The base part 4 is preferably embodied in a rigid manner, and/or integrally formed, and is particularly injected or molded from a suitable synthetic material.

[0025] The component 5 is embodied in an elastically deformable manner. The proposed embodiment of the component 5 will be explained in further detail below.

[0026] The delivery device 1 further has a receiving or pump chamber 6 for the liquid 2, which in particular is formed or limited exclusively in front of, or between the component 5 and the base part 4.

[0027] Preferably, the component 5 forms an inlet valve 7 and/or an outlet valve 8 optionally together with the base part 4. However, the valves 7, 8 may also be embodied separately. The functionality of the pump is enabled preferably due to the valves 7, 8. The valves 7, 8 are preferably embodied as self-locking one-way valves.

[0028] When the pump chamber 6 is filled with liquid 2, as illustrated in FIG. 1, the volume of the pump chamber 6 can be decreased by means of deforming the component 5, and thus the liquid 2 can be displaced from the pump chamber 6 and dispersed. Particularly for this purpose, an optional actuating element 9 is preferably pressed down manually in the direction of the arrow N, and thus at least one actuating section 10 of the component 5. However, it is also possible, for example, that a user (not illustrated) presses the component 5, or the actuating section 10 directly for the dispensing of the liquid 2.

[0029] The displaced liquid 2 is delivered, or dispensed via the outlet valve 8. The opening of the outlet valve 8 is particularly carried out in a self-activated manner, preferably due to the liquid pressure, and/or possibly in addition—as a result of a respective displacement of the component 5 when pressing down.

[0030] Due to the propriety elasticity or resetting force of the attachment section 10, or the component 5, a self-activated resetting according to arrow R then occurs after letting go into the initial position shown in FIG. 1, wherein fresh liquid 2 is received, particularly suctioned, into the pump chamber 6 via the inlet valve 7. Opening the inlet valve 7 during the resetting process is preferably carried out as a result of the low pressure that is then prevalent in the pump chamber 6. The elasticity or resetting force of the component 5 is adjusted to the viscosity and/or the flow resistances in order to ensure an adequately quick and/or safe resetting, and thus renewed filling of the pump chamber 6. The outlet valve 8 remains closed during the resetting or renewed filling of the pump chamber 6.

[0031] The component 5 preferably has at least substantially circumferential annular section 11 that particularly forms the inlet valve 7 and/or the outlet valve 8.

[0032] The annular section 11 is preferably radially supported from the outside and/or inside at least substantially across its entire peripheral extension from the base part 4. However, the annular section 11 can be elastically deflected toward the inside at least in sections, namely at least in the area of an inlet opening 12 preferably embodied in the base part 4. In the non-deflected state the annular section 11 overlaps and closes the inlet opening 12. When resetting the component 5, or with the suctioning of liquid 2, respectively, the annular section 11 is deflected due to the liquid pressure created in the inlet opening 12, and the inlet opening 12 is thus opened for the liquid 2. The annular section 11 therefore forms the inlet valve 7 together with the base part 4, or the inlet opening 12 in the illustrated example.

[0033] The annular section 11 is preferably embodied at least substantially in the manner of a hollow cylinder. The radial thickness of the annular wall is preferably decreased, or tapered toward the free axial end thereof.

[0034] As an alternative, or additionally, the annular section 11, however, may also be equipped with a through hole, a recess, an axial slot, or such, in order to form a desired passage, and/or to enable a desired, particularly radial deflection or deformation.

[0035] For supply the liquid 2 the delivery device 1 in the illustrated example preferably has a connector 13 with a suction hose 14, or such, which is connected thereto, and extends to the container 2. Preferably, the connector 13 is integrally molded to the base part 4.

[0036] The outlet valve 8 is preferably arranged diametrically opposite of the inlet valve 7 with respect to the axis of the annular section 11. The annular section 11 is radially supported on the inside in the area of the outlet valve 8, preferably by means of a wall section 15 of the base part 4. In particular, the wall section 15 is preferably formed by means of an inner elevation of the base part 4 in the pump chamber 6.

[0037] In order to form the outlet valve 8 the annular section 11 radially overlaps an outlet opening 16 on the outside that is formed in the wall section 15. In particular, the annular section 11 is elastically pre-stressed against the outlet opening 16—e.g. radially toward the inside—or overlaps the outlet opening 16 at least in a loose manner.

[0038] When activating, or pressing down on the component 5, or the actuating section 10, particularly in the pressed down direction N, any liquid 2 present in the pump chamber 6 is pressurized so that the same radially deflects the annular section 11 in the area of the outlet opening 16 toward the outside, thus opening the outlet valve 8, and enabling the dispensing of the liquid 2, particularly via a, for example, trunk-like dispensing channel 17, that is connected thereto.

