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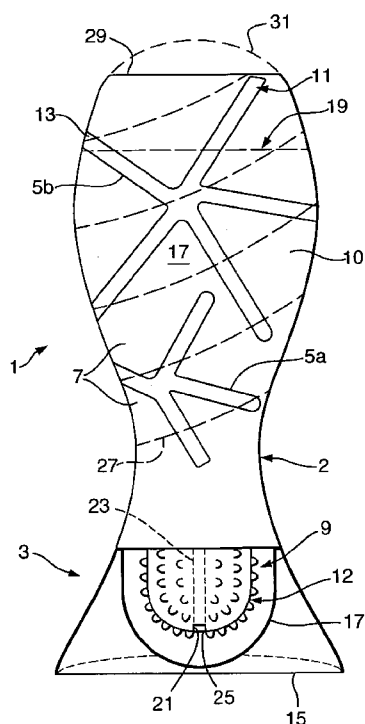
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(54) Title: MULTI-COLOURED LAUNDRY PRODUCTS

Fig.1.



(57) Abstract: A transparent fluid composition in packaging, the composition: (a) comprising 10 to 85% by wt. of a surfactant selected from the group consisting of anionic, nonionic, cationic, amphoteric, zwitterionic surfactants and mixtures thereof; and (b) having about 50% light transmittance or greater using a 1 cm cuvette at wavelength of 410-800 nanometers; and being contained within a deformable, bottom-dispensing packaging comprising: (c) having a viscosity of at least 100 Pa. s at rest or up to a shear stress of 10 Pa being contained within a deformable, bottom-dispensing packaging comprising: (i) a container comprising a front wall and opposing rear wall, (ii) each wall comprising an inner layer which is transparent such that its light transmittance is greater than 25% at wavelength of about 410- 800 nm, (iii) and an outer layer which is opaque such that its light transmittance is less than 25% at wavelength of about 410-800 nm; characterised in that at least a portion of the inner surface of the rear outer wall is coloured and the outer layer of the front wall incorporates one or more windows through which the coloured portion of the inner surface is visible.



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MULTI-COLOURED LAUNDRY PRODUCTS

The present invention relates to multi-coloured laundry products dispensed in deformable packaging.

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Bright, multi-coloured laundry products are visually interesting to the consumer and can be used to cue certain functional aspects, such as fabric colour maintenance, enhancement or improvement. Bottom dispensing packaging offers the consumer many advantages in terms of ease of dispensing. Viscous fluids may be stored in such packaging as higher viscosities reduce leakage from a bottom-oriented dispensing aperture or valve. However, multi-coloured laundry liquids within certain types of packaging, namely deformable bottom dispensing packaging, can present technical challenges. Multiple and distinct colours achieved chemically e.g. by phase-separation are adversely affected when deformable packaging is squeezed, as squeezing can lead to mixing of the phases. With viscous fluids, mixed phases can take some time to separate reducing the visual effect experienced by the consumer when using the product.

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The object of the present invention is to provide a multi-coloured viscous laundry composition in a deformable bottom dispensing packaging, which can be squeezed freely without mixing different colours but without the need for formulation modification.

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Accordingly, in a first aspect the invention provides a transparent fluid composition in packaging, the composition:

- (a) comprising 10 to 85% by wt. of a surfactant selected from the group consisting of anionic, nonionic, cationic, amphoteric, zwitterionic surfactants and mixtures thereof; and

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- (b) having about 50% light transmittance or greater using a 1 cm cuvette at wavelength of 410-800 nanometers; and
- (c) having a viscosity of at least 100 Pa.s at rest or up to a shear stress of 10 Pa being

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contained within a deformable, bottom-dispensing packaging comprising:

- (i) a container comprising a front wall and opposing rear wall,
 - (ii) each wall comprising an inner layer which is transparent such that its
10 light transmittance is greater than 25% at wavelength of about 410-800 nm,
 - (iii) and an outer layer which is opaque such that its light transmittance is less than 25% at wavelength of about 410-800 nm;
- 15 characterised in that at least a portion of the inner surface of the rear outer wall is coloured and the outer layer of the front wall incorporates one or more windows through which the coloured portion of the inner surface is visible.

