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(54) WATER-SOLUBLE UNIT DOSE ARTICLE

(57) The present invention relates to water-soluble unit dose articles.

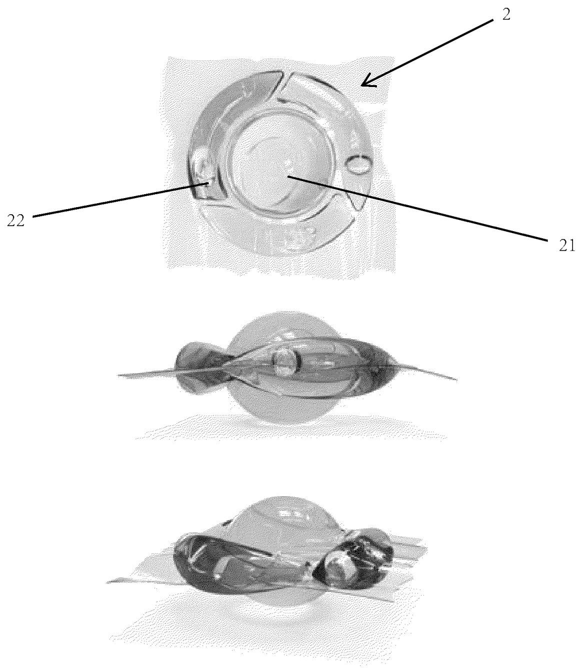

Figure 2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to water-soluble unit dose articles.

BACKGROUND OF THE INVENTION

[0002] Water-soluble unit dose articles are liked by consumers due their convenience and ease of use. Consumers also like the fact that they do not need to measure a detergent dose and so this eliminates accidental spillage during the dosing operation. Accidental dosage can be messy and inconvenient. The water-soluble unit dose article comprises the water-soluble film shaped such that the unit dose article comprises at least one internal compartment surrounded by the water-soluble film. Preferred film materials are preferably polymeric materials. The film material can, for example, be obtained by casting, blow-moulding, extrusion or blown extrusion of the polymeric material, as known in the art.

[0003] Water-soluble unit dose articles may comprise one or more compartments for containing same or different substrate treatment compositions (e.g. laundry detergent compositions). The compartments may be made in various shapes. The selection of shapes usually depends on aesthetics preferences. A typical process for making unit dose articles comprises the following steps: film feeding, juice filling, film sealing, and packing. In the packing step, unit dose articles are transported to a packing line which may comprise a slope module. In the slope module, the unit dose articles usually roll down or slide down along the slope into a packaging or a container due to gravity. However, a "traffic jam" phenomenon sometimes happens because some unit dose articles fail to roll down or slide down and sometimes two or more unit dose articles would stick to each other together on the slope. As such, it is needed to optimize the shape of unit dose articles so as to reduce such "traffic jam" phenomenon.

[0004] It was surprisingly found by the present inventors that a water-soluble unit dose article with an optimized shape of compartment can provide a reduced "traffic jam" phenomenon.

SUMMARY OF THE INVENTION

[0005] The present invention in one aspect relates to a water-soluble unit dose article for treatment of a substrate, wherein the water-soluble unit dose article comprises a water-soluble film shaped such that the water-soluble unit dose article comprises a first compartment and a second compartment and wherein the first compartment contains a first substrate treatment composition, and the second compartment contains a second substrate treatment composition, wherein said first compartment and said second compartment are arranged in a side-by-side manner on a sealing plane, and wherein said first compartment has a First Depth and said second compartment has a Second Depth, and wherein the ratio of the First Depth to the Second Depth is at least 1.5. The water-soluble unit dose articles according to the present invention can provide a reduced occurrence of "traffic jam" phenomenon.

[0006] Particularly, the ratio of the First Depth to the Second Depth is from 1.5 to 10, preferably from 1.8 to 7, more preferably from 2.0 to 5, and most preferably from 2.2 to 3.5, for example 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.5, 4, 5, 6, 7, 8, 9, 10, or any ranges therebetween. Particularly, the First Depth is from 5mm to 60mm, preferably from 8mm to 45mm, more preferably from 10mm to 35mm, and most preferably from 12mm to 28mm. for example 12mm, 15mm, 18mm, 20mm, 22mm, 25mm, 28mm, or any ranges therebetween; and/or the Second Depth is from 3mm to 45mm, preferably from 5mm to 30mm, more preferably from 7mm to 20mm, and most preferably from 8mm to 12mm, for example 8mm, 9mm, 10mm, 11mm, 12mm, or any ranges therebetween.

[0007] In some preferred embodiments, the first compartment has a Top-to-Bottom Depth Ratio (TBR) of from 0.60 to 1, preferably from 0.60 to less than 1, more preferably from 0.65 to 0.95, yet more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90, for example 0.75, 0.8, 0.85, 0.9, or any ranges therebetween. Preferably, the first compartment is up-down non-symmetrical, and in other words, the TBR of the first compartment is less than 1.

[0008] It may be an advantage of the water-soluble unit dose article according to the present application to provide an improved making process.

[0009] It may be another advantage of the water-soluble unit dose article according to the present application to provide a reduced occurrence of "traffic jam" phenomenon.

[0010] It may be another advantage of the water-soluble unit dose article according to the present application to provide a reduced occurrence of unit dose articles sticking together on the conveyor belt (both on the flat belt and the slope). Without wishing to be bound by theory, it is believed that the unit dose articles according to the present application would be in continuous trembling movement versus each other, resulting in avoidance of stickiness accordingly.

[0011] These and other aspects of the present invention will become more apparent upon reading the following detailed description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 shows an exemplary unit dose article 1 before optimization. The unit dose article 1 comprises a first compartment 11 which is arranged in the center of the unit dose article 1 and a second compartment 12 which is arranged in the periphery of the unit dose article 1.

FIG. 2 shows an exemplary unit dose article 2 according to the present disclosure in which the shape of compartments is optimized. The unit dose article 2 comprises a first compartment 21 which is arranged in the center of the unit dose article 2 and a second compartment 22 which is arranged in the periphery of the unit dose article 2.

FIG. 3 shows an illustrative diagram of the shape parametric test for unit dose articles. FIG.3A and FIG.3B respectively show a perspective view and a side view of the unit dose article 2.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

[0013] As used herein, the articles including "a" and "an" when used in a claim, are understood to mean one or more of what is claimed or described.

[0014] As used herein, the terms "comprise", "comprises", "comprising", "include", "includes", "including", "contain", "contains", and "containing" are meant to be non-limiting, i.e., other steps and other ingredients which do not affect the end of result can be added. The above terms encompass the terms "consisting of' and "consisting essentially of".

[0015] As used herein, when a composition is "substantially free" of a specific ingredient, it is meant that the composition comprises less than a trace amount, alternatively less than 0.1%, alternatively less than 0.01%, alternatively less than 0.001%, by weight of the composition, of the specific ingredient.

[0016] As used herein, the term "substrate" means a substance which need to be treated, e.g., to be cleaned. Such substrate may include a hard surface and fabrics.

[0017] As used herein, the term "substrate treatment composition" means a composition for treating substrates. Such compositions may be in any form suitable for treating substrates, including particles, pourable liquid, gel, cream, and combinations thereof. The substrate treatment compositions contained in different compartments of unit dose articles may be the same or different.

[0018] As used herein, the term "laundry detergent composition" means a composition for cleaning soiled materials, including fabrics. Such compositions may be used as a pre-laundering treatment, a post-laundering treatment, or may be added during the rinse or wash cycle of the laundering operation. The term of "liquid laundry detergent composition" herein refers to compositions that are in a form selected from the group consisting of pourable liquid, gel, cream, and combinations thereof. The term of "unit dose laundry detergent composition" herein refers to a water-soluble pouch containing a certain volume of liquid wrapped with a water-soluble film.

[0019] As used herein, the terms "side-by-side manner" means the first compartment, the second compartment and optionally third or subsequent compartments are arranged next to each other on a sealing plane.

[0020] As used herein, the terms "superposed manner" means the second compartment and optionally third or subsequent compartments are superimposed on the first compartment. In one embodiment, the third compartment may be superimposed on the second compartment which is in turn superimposed on the first compartment in a sandwich configuration. Alternatively, the second and third and optionally subsequent compartments may all be superimposed on the first compartment.

[0021] As used herein, the term "alkyl" means a hydrocarbyl moiety which is branched or unbranched, substituted or unsubstituted. Included in the term "alkyl" is the alkyl portion of acyl groups.

[0022] As used herein, the term "washing solution" refers to the typical amount of aqueous solution used for one cycle of laundry washing, preferably from 1 L to 50 L, alternatively from 1 L to 20 L for hand washing and from 10 L to 50 L for machine washing.

[0023] As used herein, the term "soiled fabric" is used non-specifically and may refer to any type of natural or artificial fibers, including natural, artificial, and synthetic fibers, such as, but not limited to, cotton, linen, wool, polyester, nylon, silk, acrylic, and the like, as well as various blends and combinations.

Water-soluble unit dose article

[0024] The present invention discloses a water-soluble unit dose article comprising a water-soluble film and a substrate treatment composition. Particularly, the substrate treatment composition is wrapped with the water-soluble film. The water-soluble film and the substrate treatment composition are described in more detail below.

[0025] The water-soluble unit dose article comprises the water-soluble film shaped such that the unit-dose article comprises at least one internal compartment surrounded by the water-soluble film. The unit dose article may comprise a first water-soluble film and a second water-soluble film sealed to one another such to define the internal compartment. The water-soluble unit dose article is constructed such that the substrate treatment composition does not leak out of the compartment during storage. However, upon addition of the water-soluble unit dose article to water, the water-soluble film dissolves and releases the contents of the internal compartment into the wash liquor.

[0026] The compartment should be understood as meaning a closed internal space within the unit dose article, which holds the detergent composition. During manufacture, a first water-soluble film may be shaped to comprise an open compartment into which the detergent composition is added. A second water-soluble film is then laid over the first film in such an orientation as to close the opening of the compartment. The first and second films are then sealed together along a seal region.

[0027] The water-soluble unit dose article may comprise a water-soluble film shaped such that the water-soluble unit dose article comprises a first compartment and a second compartment and wherein the first compartment contains a first substrate treatment composition, and the second compartment contains a second substrate treatment composition, wherein said first compartment has a First Depth and said second compartment has a Second Depth, and wherein the ratio of the First Depth to the Second Depth is at least 1.5.

[0028] Particularly, the ratio of the First Depth to the Second Depth is from 1.5 to 10, preferably from 1.8 to 7, more preferably from 2.0 to 5, and most preferably from 2.2 to 3.5.

[0029] Particularly, the First Depth is from 5mm to 40mm, preferably from 8mm to 35mm, more preferably from 10mm to 30mm, and most preferably from 12mm to 28mm; and/or the Second Depth is from 3mm to 25mm, preferably from 5mm to 21mm, more preferably from 7mm to 16mm, and most preferably from 8mm to 12mm.