[0039] Subsequently the outlet valve 8—particularly due to the self-elasticity or resetting force of the annular section 11—is again at least substantially completely closed.

[0040] In the illustrated example the valves 7, 8 at least substantially open and close by means of axial movements or deflections, or deformations of the annular section 11, and/or at least substantially perpendicular to the main actuating direction, or the pressing down direction N of the component 5, or of the actuating section 10. However, other arrangements are also possible.

[0041] The dispensing of liquid 2 by means of the delivery device 1 is particularly carried out in the non-atomized state. However, generally the atomizing of the liquid 2 is also possible by means of the delivery device 1.
[0042] The delivery device 1 preferably has a connecting part 18 for supporting the component 5, and particularly for connecting the component 5 to the base part 4. In particular, the connecting part 18 is embodied substantially in the manner of a bushing and/or rigid—at least in comparison to the component 5. In a particularly preferred manner the connecting part 18 is integrally molded directly onto the component 5, particularly by means of so-called “bi-injection,” e.g., injection of another material onto a first material. In a particularly preferred manner the component 5 is peripherally circumferentially supported or held on the connecting part 18.

[0043] Preferably, the base part 4 is inserted into the connecting part 18, such as glued in, clamped in, or engaged.

[0044] However, it is also possible that the component 5 is connected directly to the base part 4 only, or is held at the base part 4 preferably at least in a self-sealing and/or self-supporting manner. If necessary, undercut sections, snaps, or such may also engage with each other for the connection.

[0045] Until recently, the component 5 has been produced in one piece of a single material. According to the invention, however, the component 5 is modified particularly as disclosed below, and/or in the claims.

[0046] In the illustrated example the component 5 preferably forms a continuous, particularly arched wall 19 at least in the area of the pump chamber 6. The wall 19 particularly forms the primary deformable area, particularly the actuating section 10, of the component 5. In the illustrated example the component 5, or the wall 19, is embodied preferably in dome-shaped or spherical manner, particularly in a hemispherical manner. However, other shapes and/or other uses of the component 5, such as for container walls, valve parts, spring sections, or such—depending on the application—are possible.

[0047] The wall 19 is comprised of a first material. Preferably, the component 5 is comprised at least substantially of this first material, particularly also the other sections, or areas thereof, as the annular section 11 in the illustrated example, but alternatively, or additionally, also other integrally molded one-piece sections, such as valve tabs, supports, holding sections, flange sections, reinforcements, or such.

[0048] According to the invention the component 5 is equipped with an element 20 made of a second material, particularly at least in the area of the pump chamber 6, or of the wall 19. In the first embodiment according to FIG. 1 the element 20 is integrated in the component 5, or the wall 19, particularly injected into the first material, or extrusion-coated by the same.

[0049] The element 20 in this case is embodied, for example, in a plane, fiber-like, or grate-like manner. Preferably the element 20 is also produced by means of injection molding, or in another suitable manner.

[0050] The component 5 is preferably injection-molded. The first material is preferably a synthetic material, particularly an elastomer and/or a thermoplastic material. However, it may generally be any other material. This applies in particular, if the component 5 does not (only) form the wall 19 for the pump chamber 6, or another pump part, but another component of the delivery device 1.

[0051] The first material is preferably an elastomer, rubber, or another thermoplastic material. TPE (thermoplastic elastomer), TPO, TEEE (thermoplastic elastomers having ether and ester groups), or TPO (thermoplastic urethanes) are preferably used.

[0052] Preferably, the second material is also an elastomer and/or a thermoplastic material, however, if necessary, it may also be any other material.

[0053] In a particularly preferred manner the second material is a polyolefin, particularly PP (polypropylene) or PE (polyethylene).

[0054] It should be noted that the first material and the second material are different, e.g. at least have different properties and/or at least different compositions. By combining different materials, the desired properties of the component 5 can be achieved substantially more easily, for example, in the area of the wall 19, or in the area for the pumps that can be elastically deformed.

[0055] In the first embodiment according to FIG. 1 the element 20 particularly serves for optimizing the elastic properties of the component 5, or of the wall 19, particularly of the elastic resetting. Due to the integration into the first material, or into the wall 19, the second material does not have any contact with the liquid 2. Accordingly, a material optimal for the elastic properties can be used independently of the chemical resistance thereof as opposed to the liquid 2.

[0056] The element 20 is permanently connected to the component 5, or to the wall 19 thereof. As an alternative to the injection-molding, the element 20 itself may also be injected or molded on, or vice versa, the wall 19 may be injected or molded against the element 20, particularly preferably by means of the previously mentioned “bi-injection” process. As an alternative, the element 20 can generally also be connected to the component 5 or the wall 19 by means of gluing, welding, or another suitable manner.