The advantage of the above arrangement is that the fluid laundry composition can
20 be coloured with deep, vivid and distinct colours to create a stunning effect whilst still enabling squeezing of the deformable bottle which does not adversely affect the colour effects.

Preferably the entire inner surface of the rear wall is coloured. Preferably the
25 inner surface of the rear outer wall is coloured with multiple colours.

The colours are preferably bright vivid colours, and are defined by the CIE L*C*H* colour space. The L*C*H* colour space is in the form of a sphere.

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The vertical L* axis represents Luminance or lightness: from 0 representing no lightness (absolute black) at the bottom, with 50 at the middle to 100 representing maximum lightness (i.e. absolute white) at the top.

- 5 H* or H° axis represents Hue and is a circular horizontal axis passing through the centre. The units are in the form of degrees°, ranging from 0° (red) through 90° (yellow), 180° (green), 270° (blue) back to 0°.

The C* axis represents *Chroma* or "saturation": 0 at the centre of the circle is completely unsaturated (i.e. a neutral grey, black or white) through to 100 at the
10 edge of the circle which is maximum Chroma or saturation.

Preferably, C* is greater than 20.

The or each colour of the rear wall may be located in a region of the L*C*H*
15 sphere, said region forming an equatorial shell which passes through and is asymmetrical about the centre and occupies less than a third of the volume of the sphere. The inclusion in the composition of high levels of strong dyes/pigments to achieve vivid coloured compositions is therefore not required allowing for
20 formulations which are suitable for sensitive skin.

The package may comprise one or more side walls with inner and outer layers as defined above. The one or side walls may be coloured as for the rear wall.

It is preferred that the or each window is as small as possible so that the package
25 can offer protection to any light-sensitive components. However, at the same time it is preferred that a large number of colours, and more preferably all the colours are clearly visible through the or each window. These conflicting requirements are advantageously achieved by window(s) comprising one or more elongate
30 sections, each elongate section corresponding positionally (when viewed from the front) with at least three, and more preferably at least five, even more preferably at

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least seven colours on the inner surface of the outer rear wall. Preferably the window(s) correspond positionally with all colours of the rear wall.

5 Multiple windows may be arranged so that the elongate sections together positionally correspond with all the colours of the rear wall.

The colours may be in zones and the elongate sections positionally correspond by overlapping (when viewed from at least the front) with a portion of the zone.

10 Suitable materials for the transparent inner layer of the package include, but are not limited to: polypropylene (PP), polyethylene (PE), polycarbonate (PC), polyamides (PA) and/or polyethylene terephthalate (PETE), polyvinylchloride (PVC); and polystyrene (PS). The container may formed by extrusion, moulding e.g. blow moulding from a preform or by thermoforming or by injection moulding.

15 The transparent layer of the package according to the invention preferably has a transmittance of more than 25%, more preferably more than 30%, more preferably more than 40%, more preferably more than 50% in the visible part of the spectrum (approx. 410-800 nm).

20 Conversely the opaque layer of the package according to the invention preferably has a transmittance of less than 25%, more preferably less than 20%, more preferably less than 15%, more preferably less than 5% in the visible part of the spectrum (approx. 410-800 nm).

25 Alternatively, absorbency of transparent layer may be measured as less than 0.6 (approximately equivalent to 25% transmitting) or by having transmittance greater

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than 25% wherein % transmittance equals:

$$\frac{1}{10^{\text{absorbency}}} \times 100\%$$

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Conversely, absorbency of the opaque layer may be measured as more than 0.6.

For purposes of the invention, as long as one wavelength in the visible light range has greater than 25% transmittance, the container is considered to be
10 transparent.

All percentages, unless indicated otherwise, are intended to be percentages by weight.