[0030] In some preferred embodiments, the first compartment has a Top-to-Bottom Depth Ratio (TBR) of from 0.60 to 1, preferably from 0.60 to less than 1, more preferably from 0.65 to 0.95, yet more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90, for example 0.75, 0.8, 0.85, 0.9 or any ranges therebetween. Preferably, the first compartment is up-down non-symmetrical, and in other words, the TBR of the first compartment is less than 1. As used herein, the term of "Top-to-Bottom Depth Ratio" is intended to refer to the ratio of a depth of the top half of a compartment to a depth of the bottom half of the compartment. Particularly, the compartment can be divided into two halves (i.e., the top half and the bottom half) at the sealing plane. The top half refers to the lower one within the two halves while the bottom half refers to the higher one.

[0031] In some preferred embodiments, the second compartment has a second Top-to-Bottom Depth Ratio (TBR) of from 0.60 to 1, preferably from 0.60 to less than 1, more preferably from 0.65 to 0.95, yet more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90, for example 0.75, 0.8, 0.85, 0.9 or any ranges therebetween. Preferably, the second compartment is up-down non-symmetrical, and in other words, the second TBR of the second compartment is less than 1.

[0032] In some preferred embodiments, the first compartment of the unit dose article according to the present disclosure has a first top depth and the second compartment of the unit dose article according to the present disclosure has a second top depth wherein the unit dose article according to the present disclosure is characterized of a ratio of the first top depth to the second top depth of from 1.5 to 10, preferably from 1.8 to 7, more preferably from 2.0 to 5, and most preferably from 2.2 to 3.5.

[0033] In some preferred embodiments, the first compartment of the unit dose article according to the present disclosure has a first bottom depth and the second compartment of the unit dose article according to the present disclosure has a second bottom depth wherein the unit dose article according to the present disclosure is characterized of a ratio of the first bottom depth to the second bottom depth of from 1.5 to 10, preferably from 1.8 to 7, more preferably from 2.0 to 5, and most preferably from 2.2 to 3.5.

[0034] In some preferred embodiments, the first substrate treatment composition has a First Volume, and the second substrate treatment composition has a Second Volume, wherein the ratio of the First Volume to the Second Volume is from 1.2 to 10, preferably from 1.5 to 8, more preferably from 1.8 to 6, and most preferably from 2 to 5, and; wherein the First Volume is between 6 ml and 60 ml, preferably between 7 ml and 40 ml, more preferably between 8 ml and 20 ml; and/or wherein the Second Volume is between 1.5 ml and 30 ml, preferably between 2 ml and 15 ml, more preferably between 2.5 ml and 8 ml.

[0035] In some preferred embodiments, the first compartment has a First Volume, and the second compartment has a Second Volume, wherein the ratio of the First Volume to the Second Volume is from 1.2 to 10, preferably from 1.5 to 8, more preferably from 1.8 to 6, and most preferably from 2 to 5, and; wherein the First Volume is between 6 ml and 80 ml, preferably between 7 ml and 60 ml, more preferably between 8 ml and 30 ml; and/or wherein the Second Volume is between 1.5 ml and 40 ml, preferably between 2 ml and 20 ml, more preferably between 2.5 ml and 10 ml. Preferably, the filling level of a substrate treatment composition in a compartment is at least 50%, preferably at least 60% or even at least 70% or even at least 80% preferably at least 90%.

[0036] In some preferred embodiments, said first compartment has a First Aspect Ratio of from 0.60 to 1, preferably from 0.65 to 0.95, more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90.

[0037] In some preferred embodiments, said second compartment has a Second Aspect Ratio of from 0.60 to 1, preferably from 0.65 to 0.95, more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90.

[0038] In some preferred embodiments, said first compartment and said second compartment are arranged in a side-by-side manner on a sealing plane, and wherein said second compartment substantially surrounds said first compartment.

[0039] In some preferred embodiments, the water-soluble unit dose article further comprises one or more additional compartments in which each of said one or more additional compartments contains an additional substrate treatment composition and preferably wherein said one or more additional compartments has an Additional Depth which is essentially the same with the Second Depth and said additional substrate treatment composition contained in each of said one or more additional compartments has an Additional Volume which is essentially the same with the Second Volume, wherein said first compartment, said second compartment and said one or more additional compartments are arranged in a side-by-side manner on a sealing plane, and wherein said second compartment and said one or more additional compartments substantially surrounds said first compartment. More preferably, the second and said one or more additional compartments are arranged symmetrically around a central rotational vertical axis perpendicular to the sealing plane.

[0040] In some preferred embodiments, the one or more additional compartments has an Additional Volume which is essentially the same with the Second Volume of the second compartment; and/or the one or more additional compartments has an additional TBR which is essentially the same with the second TBR of the second compartment; and/or the one or more additional compartments has an additional top depth which is essentially the same with the second top depth of the second compartment; and/or the one or more additional compartments has an additional bottom depth which is essentially the same with the second bottom depth of the second compartment; and/or the one or more additional compartments has an additional aspect ratio which is essentially the same with the second aspect ratio of the second compartment.

[0041] In some preferred embodiments, said first compartment has a footprint on the sealing plane in which the footprint is round-shaped, square-shaped, oval-shaped, triangle-shaped, rectangle-shaped, or drop-shaped. Preferably, said first compartment has a footprint on the sealing plane in which the footprint is round-shaped.

[0042] In some preferred embodiments, said second compartment has a footprint on the sealing plane in which the footprint is donut-shaped, annular-sector-shaped, oval-shaped, crescent-shaped, leaf-shaped, or drop-shaped. Preferably, said second compartment has a footprint on the sealing plane in which the footprint is annular-sector-shaped or crescent-shaped.

[0043] In some preferred embodiments, said one or more additional compartments respectively have a footprint on the sealing plane in which the footprint is donut-shaped, annular-sector-shaped, oval-shaped, crescent-shaped, leaf-shaped, or drop-shaped. Preferably, said one or more additional compartments respectively have a footprint on the sealing plane in which the footprint is annular-sector-shaped or crescent-shaped.

[0044] In some preferred embodiments, said first compartment has a footprint area of from 1 cm^2 to 20 cm^2, preferably from 3 cm^2 to 15 cm^2, more preferably from 5 cm^2 to 12 cm^2, most preferably from 7 cm^2 to 10 cm^2.

[0045] In some preferred embodiments, said second compartment has a footprint area of from 1 cm^2 to 10 cm^2, preferably from 2 cm^2 to 8 cm^2, more preferably from 3 cm^2 to 7 cm^2, most preferably from 3.5 cm^2 to 6 cm^2.

[0046] In some preferred embodiments, said additional compartment has a footprint area of from 1 cm^2 to 10 cm^2, preferably from 2 cm^2 to 8 cm^2, more preferably from 3 cm^2 to 7 cm^2, most preferably from 3.5 cm^2 to 6 cm^2.

[0047] In some preferred embodiments, said second compartment and said one or more additional compartments substantially surrounds said first compartment.

[0048] In some preferred embodiments, each of said second substrate treatment composition and said additional substrate treatment compositions has a substantially same volume.

[0049] In some preferred embodiments, said second compartment and said one or more additional compartments have essentially the same footprint on the sealing plane.

[0050] In some preferred embodiments, said second compartment and said one or more additional compartments have essentially the same shape.

[0051] In some embodiments, the first compartment and the second compartment are arranged in a side-by-side manner on a sealing plane and individually contain a substrate treatment composition. Preferably, the water-soluble unit dose article comprises a plurality of compartments in which the number of the plurality of compartments is from 2 to 10, preferably from 2 to 7, more preferably from 2 to 5, e.g. 2, 3, 4, 5, 6, 7, 8, 9, 10 and any ranges therebetween, and the plurality of compartments are arranged in a side-by-side manner on a sealing plane and individually contain a substrate treatment composition. In such a side-by-side manner, the unit dose article is formed from two sheets of water-soluble film, the two sheets of film being sealed together forming a sealing web lying on a sealing plane. Preferably the water-soluble unit dose article consists of compartments arranged in a side-by-side configuration within a sealing plane, e.g. the water-soluble unit dose article does not comprise any compartments in a relative superposed position. As such the water-soluble unit dose article preferably is made from 2 different distinct water-soluble films.

[0052] The outer contouring seal area includes or preferably consists of a flange area. A flange area is arranged around the perimeter of the water-soluble multicompartment unit dose article, and the flange comprises sealed film from two, three, or more water-soluble films. Most preferably the flange comprises sealed film from two water-soluble films. In other words, the flange area protrudes out from the water-soluble unit dose article and comprises sealed film.

[0053] Preferably, the water-soluble multicompartment unit dose article excluding a flange has a maximum length and a maximum width measured perpendicular to the maximum length wherein each of the maximum length and maximum width are independently smaller than 50mm. The water-soluble unit dose article preferably comprises a flange in which the flange has a width of between 1mm and 10 mm, preferable between 4mm and 8mm.

[0054] In some embodiments, average sealing width between the compartments in the water-soluble dose articles is in the range of 1.0 mm to 2.5 mm, preferably between 1.2 mm and 2.2 mm, more preferably between 1.4 mm and 2.0 mm, e.g. 1.4 mm, 1.6 mm, 1.8 mm, 2.0 mm, or any ranges therebetween. The term of "sealing width" as used herein refers to the width of inter-compartment sealing area between compartments which serves to separate the compartments from one another.

[0055] Each compartment may comprise the same or different compositions. The different compositions could all be in the same form, or they may be in different forms. Preferably all compositions are liquid detergent compositions.

Apparatus for Producing Water-soluble Unit Dose Articles

[0056] The present invention relates to an apparatus for making the water-soluble unit dose article according to the present disclosure, wherein the apparatus comprises a thermoforming mold which is configured to form the shape of the water-soluble unit dose article according to the present disclosure.

[0057] The present invention relates to an apparatus for producing water-soluble unit dose articles, comprising a thermoforming mold having a forming surface; a plurality of spaced apart recesses in said forming surface, wherein each said recess comprises a vacuum orifice and each vacuum orifice is in fluid communication with a vacuum source; and a continuous land area surrounding said recesses.