[0057] A second embodiment of the delivery device 1 according to the invention is explained below based on FIG. 2, which shows a schematic cross-section according to FIG. 1. Only essential differences as opposed to the first embodiment are highlighted. The previous embodiments and explanations apply accordingly, or at least in supplement.

[0058] In the second embodiment the first material of the component 5 is preferably completely covered by the second material in that area, which is or comes in contact with the liquid 2. In particular, the element 20 therefore forms a continuous cover, or layer, or coating of the second material. The second material, or the layer, is connected to the first material preferably in a firm, non-detachable, and/or holohedral manner. For this purpose the second material may be injected molded onto the first material by means of so-called “bi-injection,” wherein the first material may have or may form an at least substantially smooth or rough surface, or a surface with undercuts, recesses, through holes, or such. As an alternative the element 20, or the material layer, respectively, may be connected to the first material, or may be supported by the same only in sections—such as in edge or circumferential areas. Alternatively, a mechanical, particularly a positive-fit or form-fit connection is also possible in addition to a chemical connection of the two materials. As an alternative, the element 20 may also form only a particularly membrane-like part that is inserted, or arranged between the liquid 2 and the component 5. According to an alternative that is not illustrated, the second material may also form a bushing, which preferably surrounds the first material completely. In this case a direct connection of the two materials is also not necessary.

[0059] The arrangement of the second material, or the cover of the first material on the liquid side, or on the inside protects the first material from chemical influences, particularly by means of the liquid 2, and/or the liquid 2 from
chemical influences by the first materials, or any other interactions. In this manner it is possible to utilize non-food safe materials and/or materials not resistant to the liquid 2 as the first material in order to, for example, achieve a cost-effective production and/or certain mechanical or other properties. The second material can then meet the required food safety or resistance with regard to the liquid 2.

In the illustrated example the element 20, or the second material, respectively covers the surface of the wall 19 facing the pump chamber 6, the inside, outside, and the front surface of the attached annular section 11, and the radially attached annular area of the annular flange 24 of the component 5. In particular, the second material, or the layer or cover formed thereof, extends to, or even underneath a material or component that is otherwise resistant to the liquid 2, or that is inert, e.g., the base part 4, or the connecting part 18 in the illustrated example.

In addition to the shielding of the first material, the second material, or the element 20, respectively may also serve for a modification of the elastic properties or other properties of the component 5.

It should be noted that in the present invention elastic properties and resetting generally are also to be understood as the deformation of the component 5 in particular as an essential property, or a property associated therewith.

The present invention, however, is not limited to elastic, or flexible, e.g. particularly deformable components. Rather, the cover via the second material may generally also be utilized with any type of component of a delivery device in the sense of the present invention, particularly in order to prevent a direct contact between the liquid 2 and the material.

Additional embodiments of the component 5 modified according to the invention based on FIGS. 3 to 5 are explained below, wherein, however, only substantial differences are highlighted. The previous embodiments and explanations therefore apply accordingly, or in supplement.

In the third embodiment according to FIG. 3 the element 20 is arranged on the side of the component 5, or of the wall 19 opposite of the pump chamber 6—e.g. on the outside. In this case, the element 20 is embodied particularly as a continuous material layer, or cover. Preferably, the element 20 is directly injected or molded onto the first material, particularly by means of the so-called "bi-injection" or such. The element 20 in turn serves particularly for optimizing the resetting properties, particularly in order to be able to achieve a sufficiently great resetting force. Alternatively, or additionally, the element 20 can protect the component 5, particularly the wall 19, or the actuating section 10, from mechanical or other influences.

Alternatively, or additionally, the cover formed by the element 20 can also prevent the escape of plasticizers from the first material in order to ensure the desired material properties of the first material.

According to an embodiment variation that is not illustrated, the element 20 may additionally be arranged on the side of the component 5, or of the wall 19, facing the pump chamber 6—e.g. on the inside. In this case the element 20 can protect the first material from chemical influences—particularly by means of the liquid 2—alternatively, or additionally to the previously mentioned properties, or effects. For example, it is possible to optimize the first material with regard to its elastic properties, or resetting properties, or to optimally choose the same regardless of the chemical resistance or other properties thereof.

Preferably, the material being or coming into contact with the pump chamber 6, or the liquid 2—e.g. the first and/or second material—is food safe and/or at least chemically resistant to a sufficient degree.

The element 20 is preferably connected to the wall 19 in a holohedral manner. However, it is generally also possible that the element 20 is connected to the wall 19 only in sections, for example, only along welding lines.

FIG. 4 illustrates a fourth embodiment of the component 5 according to the invention. The element 20 is arranged on the outside of the wall 19. The element 20 does not cover the wall 19 completely, and is therefore not embodied continuously, but instead is equipped with through holes or openings in particular. In the illustrated example the element 20 particularly has rib or bar-like sections 21, which connect an inner ring 22 to an outer ring 23 of the element 20—preferably radially and/or having an arched progression. The desired resetting behavior can be realized very easily by means of respective adjustment, such as of the number, cross-section, width, height, course of the sections 21, the dimensioning of the inner ring 22 and/or of the outer ring 23, selection of a respective material, and such.