- 15 The package is a bottom-dispensing packaging, wherein the packaging comprises a container (containing the fluid composition) and a dispensing device, the dispensing device being located at the base of the packaging. Preferably the dispensing device is enclosed by a closure device which also provides a supportive base of the package. The closure device may also comprise a dosing
20 device, for dosing the composition.

The package may have a curved top to deter users from storing the bottle top-down. In this way the package is more likely to be stored in a pretreater - loading position i.e. with the fluid laundry composition accumulated by gravity in the base
25 of the package.

Laundry Compositions

The composition preferably has a viscosity of at least 500 Pa.s.
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The composition is preferably a shear thinning gel-type composition. The viscosity under shear stress may be less than 300 Pa.s, preferably less than 100 Pa.s and more preferably less than 5 Pa.s, even more preferably it is at most 1 Pa.s and most preferably it is at most 0.5 Pa.s.

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Shear thinning compositions may comprise a polymer gum, e.g. Xanthan gum or other gum capable of forming stable continuous gum networks which can suspend particles.

- 10 Other external structurants e.g. hydrogenated castor oil, micro crystalline cellulose may be used.

Another method useful is to change a non-gelled formulation so as to form an internal structure therein where the structure gives the desired properties to the thus-formed gel-type detergent. The composition may comprise a soap or fatty acid in combination with sodium sulphate and one or more surfactants may be used to form a gelled structure by the formation of lamellar phases.

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- 20 The composition may comprise a lamellar phase dispersions from a micellar surfactant systems, and additionally a structurant for establishing the lamellar phase, whereby said structurant may be a fatty alcohol.

- 25 The compositions of the invention contains one or more surface active agents (surfactants) selected from the group consisting of anionic, nonionic, cationic, ampholytic and zwitterionic surfactants or mixtures thereof. The preferred surfactant detergents for use in the present invention are mixtures of anionic and nonionic surfactants although it is to be understood that any surfactant may be used alone or in combination with any other surfactant or surfactants. The surfactant should comprise at least 10% by wt. of the composition, e.g., 11% to

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85%, preferably at least 15% to 70% of the total composition, more preferably 16% to 65%; even more preferably 20% to 65%.

Nonionic Surfactant

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Nonionic synthetic organic detergents which can be used with the invention, alone or in combination with other surfactants, are described below.

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Nonionic detergents are characterized by the presence of an organic hydrophobic group and an organic hydrophilic group and are typically produced by the condensation of an organic aliphatic or alkyl aromatic hydrophobic compound with ethylene oxide (hydrophilic in nature). Typical suitable nonionic surfactants are those disclosed in U.S. Pat. Nos. 4,316,812 and 3,630,929.

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Usually, the nonionic detergents are polyalkoxylated lipophiles wherein the desired hydrophile-lipophile balance is obtained from addition of a hydrophilic poly-lower alkoxy group to a lipophilic moiety. A preferred class of nonionic detergent is the alkoxylated alkanols wherein the alkanol is of 9 to 18 carbon atoms and wherein the number of moles of alkylene oxide (of 2 or 3 carbon atoms) is from 3 to 12. Of such materials it is preferred to employ those wherein the alkanol is a fatty alcohol of 9 to 11 or 12 to 15 carbon atoms and which contain from 5 to 8 or 5 to 9 alkoxy groups per mole.

20

Exemplary of such compounds are those wherein the alkanol is of 12 to 15 carbon atoms and which contain about 7 ethylene oxide groups per mole, e.g. NeodolTM25-7 and NeodolTM23-6.5, which products are made by Shell Chemical Company, Inc. The former is a condensation product of a mixture of higher fatty alcohols averaging about 12 to 15 carbon atoms, with about 7 moles of ethylene oxide and the latter is a corresponding mixture wherein the carbon atoms content of the higher fatty alcohol is 12 to 13 and the number of ethylene oxide groups present averages about 6.5. The higher alcohols are primary alkanols.