[0058] An apparatus for forming a water-soluble unit dose article can comprise a first film unwind roll and a thermoforming mold. The thermoforming mold can be movable in the machine direction MD. The first unwind roll can be upstream of the thermoforming molds. A heater can be positioned downstream of the first film unwind roll. The heater can be positioned between the first film unwind roll and the merging location. The heater can be positioned between the first film unwind roll and the dosing device. The heater can be a non-contact heater. The heater can be an infrared heater. Optionally, the heater can be a heated roller. A dosing device can be positioned above the forming surface of the thermoforming mold at a location at which vacuum orifices in the thermoforming mold are in fluid communication with a vacuum source. The thermoforming mold can be slidably engaged with a vacuum manifold, the vacuum manifold being in fluid communication with each vacuum orifice. The vacuum manifold can transmit vacuum from the vacuum source to the recess or recesses of the thermoforming mold. A second film unwind roll can be operably positioned to supply a continuous web of second water soluble film above the forming surface downstream of the dosing device and at a merging location at which the vacuum orifices are in fluid communication with the vacuum source.

[0059] The apparatus can further comprise a cutting system downstream of the merging location. The cutting system can comprise one or more longitudinal cutting knives downstream of the merging location. The longitudinal cutting knives can have a longitudinal cutting direction aligned with the machine direction MD. The longitudinal cutting knife or knives can be configured to cut the joined first water soluble film and second water soluble film in the machine direction between recesses adjacent to one another in the cross direction orthogonal to the machine direction MD. The longitudinal cutting knife or knives can be rotary cutting knives.

[0060] The cutting system can comprise a plurality of transverse cutting knives downstream of the merging location. The transverse cutting knives can have a transverse cutting direction in the cross direction which is orthogonal to the machine direction MD. The transverse cutting knife or transverse cutting knives can be configured to cut the joined first water soluble film and second water soluble film in the cross direction between recesses adjacent to one another in the machine direction MD.

[0061] A continuous web of first water soluble film can be positioned on the first film unwind roll. The first water soluble film can extend downstream of the merging location and can be positioned in facing relationship with the land area of the thermoforming mold downstream of the first film unwind roll. Likewise, a continuous web of second water soluble film can be positioned on the second film unwind roll. The second water soluble film can extend downstream of the merging location and be positioned above the first water soluble film downstream of the merging location.

[0062] The thermoforming mold can be mounted on a rotatable drum or on a flat conveyance. A flat conveyance can be a continuous belt or a series of linear motor vehicles that carry the mold in a straight line or horizontal line in the machine direction MD through the process of making water soluble unit dose pouches. The flat conveyance can be a series of individual molds that can be positioned to about one another to form the flat conveyance. The individual molds can be j oined to one another to provide for a continuous belt of molds. The forming surfaces of the individual molds abutting one another can form the flat conveyance. As the molds traverse a curve, for example, when the molds are recirculated upstream, the forming surfaces of the molds may become spaced apart from one another. Optionally, the forming surfaces of the molds may remain abutting to one another as the molds are recirculated upstream if the molds are provided with structure that permits adjacent forming surfaces to move hingedly relative to one another.

[0063] In some preferred embodiments, the thermoforming mold comprises a first recess and a second recess which respectively correspond to the first compartment and the second compartment of the unit dose article according to the present disclosure, wherein the first recess has a footprint area of from 1 cm^2 to 20 cm^2, preferably from 3 cm^2 to 15 cm^2, more preferably from 5 cm^2 to 12 cm^2, most preferably from 7 cm^2 to 10 cm^2, and the second recess has a footprint area of from 1 cm^2 to 10 cm^2, preferably from 2 cm^2 to 8 cm^2, more preferably from 3 cm^2 to 7 cm^2, most preferably from 3.5 cm^2 to 6 cm^2. Optionally, the thermoforming mold further comprises an additional recess corresponding to the additional compartment wherein the additional recess has a footprint area of from 1 cm^2 to 10 cm^2, preferably from 2 cm^2 to 8 cm^2, more preferably from 3 cm^2 to 7 cm^2, most preferably from 3.5 cm^2 to 6 cm^2.

[0064] A thermoforming mold can have a forming surface. The forming surface is the surface to which the first water soluble film is contacted. The forming surface can comprise a plurality of spaced apart recesses. Further, the forming surface can further comprise a continuous land area surrounding said recesses. Each of the recesses can comprise a vacuum orifice or plurality of vacuum orifices. Each vacuum orifice can be in fluid communication with a vacuum source.

[0065] In some embodiments, portions of the land area between the recesses have an average roughness Ra from 2.2 μm to 10 μm, preferably from 2.2 μm to 5 μm, more preferably from 2.5 μm to 3.5 μm. In some embodiments, portions of each of the recesses can have a roughness Sa from 2.2 μm to 10 μm, preferably from 2.2 μm to 5 μm, more preferably from 2.5 μm to 3.5 μm. Preferably, from about 50% to about 100% by area of each recess can have a roughness Sa from 2.2 μm to 10 μm, preferably from 2.2 μm to 5 μm, more preferably from 2.5 μm to 3.5 μm. As used herein, with respect characterizing land area, average roughness Ra is defined and measured according to ISO 21920-1:2021. As used herein, with respect to characterizing recesses, roughness Sa is defined and measured according to ISO 21920-1:2021.

[0066] Where the heater is utilized in the processes of the present disclosure, the heater can be an infrared emitter, e.g. lamp, a hot plate or a combination thereof. Preferably, the heater can be an infrared lamp having a temperature of from about 200 °C to about 1000 °C. As the first film web passes beneath the heater, the first film web can be heated to the desired temperature. The distance between the heater and the first film web can be adjustable so that the temperature of the first film web can be controlled. Similarly, the temperature of the heater can be adjustable so that the temperature of the first film web can be controlled.

[0067] Regarding the vacuum applied to the first film web, recall that heat from the heater may be applied in concurrence with the application of the vacuum although this is not a requirement. Also as noted, heating of the first film web can occur upstream of the vacuum being applied to the first film web. The first vacuum system can be used to apply a first negative gage pressure to the first porous face of the one or more recesses. When the first negative gage pressure is applied to the first porous face of the one or more recesses, the first web can be at a first maximum temperature. When the first web is heated, it is possible that the temperature of the first web is non-uniform in the MD direction and the CD direction. This can occur because when a web is being carried by the plurality of first molds, part of the web is resting on the land area of the plurality of first molds and part of the web is overlying the one or more recesses. The difference in boundary conditions for the first film web in the direction of the thickness of the first web can result in non-uniform heating of the first film web. For instance, the portion of a web overlying the center of a recess may be at a temperature of 107 °C and the portion of the web out on the land area may have a temperature of about 25 °C. As another example, the portion of a web overlying the center of a recess may be at a temperature of 103 °C and the portion of the web out on the land area may have a temperature of about 26 °C. As yet another example, the portion of a web overlying the center of a cavity may be at a temperature of 108 °C and the portion of the web out on the land area may have a temperature of about 24 °C. The first maximum temperature can be from about 5 °C to about 100 °C, from about 10 °C to about 100 °C, from about 20 °C to about 100 °C, or from about 60 to about 100 °C. The first maximum temperature can be such that the deformation of the first film web is by thermoforming.

[0068] The first film web can be subjected to the first negative gage pressure for from about 1 s to about 10 s, from about 2 s to about 5 s or more preferably from about 1 s to about 3 s. The first negative gage pressure can be from about 10 mbar to about 40 mbar below atmospheric pressure. The first negative gage pressure can be from about 10 mbar to about 90 mbar below atmospheric pressure or from about 25 mbar to about 35 mbar below atmospheric pressure. The first film web can have a temperature of from about 5 °C to about 100 °C, or even from about 10 °C to about 100 °C, or even from about 20 °C to about 100 °C, when the first negative gage pressure is applied to the first film web. The lower the first negative gage pressure the faster the first film web will be deformed. Slower deformation can reduce the amount of micro-cracking in the formed first web. For a lower the temperature of deformation, the first negative gage pressure may be greater, i.e. less vacuum, so that deformation of the first film web is slow, which can reduce micro-cracking in the formed first web. As the first film web is conveyed further in the machine direction MD, a second negative gage pressure can be applied to the first porous face of the one or more recesses when the first film web is at a second maximum temperature. The second negative gage pressure can be applied via the second vacuum system. The second maximum temperature can be greater than the first maximum temperature. For clarity, gage pressure is zero referenced at atmospheric pressure. So, if the first negative gage pressure is 50 mbar below atmospheric pressure and the second negative gage pressure is 100 mbar below atmospheric pressure, it can be said that the second negative gage pressure is less than the first negative gage pressure. And, it can be said a gage pressure of 50 mbar below atmospheric pressure is a negative gage pressure since it is pressure below atmospheric pressure. Since a negative gage pressure of 50 mbar below atmospheric pressure is below atmospheric pressure, it is a vacuum. So, in the circumstances in which the second negative gage pressure is less than or equal to the first negative gage pressure, it can be thought of as the first negative gage pressure being a first level of vacuum and the second negative gage pressure being a second level of vacuum, and the second level of vacuum is more forceful than the first level of vacuum. The second maximum temperature can be from about 90 °C to about 150 °C. The second negative gage pressure can be from about 150 mbar to about 400 mbar below atmospheric pressure, from about 180 mbar to about 260 mbar below atmospheric pressure, from about 180 mbar to about 230 mbar below atmospheric pressure, or from about 210 mbar to about 230 mbar below atmospheric pressure. That is, the second negative gage pressure pulls harder on the first film web than the first negative gage pressure. The first negative gage pressure, second negative gage pressure, first maximum temperature, and second maximum temperature can be selected so that the compartment is well formed, the first web is not drawn into the openings in the first porous face to an unacceptable degree, and the amount of micro-cracking that occurs during deformation of the first web is limited to an acceptable degree. In general, the higher the second temperature, the greater the second negative gage pressure can be since it can be easier to deform the first web at a higher temperature. It is also worth noting that a combination of vacuum and/or other sources of pressure differential may be utilized in the deformation of the film webs disclosed herein. For example, the first pressure difference across the first film web can be provided by, by way of non-limiting example, fluid pressure from above the mold. The fluid can be a heated fluid. The fluid pressure that can act on the water soluble first film web can be provided by a gas such as air or a liquid. For instance, nozzles can dispense fluid, by way of non-limiting example a gas, under pressure in a direction towards the first film web to conform the first film web to the first porous face of the one or more cavities.

[0069] The second web can be at a temperature of from about ambient temperature to about 120 °C. The second web can be at a temperature of from about 10 °C to about 120 °C. The second web can be at a temperature of from about 20 °C to about 120 °C.

Water-soluble film

[0070] The water-soluble film of the present invention is soluble or dispersible in water. The water-soluble film preferably has a thickness of from 20 to 150 micron, preferably 35 to 125 micron, even more preferably 50 to 110 micron, most preferably about 76 micron.

[0071] Preferably, the film has a water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns: 5 grams $\pm$ 0.1 gram of film material is added in a pre-weighed 3L beaker and 2L $\pm$ 5ml of distilled water is added. This is stirred vigorously on a magnetic stirrer, Labline model No. 1250 or equivalent and 5 cm magnetic stirrer, set at 600 rpm, for 30 minutes at 30°C. Then, the mixture is filtered through a folded qualitative sintered-glass filter with a pore size as defined above (max. 20 micron). The water is dried off from the collected filtrate by any conventional method, and the weight of the remaining material is determined (which is the dissolved or dispersed fraction). Then, the percentage solubility or dispersability can be calculated.