Additionally, the ring 22, or any other area of the wall 19 that is optionally reinforced or covered by the element 20 may form the actuating section 10, or abutment or support for the actuating element 9.

FIG. 5 illustrates the bottom view of a fifth embodiment of the component 5 according to the invention. In this case the element 20 is arranged on the side facing the pump chamber 6—e.g. the inside—and is preferably embodied according to the third embodiment.

Individual characteristics and constructive solutions of the embedment and of the stated embodiment variations explained may also be combined with each other and/or utilized in other delivery devices.

LIST OF REFERENCE SYMBOLS

1 delivery device
2 liquid
3 container
4 base part
5 component
6 pump chamber
7 inlet valve
8 outlet valve
9 actuating element
10 actuating section
11 annular section
12 inlet opening
13 connector
14 suction hose
15 wall section
16 outlet opening
17 delivery channel
18 connecting part
19 wall (component)
20 element
21 sections
22 inner ring
What is claimed is:

1. (canceled)
2. (canceled)
3. (canceled)
4. (canceled)
5. (canceled)
6. (canceled)
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19. (canceled)
20. (canceled)
21. (canceled)
22. (canceled)
23. (canceled)
24. (canceled)
25. (canceled)
26. A delivery device for a preferably cosmetic liquid, the delivery device, comprising:
   an elastic or flexible component;
   said component including a wall made of a first material; and
   an element made of a second material connecting and/or covering said component.
27. The delivery device as set forth in claim 1, wherein said element is connected to said wall by a non-detachable manner.
28. The delivery device as set forth in claim 1, wherein said element is injected to said wall or injected into said wall.
29. The delivery device as set forth in claim 1, wherein said element and said wall include an integral one piece unit.
30. The delivery device as set forth in claim 1, wherein said element forms a continuous material layer or a cover.
31. The delivery device as set forth in claim 1, wherein said element is connected to said wall by at least one arched and/or rib or fin-shaped section extending over said wall.
32. The delivery device as set forth in claim 1, wherein said element is positioned lower said first material, or the wall for protecting the first material, or the wall, respectively, from chemical and/or mechanical influences.
33. The delivery device as set forth in claim 1, wherein said element provides an resetting force upon displacement of said element for bring about, or supporting the elastic resetting of the component instrumentally, or exclusively.
34. The delivery device as set forth in claim 1, wherein said element is connected to the wall, or to the first material, respectively, in a holohedral manner.
35. The delivery device as set forth in claim 1, wherein said wall is arched or dome-shaped.
36. The delivery device as set forth in claim 1, wherein said component, or said wall, respectively, limits or forms a pump chamber of the delivery device.
37. The delivery device as set forth in claim 1, wherein said component, or said wall, respectively, limits or forms a pump chamber of the delivery device;
   an actuating section of said component is adapted to be deformed by pressing down on said actuating section for dispensing the liquid from said pump chamber; and
   a resetting force of said component or of said actuating section is automatically suctionsing the liquid into said pump chamber.
38. The delivery device as set forth in claim 1, wherein said preferably elastic or flexible component or said first material is covered by said second material such that the surface of said component, or of said first material, respectively, is protected from direct contact with the liquid.
39. The delivery device as set forth in claim 1, wherein said component forms a wall for the liquid.
40. The delivery device as set forth in claim 1, wherein said second material is connected to said first material in a holohedral manner, or only in sections.
41. The delivery device as set forth in claim 1, wherein said second material is extruded on or onto said first material.
42. The delivery device as set forth in claim 1, wherein said first and second materials differ with regard to their composition, resistance to the liquid and/or their other properties.
43. The delivery device as set forth in claim 1, wherein said second material forms a continuous layer, or cover, respectively.
44. A delivery device for a preferably cosmetic liquid, the delivery device, comprising:
   a pump chamber;
   an elastic or flexible component forming part of said pump chamber;
   said component including a wall made of a first material;
   an element made of a second material connecting and/or covering said component;
   said element comprises at least one arched and/or rib or fin-shaped section extending over said wall; and
   said element is arranged on the side of said wall facing said pump chamber.
45. A delivery device for a preferably cosmetic liquid, the delivery device, comprising:
   a pump chamber;
   an elastic or flexible component forming part of said pump chamber;
   said component including a wall made of a first material;
   an element made of a second material connecting and/or covering said component;
   said element comprises at least one arched and/or rib or fin-shaped section extending over said wall; and
   said element is arranged on the side of said wall opposite of said pump chamber.

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