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Other useful nonionics are represented the class of nonionics sold under the trademark Plurafac. The Plurafacs are the reaction products of a higher linear alcohol and a mixture of ethylene and propylene oxides, containing a mixed chain of ethylene oxide and propylene oxide, terminated by a hydroxyl group. Examples
 5 include C₁₃-C₁₅ fatty alcohol condensed with 6 moles ethylene oxide and 3 moles propylene oxide, C₁₃-C₁₅ fatty alcohol condensed with 7 moles propylene oxide and 4 moles ethylene oxide, C₁₃-C₁₅ fatty alcohol condensed with 5 moles propylene oxide and 10 moles ethylene oxide, or mixtures of any of the above.

10 Another group of liquid nonionics are commercially available from Shell Chemical Company, Inc. under the Dobanol trademark: Dobanol 91-5 is an ethoxylated C₉-C₁₁ fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 23-7 is an ethoxylated C₁₂-C₁₅ fatty alcohol with an average of 7 moles ethylene oxide per mole of fatty alcohol.

15 In the compositions of this invention, preferred nonionic surfactants include the C₁₂-C₁₅ primary fatty alcohols with relatively narrow contents of ethylene oxide in the range of from about 7 to 9 moles, and the C₉ to C₁₁ fatty alcohols ethoxylated with about 5-6 moles ethylene oxide.

20 Another class of nonionic surfactants which can be used in accordance with this invention are glycoside surfactants. Glycoside surfactants suitable for use in accordance with the present invention include those of the formula:

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$$RO-R'O_y(Z)_x$$

wherein R is a monovalent organic radical containing from 6 to 30 (preferably from 8 to 18) carbon atoms; R' is a divalent hydrocarbon radical containing from about 2 to 4 carbons atoms; O is an oxygen atom; y is a number which can have an
 30 average value of from 0 to about 12 but which is most preferably zero; Z is a

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moiety derived from a reducing saccharide containing 5 or 6 carbon atoms; and x is a number having an average value of from 1 to about 10 (preferably from 1.5 to 10).

- 5 A particularly preferred group of glycoside surfactants for use in the practice of this invention includes those of the formula above in which R is a monovalent organic radical (linear or branched) containing from 6 to 18 (especially from about 8 to about 18) carbon atoms; y is zero; z is glucose or a moiety derived therefrom; x is a number having an average value of from 1 to about 4 (preferably from about 1 to 4).

- Nonionic surfactants particularly useful for this application include, but are not limited to: alcohol ethoxylates (e.g. Neodol 25-9 from Shell Chemical Co.), alkyl phenol ethoxylates (e.g. Tergitol NP-9 from Union Carbide Corp.),
- 15 alkylpolyglucosides (e.g. GlucaponTM 600CS from Henkel Corp.), polyoxyethylenated polyoxypropylene glycols (e.g. PluronicTM L-65 from BASF Corp.), sorbitol esters (e.g. EmsorbTM 2515 from Henkel Corp.) , polyoxyethylenated sorbitol esters (e.g. EmsorbTM 6900 from Henkel Corp.), alkanolamides (e.g. AlkamideTM DC212/SE from Rhone-Poulenc Co.), and N-
- 20 alkylpyrrolidones (e.g. SurfadoneTM LP-100 from ISP Technologies Inc.).

Nonionic surfactant is used in the formulation from about 0% to about 70%, preferably between 5% and 50%, more preferably 10-40% by weight.

- 25 Mixtures of two or more of the nonionic surfactants can be used.

Anionic Surfactant Detergents

- Anionic surface active agents which may be used in the present invention are
- 30 those surface active compounds which contain a long chain hydrocarbon