[0072] The water-soluble film material may be obtained by casting, blow-moulding, extrusion or blown extrusion of the polymeric material, as known in the art.

[0073] The water-soluble film comprises polyvinylalcohol. The polyvinylalcohol may be present between 50% and 95%, preferably between 55% and 90%, more preferably between 60% and 80% by weight of the water soluble film. The polyvinylalcohol preferably comprises polyvinyl alcohol homopolymer, polyvinylalcohol copolymer, or a mixture thereof. Preferably, the water-soluble film comprises a blend of polyvinylalcohol homopolymers and/or anionic polyvinylalcohol copolymers, preferably wherein the polyvinylalcohol copolymers are selected from sulphonated and carboxylated anionic polyvinylalcohol copolymers especially carboxylated anionic polyvinylalcohol copolymers, most preferably the water-soluble film comprises a blend of a polyvinylalcohol homopolymer and a carboxylated anionic polyvinylalcohol copolymer, or a blend of polyvinylalcohol homopolymers. Alternatively, the polyvinylalcohol comprises an anionic polyvinyl alcohol copolymer, most preferably a carboxylated anionic polyvinylalcohol copolymer. When the polyvinylalcohol in the water soluble film is a blend of a polyvinylalcohol homopolymer and a carboxylated anionic polyvinylalcohol copolymer, the homopolymer and the anionic copolymer are present in a relative weight ratio of 90/10 to 10/90, preferably 80/20 to 20/80, more preferably 70/30 to 50/50. Without wishing to be bound by theory, the term "homopolymer" generally includes polymers having a single type of monomeric repeating unit (e.g., a polymeric chain comprising or consisting of a single monomeric repeating unit). For the particular case of polyvinylalcohol, the term "homopolymer" further includes copolymers having a distribution of vinyl alcohol monomer units and optionally vinyl acetate monomer units, depending on the degree of hydrolysis (e.g., a polymeric chain comprising or consisting of vinyl alcohol and vinyl acetate monomer units). In the case of 100% hydrolysis, a polyvinylalcohol homopolymer can include only vinyl alcohol units. Without wishing to be bound by theory, the term "copolymer" generally includes polymers having two or more types of monomeric repeating units (e.g., a polymeric chain comprising or consisting of two or more different monomeric repeating units, whether as random copolymers, block copolymers, etc.). For the particular case of polyvinylalcohol, the term "copolymer" (or "polyvinylalcohol copolymer") further includes copolymers having a distribution of vinyl alcohol monomer units and vinyl acetate monomer units, depending on the degree of hydrolysis, as well as at least one other type of monomeric repeating unit (e.g., a ter- (or higher) polymeric chain comprising or consisting of vinyl alcohol monomer units, vinyl acetate monomer units, and one or more other monomer units, for example anionic monomer units). In the case of 100% hydrolysis, a polyvinylalcohol copolymer can include a copolymer having vinyl alcohol units and one or more other monomer units, but no vinyl acetate units. Without wishing to be bound by theory, the term "anionic copolymer" includes copolymers having an anionic monomer unit comprising an anionic moiety. General classes of anionic monomer units which can be used for the anionic polyvinyl alcohol co-polymer include the vinyl polymerization units corresponding to monocarboxylic acid vinyl monomers, their esters and anhydrides, dicarboxylic monomers having a polymerizable double bond, their esters and anhydrides, vinyl sulfonic acid monomers, and alkali metal salts of any of the foregoing. Examples of suitable anionic monomer units include the vinyl polymerization units corresponding to vinyl anionic monomers including vinyl acetic acid, maleic acid, monoalkyl maleate, dialkyl maleate, monomethyl maleate, dimethyl maleate, maleic anyhydride, fumaric acid, monoalkyl fumarate, dialkyl fumarate, monomethyl fumarate, dimethyl fumarate, fumaric anyhydride, itaconic acid, monomethyl itaconate, dimethyl itaconate, itaconic anhydride, vinyl sulfonic acid, allyl sulfonic acid, ethylene sulfonic acid, 2-acrylamido-1-methylpropanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, 2-methylacrylamido-2-methylpropanesulfonic acid, 2-sufoethyl acrylate, alkali metal salts of the foregoing (e.g., sodium, potassium, or other alkali metal salts), esters of the foregoing (e.g., methyl, ethyl, or other C1-C4 or C6 alkyl esters), and combinations thereof (e.g., multiple types of anionic monomers or equivalent forms of the same anionic monomer). The anionic monomer may be one or more acrylamido methylpropanesulfonic acids (e.g., 2-acrylamido-1-methylpropanesulfonic acid, 2-acrylamido-2-methylpropanesulfonic acid, 2-methylacrylamido-2-methylpropanesulfonic acid), alkali metal salts thereof (e.g., sodium salts), and combinations thereof. Preferably, the anionic moiety of the first anionic monomer unit is selected from a sulphonate, a carboxylate, or a mixture thereof, more preferably a carboxylate, most preferably an acrylate, a methacrylate, a maleate, or a mixture thereof. Preferably, the anionic monomer unit is present in the anionic polyvinyl alcohol copolymer in an average amount in a range of between 1 mol.% and 10 mol.%, preferably between 2 mol.% and 5 mol.%. Preferably, the polyvinyl alcohol, and/or in case of polyvinylalcohol blends the individual polyvinylalcohol polymers, have an average viscosity (μ1) in a range of between 4 mPa.s and 30 mPa.s, preferably between 10mPa.s and 25 mPa.s, measured as a 4% polyvinyl alcohol copolymer solution in demineralized water at 20 degrees C. The viscosity of a polyvinyl alcohol polymer is determined by measuring a freshly made solution using a Brookfield LV type viscometer with UL adapter as described in British Standard EN ISO 15023-2:2006 Annex E Brookfield Test method. It is international practice to state the viscosity of 4% aqueous polyvinyl alcohol solutions at 20 °C. It is well known in the art that the viscosity of an aqueous water-soluble polymer solution (polyvinylalcohol or otherwise) is correlated with the weight-average molecular weight of the same polymer, and often the viscosity is used as a proxy for weight-average molecular weight. Thus, the weight-average molecular weight of the polyvinylalcohol can be in a range of 30,000 to 175,000, or 30,000 to 100,000, or 55,000 to 80,000. Preferably, the polyvinyl alcohol, and/or in case of polyvinylalcohol blends the individual polyvinylalcohol polymers, have an average degree of hydrolysis in a range of between 75% and 99%, preferably between 80% and 95%, most preferably between 85% and 95%. A suitable test method to measure the degree of hydrolysis is as according to standard method JIS K6726.

[0074] Preferably, the water-soluble film comprises a non-aqueous plasticizer. Preferably, the non-aqueous plasticizer is selected from polyols, sugar alcohols, and mixtures thereof. Suitable polyols include polyols selected from the group consisting of glycerol, diglycerin, ethylene glycol, diethylene glycol, triethyleneglycol, tetraethylene glycol, polyethylene glycols up to 400 molecular weight, neopentyl glycol, 1,2-propylene glycol, 1,3-propanediol, dipropylene glycol, polypropylene glycol, 2-methyl-1,3-propanediol, trimethylolpropane and polyether polyols, or a mixture thereof. Suitable sugar alcohols include sugar alcohols selected from the group consisting of isomalt, maltitol, sorbitol, xylitol, erythritol, adonitol, dulcitol, pentaerythritol and mannitol, or a mixture thereof. More preferably the non-aqueous plasticizer is selected from glycerol, 1,2-propanediol, dipropylene glycol, 2-methyl-1,3-propanediol, trimethylolpropane, triethyleneglycol, polyethyleneglycol, sorbitol, or a mixture thereof, most preferably selected from glycerol, sorbitol, trimethylolpropane, dipropylene glycol, and mixtures thereof. One particularly suitable plasticizer system includes a blend of glycerol, sorbitol and trimethylol propane. Another particularly suitable plasticizer system includes a blend of glycerin, dipropylene glycol, and sorbitol. Preferably, the film comprises between 5% and 50%, preferably between 10% and 40%, more preferably between 20% and 30% by weight of the film of the non-aqueous plasticizer.

[0075] Preferably, the water-soluble film comprises a surfactant. Preferably, the water-soluble film comprises a surfactant in an amount between 0.1% and 2.5%, preferably between 1% and 2% by weight of the water-soluble film. Suitable surfactants can include the nonionic, cationic, anionic and zwitterionic classes. Suitable surfactants include, but are not limited to, polyoxyethylenated polyoxypropylene glycols, alcohol ethoxylates, alkylphenol ethoxylates, tertiary acetylenic glycols and alkanolamides (nonionics), polyoxyethylenated amines, quaternary ammonium salts and quaternized polyoxyethylenated amines (cationics), and amine oxides, N-alkylbetaines and sulfobetaines (zwitterionics).

Other suitable surfactants include dioctyl sodium sulfosuccinate, lactylated fatty acid esters of glycerol and propylene glycol, lactylic esters of fatty acids, sodium alkyl sulfates, polysorbate 20, polysorbate 60, polysorbate 65, polysorbate 80, lecithin, acetylated fatty acid esters of glycerol and propylene glycol, and acetylated esters of fatty acids, and combinations thereof.

[0076] Preferably the water-soluble film according to the invention comprises lubricants / release agents. Suitable lubricants/release agents can include, but are not limited to, fatty acids and their salts, fatty alcohols, fatty esters, fatty amines, fatty amine acetates and fatty amides. Preferred lubricants/release agents are fatty acids, fatty acid salts, and fatty amine acetates. The amount of lubricant/release agent in the water-soluble film is in a range of from 0.02% to 1.5%, preferably from 0.1% to 1% by weight of the water-soluble film.

[0077] Preferably, the water-soluble film comprises fillers, extenders, antiblocking agents, detackifying agents or a mixture thereof. Suitable fillers, extenders, antiblocking agents, detackifying agents or a mixture thereof include, but are not limited to, starches, modified starches, crosslinked polyvinylpyrrolidone, crosslinked cellulose, microcrystalline cellulose, silica, metallic oxides, calcium carbonate, talc and mica. Preferred materials are starches, modified starches and silica. Preferably, the amount of filler, extender, antiblocking agent, detackifying agent or mixture thereof in the water-soluble film is in a range of from 0.1% to 25%, preferably from 1% to 10%, more preferably from 2% to 8%, most preferably from 3% to 5% by weight of the water-soluble film. In the absence of starch, one preferred range for a suitable filler, extender, antiblocking agent, detackifying agent or mixture thereof is from 0.1% to 1%, preferably 4%, more preferably 6%, even more preferably from 1% to 4%, most preferably from 1% to 2.5%, by weight of the water-soluble film.

[0078] Preferably the water-soluble film according to the invention has a residual moisture content of at least 4%, more preferably in a range of from 4% to 15%, even more preferably of from 5% to 10% by weight of the water-soluble film as measured by Karl Fischer titration.

[0079] Preferred films exhibit good dissolution in cold water, meaning unheated distilled water. Preferably such films exhibit good dissolution at temperatures of 24°C, even more preferably at 10°C. By good dissolution it is meant that the film exhibits water-solubility of at least 50%, preferably at least 75% or even at least 95%, as measured by the method set out here after using a glass-filter with a maximum pore size of 20 microns, described above.

[0080] Preferred films include those supplied by Monosol under the trade references M8630, M8900, M8779, M8310.

[0081] The film may be opaque, transparent or translucent. The film may comprise a printed area. The area of print may be achieved using standard techniques, such as flexographic printing or inkjet printing. Preferably, the ink used in the printed area comprises between Oppm and 20ppm, preferably between Oppm and 15ppm, more preferably between Oppm and 10ppm, even more preferably between Oppm and 5ppm, even more preferably between Oppm and 1ppm, even more preferably between Oppb and 100ppb, most preferably Oppb dioxane. Those skilled in the art will be aware of known methods and techniques to determine the dioxane level within the ink formulations.

[0082] The film may comprise an aversive agent, for example a bittering agent. Suitable bittering agents include, but are not limited to, naringin, sucrose octaacetate, quinine hydrochloride, denatonium benzoate, or mixtures thereof. Any suitable level of aversive agent may be used in the film. Suitable levels include, but are not limited to, 1 to 5000ppm, or even 100 to 2500ppm, or even 250 to 2000rpm.

[0083] Preferably, the water-soluble film or water-soluble unit dose article or both are coated in a lubricating agent, preferably, wherein the lubricating agent is selected from talc, zinc oxide, silicas, siloxanes, zeolites, silicic acid, alumina, sodium sulphate, potassium sulphate, calcium carbonate, magnesium carbonate, sodium citrate, sodium tripolyphosphate, potassium citrate, potassium tripolyphosphate, calcium stearate, zinc stearate, magnesium stearate, starch, modified starches, clay, kaolin, gypsum, cyclodextrins or mixtures thereof.

[0084] Preferably, the water-soluble film, and each individual component thereof, independently comprises between Oppm and 20ppm, preferably between Oppm and 15ppm, more preferably between Oppm and 10ppm, even more preferably between Oppm and 5ppm, even more preferably between Oppm and 1ppm, even more preferably between Oppb and 100ppb, most preferably Oppb dioxane. Those skilled in the art will be aware of known methods and techniques to determine the dioxane level within water-soluble films and ingredients thereof.

Substrate treatment composition

[0085] The water-soluble unit dose article comprises a substrate treatment composition. Particularly, the substrate treatment composition may be a liquid laundry detergent composition which refers to any laundry detergent composition comprising a liquid capable of wetting and treating a fabric, and includes, but is not limited to, liquids, gels, pastes, dispersions and the like. The liquid detergent composition can be used in a fabric hand wash operation or may be used in an automatic machine fabric wash operation.

[0086] The substrate treatment composition may comprise f from 1% to 40%, preferably from 5% to 35%, more preferably from 10% to 30%, e.g. 10%, 15%, 20%, 25%, 30% or any ranges therebetween, by weight of the composition, of a non-aqueous solvent.

[0087] The substrate treatment composition, e.g. each of said first substrate treatment composition, said second substrate treatment composition and said additional substrate treatment composition, may comprise from 1% to 60%, preferably from 3% to 45%, more preferably from 5% to 40%, most preferably from 7% to 35%, by weight of the composition, a surfactant. Preferably, said surfactant comprises a non-soap anionic surfactant and/or a non-ionic surfactant.

[0088] Preferably, said surfactant comprises a non-soap anionic surfactant and/or a non-ionic surfactant in which said non-soap anionic surfactant is selected from the group consisting of C_6-C_{20} linear alkylbenzene sulfonates (LAS), C_6-C_{20} alkyl sulfates (AS), C_6-C_{20} alkyl alkoxy sulfates (AAS), C_6-C_{20} methyl ester sulfonates (MES), C_6-C_{20} alkyl ether carboxylates (AEC), and any combinations thereof, and said non-ionic surfactant is selected from the group consisting of alkyl alkoxylated alcohols, alkyl alkoxylated phenols, alkyl polysaccharides, alkyl polyglycosides, methyl ester ethoxylates, polyhydroxy fatty acid amides, alkoxylated fatty acid esters, sucrose esters, sorbitan esters and alkoxylated derivatives of sorbitan esters, and any combinations thereof;

[0089] More preferably, said surfactant comprises a non-soap anionic surfactant and a non-ionic surfactant in which said anionic surfactant comprises a C_6-C_{20} LAS and optionally a C_6-C_{20} AS and/or a C_6-C_{20} AAS and said non-ionic surfactant comprises a C_6-C_{20} alkoxylated alcohol having an average degree (e.g. number average degree) of alkoxylation ranging from 1 to 20, preferably from 5 to 15, more preferably from 7 to 10.

[0090] Preferably, the surfactant is selected from the group consisting of C_6-C_{20} alkyldimethyl amine oxides, C_{6-20} amido alkyl dimethyl amine oxides, C_6-C_{20} linear alkylbenzene sulfonates (LAS), C_6-C_{20} alkyl sulfates (AS), C_6-C_{20} alkyl alkoxy sulfates (AAS), C_6-C_{20} methyl ester sulfonates (MES), C_6-C_{20} alkyl ether carboxylates (AEC), fatty acids, alkyl alkoxylated alcohols, alkyl alkoxylated phenols, alkyl polysaccharides, alkyl polyglycosides, methyl ester ethoxylates, polyhydroxy fatty acid amides, alkoxylated fatty acid esters, sucrose esters, sorbitan esters and alkoxylated derivatives of sorbitan esters, and any combinations thereof, and the non-aqueous solvent is selected from the group consisting of monoalcohols, diols, polyols, glycol ethers, and any combinations thereof. More preferably, the surfactant comprises a C_6-C_{20} alkyldimethyl amine oxide, a C_6-C_{20} LAS, a C_6-C_{20} alkoxylated alcohol having an average degree (e.g. number average degree) of alkoxylation ranging from 1 to 20 preferably having an average degree of ethoxylation ranging from 1 to 20, a C_6-C_{20} alkyl alkoxy sulfate (AAS) preferably a C_6-C_{20} alkyl ethoxylated sulfate having a weight average degree of ethoxylation ranging from 1 to 5, a fatty acid, and any combinations thereof, and the non-aqueous solvent is selected from the group consisting of ethanol, propanol, isopropanol, terpineol, ethylene glycol, 1,2-propanediol, 1,3-propanediol, butanediol, glycerine, butanetriol, pentaerythritol, dipropylene glycol (DPG), tripropylene glycol (TPG), polypropylene glycol (PPG), n-butoxy propoxy propanol (nBPP), diethylene glycol, 2-ethoxyethanol, 2-butoxyethanol, polyethylene glycols and any combinations thereof.

[0091] Preferably the liquid laundry detergent composition comprises from 7 to 18%, preferably from 8 to 15%, e.g. 8%, 9%, 10%, 11%, 12%, 13%, 14%, 15%, or any ranges therebetween, by weight of the liquid laundry detergent composition of water.

[0092] The liquid laundry detergent composition may comprise a cleaning or care polymer, preferably wherein the cleaning or care polymer is selected from an ethoxylated or mixed ethoxylated/propoxylated polyethyleneimine, alkoxylated polyalkyl phenol, an amphiphilic graft copolymer, an optionally anionically modified polyester terephthalate, an optionally cationically modified hydroxyethylcellulose, a carboxymethylcellulose or a mixture thereof.

[0093] The water-soluble unit dose article may comprise an adjunct ingredient selected from hueing dyes, polymers, builders, dye transfer inhibiting agents, dispersants, enzymes, enzyme stabilizers, catalytic materials, bleach, bleach activators, polymeric dispersing agents, antiredeposition agents, suds suppressors, aesthetic dyes, opacifiers, perfumes, perfume delivery systems, structurants, hydrotropes, processing aids, pigments and mixtures thereof.

[0094] Preferably, the laundry detergent composition has a pH between 6 and 10, between 6.5 and 8.9, or between 7 and 8, wherein the pH of the laundry detergent composition is measured as a 10% product concentration in demineralized water at 20°C.

[0095] In some embodiments, the liquid laundry detergent composition is Newtonian.

[0096] In some other embodiments, the liquid laundry detergent composition is non-Newtonian. Without wishing to be bound by theory, a non-Newtonian liquid has properties that differ from those of a Newtonian liquid, more specifically, the viscosity of non-Newtonian liquids is dependent on shear rate, while a Newtonian liquid has a constant viscosity independent of the applied shear rate. The liquid laundry detergent composition may have a viscosity of at least 2Pa.s at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C, preferably wherein the liquid detergent composition has a viscosity of between 2Pa.s and 35Pa.s, preferably between 2.5Pa.s and 30Pa.as, more preferably between 3Pa.s and 25Pa.s, even more preferably between 5Pa.s and 20Pa.s, most preferably between 10Pa.s and 16Pa.s at a shear rate of $0.5s^{-1}$ as measured using a TA Rheometer AR2000 at 25°C. The liquid laundry detergent composition may be characterized by a high shear viscosity ranging from about 100 to about 900 mPa·s, preferably from about 150 to 800 mPa·s, more preferably from about 200 to about 600 mPa·s, measured at a shear rate of about 1000 s^{-1} and at a temperature of about 20°C. The fluid may be preferably a non-Newtonian fluid with shear-thinning properties, hence is further characterized by a low shear viscosity ranging from about 1000 mPa.s to about 10000 mPa.s, preferably from about 1500 mPa.s to about 7500 mPa.s, more preferably from about 2000 mPa.s to about 5000 mPa.s when measured at a shear rate of about 0.5 s^{-1}.

Method of washing

[0097] A further aspect of the present invention is a process of laundering fabrics comprising the steps of diluting between 200 and 3000 fold, preferably between 300 and 2000 fold, the water-soluble unit dose article according to the present invention with water to make a wash liquor, contacting fabrics to be treated with the wash liquor.