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hydrophobic group in their molecular structure and a hydrophilic group, i.e.; water solubilizing group such as sulfonate or sulfate group. The anionic surface active agents include the alkali metal (e.g. sodium and potassium) water soluble higher alkyl benzene sulfonates, alkyl sulfonates, alkyl sulfates and the alkyl polyether sulfates. They may also include fatty acid or fatty acid soaps. The preferred anionic surface active agents are the alkali metal, ammonium or alkanolamide salts of higher alkyl benzene sulfonates and alkali metal, ammonium or alkanolamide salts of higher alkyl sulfonates. Preferred higher alkyl sulfonates are those in which the alkyl groups contain 8 to 26 carbon atoms, preferably 12 to 22 carbon atoms and more preferably 14 to 18 carbon atoms. The alkyl group in the alkyl benzene sulfonate preferably contains 8 to 16 carbon atoms and more preferably 10 to 15 carbon atoms. A particularly preferred alkyl benzene sulfonate is the sodium or potassium dodecyl benzene sulfonate, e.g. sodium linear dodecyl benzene sulfonate. The primary and secondary alkyl sulfonates can be made by reacting long chain alpha-olefins with sulfites or bisulfites, e.g. sodium bisulfite. The alkyl sulfonates can also be made by reacting long chain normal paraffin hydrocarbons with sulfur dioxide and oxygen as described in U.S. Pat. Nos. 2,503,280, 2,507,088, 3,372,188 and 3,260,741 to obtain normal or secondary higher alkyl sulfonates suitable for use as surfactant detergents.

The alkyl substituent is preferably linear, i.e. normal alkyl, however, branched chain alkyl sulfonates can be employed, although they are not as good with respect to biodegradability. The alkane, i.e. alkyl, substituent may be terminally sulfonated or may be joined, for example, to the carbon atom of the chain, i.e. may be a secondary sulfonate. It is understood in the art that the substituent may be joined to any carbon on the alkyl chain. The higher alkyl sulfonates can be used as the alkali metal salts, such as sodium and potassium. The preferred salts are the sodium salts. The preferred alkyl sulfonates are the C₁₀ to C₁₈ primary normal alkyl sodium and potassium sulfonates, with the C₁₀ to C₁₅ primary normal alkyl sulfonate salt being more preferred.

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Mixtures of higher alkyl benzene sulfonates and higher alkyl sulfonates can be used as well as mixtures of higher alkyl benzene sulfonates and higher alkyl polyether sulfates.

- 5 The alkali metal alkyl benzene sulfonate can be used in an amount of 0 to 70%, preferably 10 to 50% and more preferably 10 to 20% by weight.

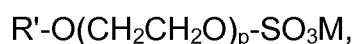
The alkali metal sulfonate can be used in admixture with the alkylbenzene sulfonate in an amount of 0 to 70%, preferably 10 to 50% by weight.

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Also normal alkyl and branched chain alkyl sulfates (e.g., primary alkyl sulfates) may be used as the anionic component).

- 15 The higher alkyl polyether sulfates used in accordance with the present invention can be normal or branched chain alkyl and contain lower alkoxy groups which can contain two or three carbon atoms. The normal higher alkyl polyether sulfates are preferred in that they have a higher degree of biodegradability than the branched chain alkyl and the lower poly alkoxy groups are preferably ethoxy groups.

- 20 The preferred higher alkyl poly ethoxy sulfates used in accordance with the present invention are represented by the formula:



- 25 where R' is C₈ to C₂₀ alkyl, preferably C₁₀ to C₁₈ and more preferably C₁₂ to C₁₅; P is 2 to 8, preferably 2 to 6, and more preferably 2 to 4; and M is an alkali metal, such as sodium and potassium, or an ammonium cation.

The sodium and potassium salts are preferred.

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A preferred higher alkyl poly ethoxylated sulfate is the sodium salt of a triethoxy C₁₂ to C₁₅ alcohol sulfate having the formula:



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Examples of suitable alkyl ethoxy sulfates that can be used in accordance with the present invention are C₁₂₋₁₅ normal or primary alkyl triethoxy sulfate, sodium salt; n-decyl diethoxy sulfate, sodium salt; C₁₂ primary alkyl diethoxy sulfate, ammonium salt; C₁₂ primary alkyl triethoxy sulfate, sodium salt; C₁₅ primary alkyl tetraethoxy sulfate, sodium salt, mixed C₁₄₋₁₅ normal primary alkyl mixed tri- and tetraethoxy sulfate, sodium salt; stearyl pentaethoxy sulfate, sodium salt; and mixed C₁₀₋₁₈ normal primary alkyl triethoxy sulfate, potassium salt.