[0098] Preferably the wash liquor comprises between 5L and 75L, preferably between 7L and 40L, more preferably between 10L and 20L of water. Alternatively the wash liquor may comprise between 35L and 65L of water. Preferably, the wash liquor is at a temperature of between 5°C and 90°C, preferably between 10°C and 60°C, more preferably between 12°C and 45°C, most preferably between 15°C and 40°C. Preferably, washing the fabrics in the wash liquor takes between 5 minutes and 60 minutes, preferably between 5 minutes and 40 minutes, more preferably between 5 minutes and 30 minutes, even more preferably between 5 minutes and 20 minutes, most preferably between 6 minutes and 18 minutes to complete. Alternatively washing the fabrics in the wash liquor may take between 30 minutes and 60 minutes. Preferably, the wash liquor comprises between 1kg and 20 kg, preferably between 3kg and 15kg, most preferably between 5 and 10 kg of fabrics. The wash liquor may comprise water of any hardness preferably varying between 0 gpg to 40gpg.

Packaged product

[0099] A further aspect of the present invention is a packaged product comprising a recloseable container and at least one water-soluble unit dose article according to the present invention comprised therein.

[0100] Those skilled in the art will be aware of relevant storage receptacles. Preferably, the storage receptacle is a flexible, preferably resealable, bag, a rigid, preferably recloseable, tub or a mixture thereof, preferably, wherein the storage receptacle comprises a child resistant closure. Those skilled in the art will be aware of suitable child resistant closures.

[0101] The package may be made from any suitable material. The container may be made from metallic materials, Aluminium, plastic materials, cardboard materials, laminates, cellulose pulp materals or a mixture thereof. The package may be made from a plastic material, preferably a polyolefin material. The package may be made from polypropylene, polystyrene, polyethylene, polyethylene terephthalate, PVC or a mixture thereof or more durable engineering plastics like Acrylonitrile Butadiene Styrene (ABS), Polycarbonates, Polyamides and the like The material used to make the container may comprise other ingredients, such as colorants, preservatives, plasticisers, UV stabilizers, Oxygen, perfume and moisture barriers recycled materials and the like.

[0102] FIG. 1 shows an exemplary unit dose article **1** before optimization. The unit dose article **1** comprises a first compartment **11** which is arranged in the center of the unit dose article **1** and a second compartment **12** which is arranged in the periphery of the unit dose article **1.** Additionally, the unit dose article **1** further comprises two additional compartments which have essentially the same shape with the second compartment **12.** The second compartment **12** and the two additional compartments together surround the first compartment **11.**

[0103] FIG. 2 shows an exemplary unit dose article **2** according to the present disclosure in which the shape of compartments is optimized. The unit dose article **2** comprises a first compartment **21** which is arranged in the center of the unit dose article **2** and a second compartment **22** which is arranged in the periphery of the unit dose article **2.** Additionally, the unit dose article **2** further comprises two additional compartments which have essentially the same shape with the second compartment **22.** The second compartment **22** and the two additional compartments together surround the first compartment **21.** Compared to the shape of the unit dose article 1, the shape of the unit dose article **2** has a relatively high Ratio of First Depth to Second Depth and a relatively big central compartment.

[0104] FIG. 3 shows an illustrative diagram of the shape parametric test for unit dose articles. FIG.3A and FIG.3B respectively show a perspective view and a side view of the unit dose article **2.** Particularly, the unit dose article **2** comprises a sealing plane **20** which is the plane formed by the sealing of a first water-soluble film and a second water-soluble film to form the closed compartments. The First Depth (FD) **211**, the Second Depth (SD) **221,** the Top Depth (TD) **212** of the first compartment, the Bottom Depth (BD) **213** of the first compartment, and the First Length (FL) **214** are measured in accordance with the Test 1: Shape parametric test, and then, the ratio of First Depth to Second Depth (FD/SD Ratio), the First Aspect Ratio (FAR), and the Top-to-Bottom Depth Ratio (TBD Ratio) are calculated in accordance with the Test 1: Shape parametric test.

Test Method

Test 1: Shape parametric test

[0105] In order to characterize the shape of unit dose articles, the following parameters are measured in this test: Depth including First Depth (FD), Second Depth (SD) and Additional Depth (AD), Ratio of First Depth to Second Depth

(FD/SD Ratio), Ratio of First Depth to Additional Depth (FD/AD Ratio), First Length (FL), Second Length (SL), Additional Length (AL), Aspect Ratio including First Aspect Ratio (FAR), Second Aspect Ratio (SAR) and Additional Aspect Ratio (AAR), Top Depth (TD), Bottom Depth (BD), and Top-to-Bottom Depth Ratio (TBD Ratio).

1. After pod production, the unit dose article is maintained at room temperature for 24 hours. Then, hold the unit dose article horizontally with the bottom half facing down (as used herein, the term of "top half' refers to the one having a lower depth within the two halves while the term of "bottom half' refers to the one having a higher depth within the two halves).
2. Use vernier caliper to measure the longest distance between two layers film for the first compartment (i.e., the compartment having a highest depth), the second compartment and the additional compartment(s) (if any). Define the distance for the first compartment as FD, the distance for the second compartment as SD, and the distance for the additional compartment(s) as AD (Do not squeeze each compartment during measurement to avoid deformation).
3. Divide FD by SD to calculate FD/SD ratio, similarly for FD/AD Ratio.
4. Place the unit dose article on a horizontal surface, use a ruler to measure the longest line in the footprint of the first compartment from vertical top view and define it as FL, similarly for SL and AL.
5. Divide FD by FL to calculate FAR, similarly for SAR and AAR.
6. Hold the pod vertically and use vernier caliper to measure the longest length between the sealing plane and the top film (as used herein, the term of "top film" refers to the film which is located at the side of the top half) within the first compartment (or the second compartment or the additional compartments) and define it as TD.
7. Hold the pod vertically and use vernier caliper to measure the longest length between the sealing plane and the bottom film (as used herein, the term of "bottom film" refers to the film which is located at the side of the bottom half) within the first compartment (or the second compartment or the additional compartments) and define it as BD.
8. Divide TD by BD to calculate TBD Ratio.

Test 2: Sliding Tendency Test

[0106] The sliding tendency of unit dose articles is indicated by the static friction of the unit dose articles on a slope with various degree. The measurement test method of static friction is as follows:

1. Place a metal plate horizontally on a table surface.
2. Lift up the plate from one side to achieve the target angle (20 degree, 30 degree, 40 degree, 50 degree or even higher degree if needed) with the table surface.
3. Fix the tension meter parallel with and on the plate. Zero the value on the tension meter.
4. Clamp the unit dose article at the end of the tension meter and place it to contact with the surface.
5. Release the unit dose article, record the value on the tension meter.

EXAMPLES

Example 1: Optimized Depth Ratio between Compartments in Unit Dose Articles

[0107] The following liquid detergent formulation (Formulation 1) as shown in Table 1 was prepared using standard mixing techniques and equipment known to those skilled in the art. Then, the liquid detergent formulation was encapsulated into compartment(s) of the unit dose articles (Samples 1 and 2) with two different shapes (i.e. Articles A and B) by using a polyvinyl-alcohol-based film as shown in Table 2. The shapes of Articles A and B are respectively shown in Figs. 1 and 2, in which the shape of Fig. 1 has a relatively low Ratio of First Depth to Second Depth and a relatively small central compartment while the shape of Fig. 2 has a relatively high Ratio of First Depth to Second Depth and a relatively big central compartment. The main features of the Articles A and B are shown in Table 3.

Table 1

Ingredients (weight% - as 100% active)	Formulation 1
Nonionic Surfactant[1]	9.1
Anionic surfactant A[2]	7.8
Anionic surfactant B[3]	57
C12-14 dimethyl Amine Oxide	4.0
1,2-propanediol	25.3

(continued)

Ingredients (weight% - as 100% active)	Formulation 1
Glycerine	120
DiPropyleneGlycol	6.0
TPK Fatty Acid	1.7
MEA	0.8
DTI polymer A[4]	0.7
Tinosan HPIOO	0.8
Water	10.3
Misc.	balance

1: Nonionic surfactant: C_{12}-C_{14} ethoxylated alcohol with EO7
2: Anionic surfactant A: C_{11}-C_{13} linear alkylbenzene sulfonates
3: Anionic surfactant B: C_{12}-C_{14} alkyl ethoxylated sulfate with EO3
4: Dye Transfer Inhibition polymer A: poly(2-hydroxypropyldimethylammonium chloride) available from Clariant.

Table 2

	Sample 1	Sample 2
Formulation	Formulation 1	Formulation 1
Article	Article A	Article B

Table 3

	Number of Compartments	Arrangement of Compartments	Shape of Compartments	Volume of Compartments
Article A (Reference)	4	Central + 3x Peripheral	Round /central Crescent /peripheral	4.5ml/Central 4.5ml/each Peripheral
Article B (Optimized)	4	Central + 3x Peripheral	Round /central Crescent /peripheral	10.5ml/Central 2.5ml/each Peripheral

[0108] The overall shape of side-by-side configured multi-compartment unit dose articles in market usually has a "plate" configuration. In other words, different compartments in the unit does articles have a similar depth (i.e., the ratio of a depth of a compartment to a depth of another compartment being around 1). In order to reduce "traffic jam" phenomenon during the making process of unit dose articles, the inventors have tried different shape of the multi-compartment unit dose articles. It was unexpectedly discovered that the "traffic jam" phenomenon would be significantly reduced when the multi-compartment unit dose articles have a "planet" configuration compared to a "plate" configuration. Particularly, when the ratio of the First Depth to the Second Depth as determined in Test 1: Shape parametric test is increased (2.50 for Sample 2 vs. 1.35 for Sample 1), the sliding tendency is significantly increased which indicates the "traffic jam" phenomenon is significantly reduced, as tested in Test 2: Sliding Tendency Test and shown in Tables 4 and 5. Particularly, Sample 2 shows significantly higher static friction which indicates the sliding tendency is higher than Sample 1 (0.05 N vs. 0 N at 40 degree and 0.1 N vs. 0.05 N at 50 degree).

Table 4: Ratio of First Depth to Second Depth

	First Depth	Second Depth	Ratio of First Depth to Second Depth
Sample 1 (Article A, reference)	1760	1304	1.35
Sample 2 (Article B, optimized)	21.29	8.53	2.50

Table 5: Test results of sliding tendency

	30 Degree	40 Degree	50 Degree
Sample 1 (Article A, reference)	0 N	0 N	0.05 N
Sample 2 (Article B, optimized)	0 N	0.05 N	0.1 N

Example 2: Optimized Top-to-Bottom Depth Ratio in Compartment in Unit Dose Articles

[0109] In order to further reduce the "traffic jam" phenomenon, the inventors further optimize other shape parameters of compartments in unit dose articles by using different substrate compositions contained in the unit dose articles. Particularly, the central compartment of multi-compartment unit dose articles is optimized to have a more symmetrical "top-and-bottom" configuration, i.e., Top-to-Bottom Depth Ratio (TBD ratio) is close to 1.

[0110] The following liquid detergent formulations (Formulations 1 and 2) as shown in Table 6 were prepared using standard mixing techniques and equipment known to those skilled in the art. Then, the liquid detergent compositions were encapsulated into compartment(s) of the unit dose articles (Samples 1 to 3) with two different shapes (i.e. Articles A and B) by using a polyvinylalcohol-based film as shown in Table 7.

Table 6

Ingredients (weight% - as 100% active)	Formulation 1	Formulation 2
Nonionic Surfactant[1]	9.1	13.5
Anionic surfactant A[2]	7.8	19.9
Anionic surfactant B[3]	5.7	9.4
C12-14 dimethyl Amine Oxide	4.0	-
1,2-propanediol	25.3	3.5
Glycerine	120	5.3
DiPropyleneGlycol	6.0	-
PEG200	-	14.6
TPK Fatty Acid	1.7	6.4
MEA	0.8	6.7
DTI polymer A[4]	0.7	-
DTI polymer B[5]	-	7.0
Tinosan HP100	0.8	-
Water	10.3	103
Misc.	balance	balance
Total solvent wt%	43.3	23.4

1: Nonionic surfactant: C_{12}-C_{14} ethoxylated alcohol with 7EO
2: Anionic surfactant A: C_{11}-C_{13} linear alkylbenzene sulfonates
3: Anionic surfactant B: C_{12}-C_{14} alkyl ethoxylated sulfate with 3EO
4: DTI polymer A: poly(2-hydroxypropyldimethylammonium chloride) available from Clariant.
5: DTI polymer B: Ethoxylated Polyethyleneimines available from BASF

Table 7

	Sample 1	Sample 2	Sample 3
Formulation	Formulation 1	Formulation 1	Formulation 2
Article	Article A	Article B	Article B

[0111] It was further unexpectedly discovered that the "traffic jam" phenomenon would be further reduced when the central compartment of multi-compartment unit dose articles have a more symmetrical "top-and-bottom" configuration, i.e., Top-to-Bottom Depth Ratio (TBD ratio) is close to 1. Particularly, when the TBD ratio as determined in Test 1: Shape parametric test is increased from 0.62 (Sample 2) to 0.80 (Sample 3), the sliding tendency is further increased which indicates the "traffic jam" phenomenon is significantly reduced, as tested in Test 2: Sliding Tendency Test and shown in Tables 8 and 9. Particularly, Sample 3 shows significantly higher static friction which indicates the sliding tendency is higher than Sample 2 (0.07 N vs. 0 N at 20 degree, 0.11 N vs. 0 N at 30 degree, 0.15 N vs. 0.05 N at 40 degree and 0.16 N vs. 0.1 N at 50 degree).

[0112] Without wishing to be bound by theory, it is believed that the optimized TBD ratio is achieved by optimize the substrate composition contained in the compartment. Particularly, in this Example, the total solvent wt% is reduced from 43.3% (Sample 2) to 23.4% (Sample 3) so that the TBD ratio is increased from 0.62 (Sample 2) to 0.80 (Sample 3). Then, the static friction is significantly increased.

Table 8: Shape parameters

	First Depth	Second Depth	Ratio of First Depth to Second Depth	First Length	First Aspect Ratio	Top Depth	Bottom Depth	Top-to-Bottom Depth Ratio
Sample 1 (Article A, reference)	1760	1304	1.35	24	0.73	7.05	10.55	0.67
Sample 2 (Article B, optimized)	21.29	8.53	2.50	32	0.67	8.13	1316	0.62
Sample 3 (Article B, optimized)	24.12	9.39	2.57	30	0.80	10.74	13.38	0.80

Table 9: Test results of sliding tendency

	20 Degree	30 Degree	40 Degree	50 Degree
Sample 1 (Article A, reference)	0 N	0 N	0 N	0.05 N
Sample 2	0 N	0 N	0.05 N	0.1 N
(Article B, optimized)				
Sample 3 (Article B, optimized)	0.07 N	0.11 N	0.15 N	0.16 N

[0113] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm."

Claims

1. A water-soluble unit dose article for treatment of a substrate, wherein the water-soluble unit dose article comprises a water-soluble film shaped such that the water-soluble unit dose article comprises a first compartment and a second compartment and wherein the first compartment contains a first substrate treatment composition, and the second compartment contains a second substrate treatment composition,
   wherein said first compartment and said second compartment are arranged in a side-by-side manner on a sealing plane, and wherein said first compartment has a First Depth and said second compartment has a Second Depth, and wherein the ratio of the First Depth to the Second Depth is at least 1.5.

2. The water-soluble unit dose article according to claim 1, wherein the ratio of the First Depth to the Second Depth is from 1.5 to 10, preferably from 1.8 to 7, more preferably from 2.0 to 5, and most preferably from 2.2 to 3.5, and

   wherein the First Depth is from 5mm to 60mm, preferably from 8mm to 45mm, more preferably from 10mm to

35mm, and most preferably from 12mm to 28mm; and/or
wherein the Second Depth is from 3mm to 45mm, preferably from 5mm to 30mm, more preferably from 7mm to 20mm, and most preferably from 8mm to 12mm.

3. The water-soluble unit dose article according to any preceding claims, wherein said first compartment has a Top-to-Bottom Depth Ratio (TBR) of from 0.60 to less than 1, preferably from 0.65 to 0.95, more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90.

4. The water-soluble unit dose article according to any preceding claims, wherein the first substrate treatment composition has a First Volume, and the second substrate treatment composition has a Second Volume,

wherein the ratio of the First Volume to the Second Volume is from 1.2 to 10, preferably from 1.5 to 8, more preferably from 1.8 to 6, and most preferably from 2 to 5, and;
wherein the First Volume is between 6 ml and 60 ml, preferably between 7 ml and 40 ml, more preferably between 8 ml and 20 ml; and/or
wherein the Second Volume is between 1.5 ml and 30 ml, preferably between 2 ml and 15 ml, more preferably between 2.5 ml and 8 ml.

5. The water-soluble unit dose article according to any preceding claims, wherein said first compartment has a First Aspect Ratio of from 0.60 to 1, preferably from 0.65 to 0.95, more preferably from 0.70 to 0.92, most preferably from 0.75 to 0.90.

6. The water-soluble unit dose article according to any preceding claims, wherein said second compartment substantially surrounds said first compartment.

7. The water-soluble unit dose article according to Claim 6, wherein the water-soluble unit dose article further comprises one or more additional compartments in which each of said one or more additional compartments contains an additional substrate treatment composition,

wherein said first compartment, said second compartment and said one or more additional compartments are arranged in a side-by-side manner on a sealing plane, and
wherein said second compartment and said one or more additional compartments substantially surrounds said first compartment.

8. The water-soluble unit dose article according to Claim 7, wherein said one or more additional compartments has an Additional Depth which is essentially the same with the Second Depth; and/or wherein said additional substrate treatment composition contained in each of said one or more additional compartments has an Additional Volume which is essentially the same with the Second Volume; and/or wherein said one or more additional compartments has an essentially the same shape with the second compartment.

9. The water-soluble unit dose article according to Claim 7 or 8, wherein said first compartment has a footprint on the sealing plane in which the footprint is round-shaped, square-shaped, oval-shaped, triangle-shaped, rectangle-shaped, or drop-shaped, and/or

wherein said second compartment has a footprint on the sealing plane in which the footprint is donut-shaped, annular-sector-shaped, oval-shaped, crescent-shaped, leaf-shaped, or drop-shaped, and/or
wherein said one or more additional compartments respectively have a footprint on the sealing plane in which the footprint is donut-shaped, annular-sector-shaped, oval-shaped, crescent-shaped, leaf-shaped, or drop-shaped.

10. The water-soluble unit dose article according to Claim 9, wherein said first compartment has a footprint on the sealing plane in which the footprint is round-shaped,

wherein said second compartment has a footprint on the sealing plane in which the footprint is annular-sector-shaped or crescent-shaped,
wherein said one or more additional compartments respectively have a footprint on the sealing plane in which the footprint is annular-sector-shaped or crescent-shaped, and
wherein said second compartment and said one or more additional compartments substantially surrounds said first compartment and wherein each of said second substrate treatment composition and said additional

substrate treatment compositions has a substantially same volume.

11. The water-soluble unit dose article according to any of Claims 7 to 10, wherein each of said first substrate treatment composition, said second substrate treatment composition and said additional substrate treatment composition comprises from 1% to 40%, preferably from 5% to 35%, more preferably from 10% to 30%, by weight of the composition, a non-aqueous solvent,
preferably, wherein the non-aqueous solvent is selected from the group consisting of ethanol, propanol, isopropanol, terpineol, ethylene glycol, 1,2-propanediol, 1,3-propanediol, butanediol, glycerine, butanetriol, pentaerythritol, dipropylene glycol (DPG), tripropylene glycol (TPG), polypropylene glycol (PPG), n-butoxy propoxy propanol (nBPP), diethylene glycol, 2-ethoxyethanol, 2-butoxyethanol, polyethylene glycols and any combinations thereof.

12. The water-soluble unit dose article according to any of Claims 7 to 11, wherein each of said first substrate treatment composition, said second substrate treatment composition and said additional substrate treatment composition comprises from 1% to 60%, preferably from 3% to 45%, more preferably from 5% to 40%, most preferably from 7% to 35%, by weight of the composition, a surfactant,

preferably, wherein said surfactant comprises an anionic surfactant and/or a non-ionic surfactant;
more preferably, wherein said surfactant comprises an anionic surfactant and/or a non-ionic surfactant in which said anionic surfactant is selected from the group consisting of C_6-C_{20} linear alkylbenzene sulfonates (LAS), C_6-C_{20} alkyl sulfates (AS), C_6-C_{20} alkyl alkoxy sulfates (AAS), C_6-C_{20} methyl ester sulfonates (MES), C_6-C_{20} alkyl ether carboxylates (AEC), fatty acids, and any combinations thereof, and said non-ionic surfactant is selected from the group consisting of alkyl alkoxylated alcohols, alkyl alkoxylated phenols, alkyl polysaccharides, alkyl polyglycosides, methyl ester ethoxylates, polyhydroxy fatty acid amides, alkoxylated fatty acid esters, sucrose esters, sorbitan esters and alkoxylated derivatives of sorbitan esters, and any combinations thereof;
most preferably, wherein said surfactant comprises an anionic surfactant and a non-ionic surfactant in which said anionic surfactant comprises a C_6-C_{20} LAS and optionally a C_6-C_{20} AS and/or a C_6-C_{20} AAS and said non-ionic surfactant comprises a C_6-C_{20} alkoxylated alcohol having an average degree of alkoxylation ranging from 1 to 20, preferably from 5 to 15, more preferably from 7 to 10.

13. The water-soluble unit dose article according to any of Claims 7 to 12, wherein each of said first substrate treatment composition, said second substrate treatment composition and said additional substrate treatment composition further comprises from 0.1% to 10%, preferably from 0.5% to 8%, more preferably from 0.7% to 6%, most preferably from 1% to 4%, by weight of the composition, of a fatty acid.

14. The water-soluble unit dose article according to any of Claims 7 to 13, wherein each of said first substrate treatment composition, said second substrate treatment composition and said additional substrate treatment composition comprises from 7% to 18%, preferably from 8% to 15%, more preferably from 9% to 13%, by weight of the composition, of water.

15. The water-soluble unit dose article according to any of Claims 7 to 14, wherein the total number of compartments in the water-soluble unit dose article is from 3 to 10, preferably from 3 to 7, more preferably from 3 to 5.

16. The water-soluble unit dose article according to any of Claims 7 to 15, wherein each of the first substrate treatment composition, the second substrate treatment composition and the additional substrate treatment compositions is a laundry detergent composition, preferably a liquid laundry detergent composition.

17. The water-soluble unit dose article according to any preceding claims, wherein the water-soluble film comprises polyvinyl alcohol which is preferably present between 50% and 95%, preferably between 55% and 90%, more preferably between 60% and 80% by weight of the water-soluble film.

18. The water-soluble unit dose article according to any preceding claims, wherein the unit doses article consists of compartments which are arranged side by side on the sealing plane.

19. An apparatus for making the water-soluble unit dose article according to any preceding claims, wherein the apparatus comprises a thermoforming mold which is configured to form the shape of the water-soluble unit dose article according to any preceding claims.

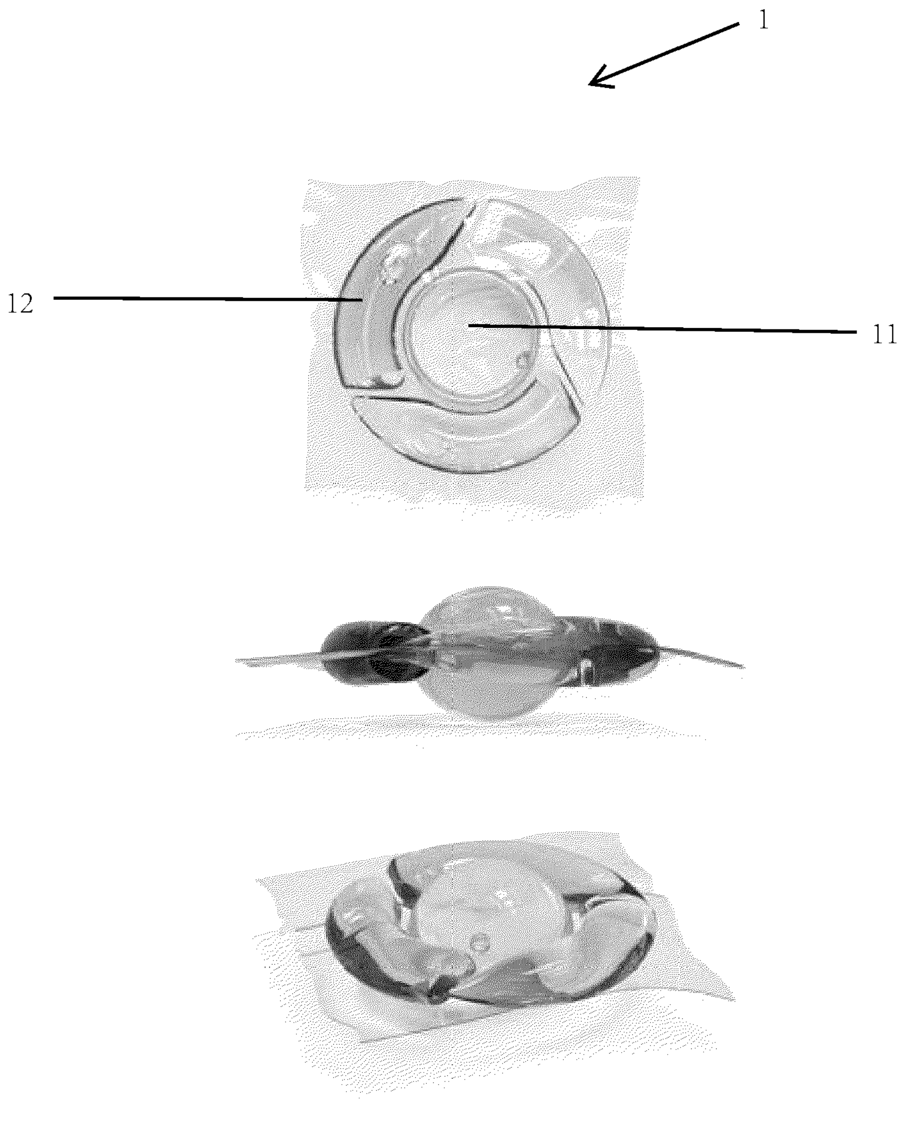

Figure 1

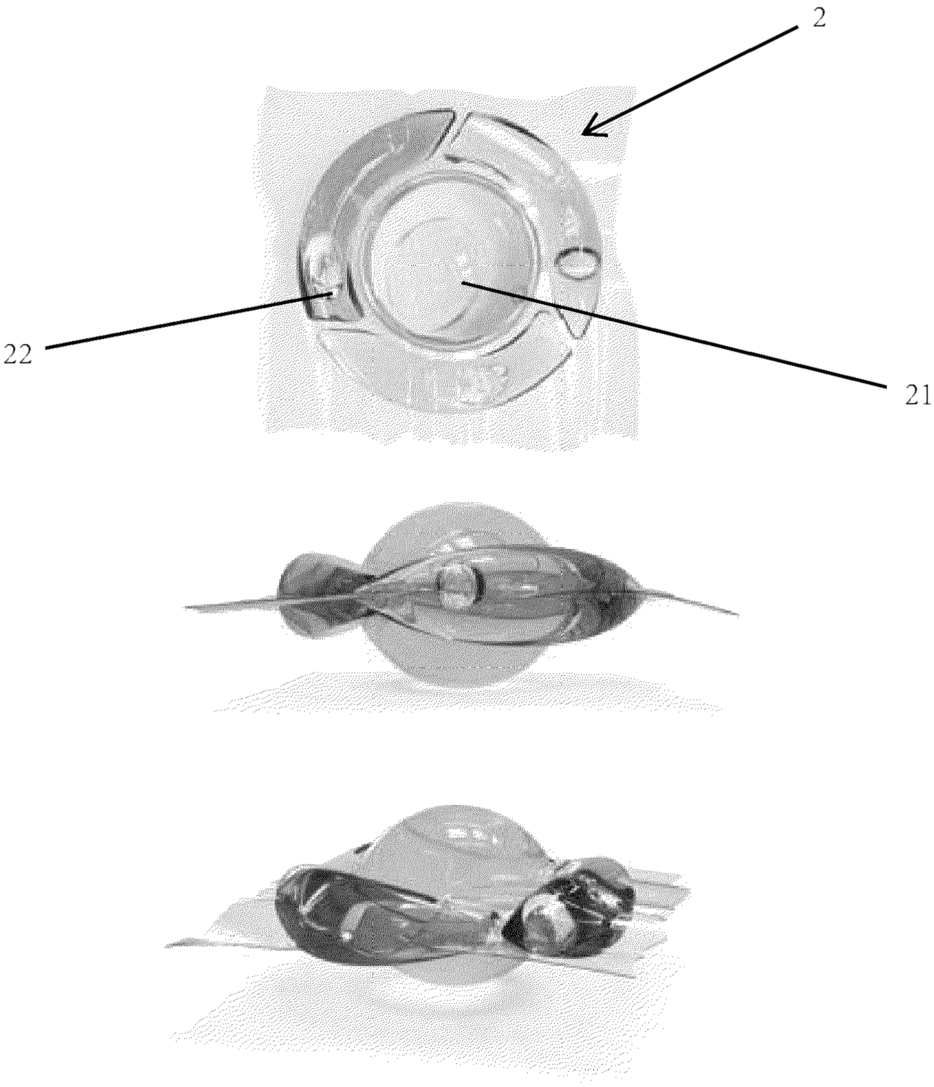

Figure 2

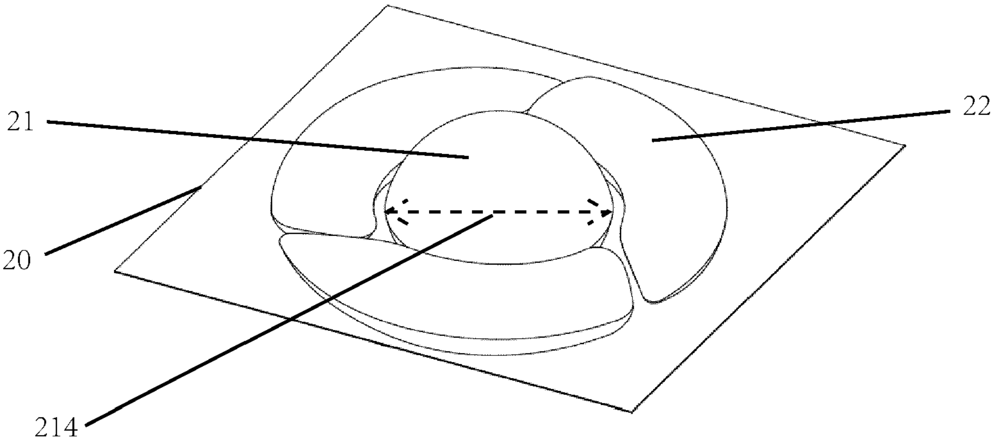

Figure 3A

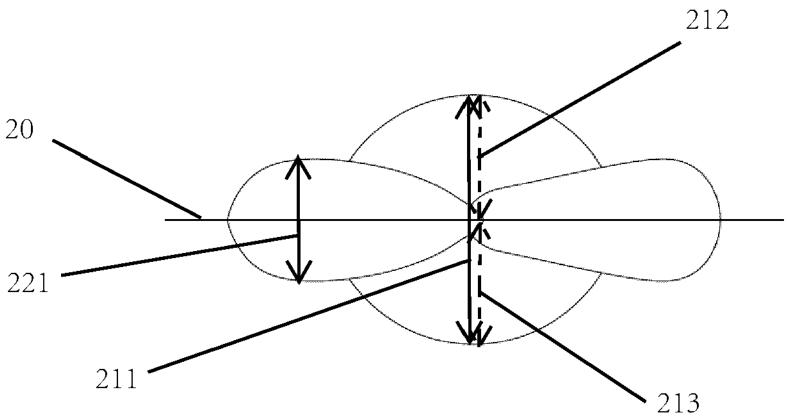

Figure 3B

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 December 2024	Loiselet-Taisne, S

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CATEGORY OF CITED DOCUMENTS

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