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The normal alkyl ethoxy sulfates are readily biodegradable and are preferred. The alkyl poly-lower alkoxy sulfates can be used in mixtures with each other and/or in mixtures with the above discussed higher alkyl benzene, alkyl sulfonates, or alkyl sulfates.

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The alkali metal higher alkyl poly ethoxy sulfate can be used with the alkylbenzene sulfonate and/or with an alkyl sulfonate or sulfonate, in an amount of 0 to 70%, preferably 10 to 50% and more preferably 10 to 20% by weight of entire composition.

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Anionic surfactants particularly useful for this application include, but are not limited to: linear alkyl benzene sulfonates (e.g. VistaTM C-500 from Vista Chemical Co.), alkyl sulfates (e.g. PolystepTM B-5 from Stepan Co.), polyoxyethylenated alkyl sulfates (e.g. StandapolTM ES-3 from Stepan Co.), alpha olefin sulfonates (e.g. WitconateTM AOS from Witco Corp.), alpha sulfo methyl esters (e.g. Alpha-StepTM MC-48 from Stepan Co.) and isethionates (e.g. JordaponTM CI from PPG Industries Inc.).

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Anionic surfactant is used in the formulation from about 0% to about 60%, preferably between 5% and 40%, more preferably 8 to 25% by weight.

Cationic Surfactants

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Many cationic surfactants are known in the art, and almost any cationic surfactant having at least one long chain alkyl group of about 10 to 24 carbon atoms is suitable in the present invention. Such compounds are described in "Cationic Surfactants", Jungermann, 1970, incorporated by reference.

10 Specific cationic surfactants which can be used as surfactants in the subject invention are described in detail in U.S. Pat. No.4,497,718.

As with the nonionic and anionic surfactants, the compositions of the invention may use cationic surfactants alone or in combination with any of the other

15 surfactants known in the art. Of course, the compositions may contain no cationic surfactants at all.

Amphoteric Surfactants

20 Ampholytic synthetic detergents can be broadly described as derivatives of aliphatic or aliphatic derivatives of heterocyclic secondary and tertiary amines in which the aliphatic radical may be a straight chain or a branched and wherein one of the aliphatic substituents contains from about 8 to 18 carbon atoms and at least one contains an anionic water-solubilizing group, e.g. carboxy, sulfonate, sulfate.

25

Examples of compounds falling within this definition are sodium 3(dodecylamino)propionate, sodium 3-(dodecylamino)propane-1-sulfonate, sodium 2-(dodecylamino)ethyl sulfate, sodium 2-(dimethylamino)octadecanoate, disodium 3-(N-carboxymethyldodecylamino)propane 1-sulfonate, disodium
30 octadecyl-imminodiacetate, sodium 1-carboxymethyl-2-undecylimidazole, and

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sodium N,N-bis(2-hydroxyethyl)-2-sulfato-3-dodecoxypropylamine. Sodium 3-(dodecylamino)propane-1-sulfonate is preferred.

5 Zwitterionic surfactants can be broadly described as derivatives of secondary and tertiary amines, derivatives of heterocyclic secondary and tertiary amines, or derivatives of quaternary ammonium, quaternary phosphonium or tertiary sulfonium compounds. The cationic atom in the quaternary compound can be part of a heterocyclic ring. In all of these compounds there is at least one aliphatic group, straight chain or branched, containing from about 3 to 18 carbon atoms
10 and at least one aliphatic substituent containing an anionic water solubilizing group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate.

Specific examples of zwitterionic surfactants which may be used are set forth in U.S. Pat. No. 4,062,647.
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The amount of amphoteric used may vary from 0 to 50% by weight, preferably 1 to 30% by weight.

It should be noted that the compositions of the invention are preferably isotropic
20 (by which is generally understood to be a homogenous phase when viewed macroscopically) and either transparent or translucent.

Total surfactant used must be at least 10%, preferably at least 15%, more preferably at least 20% by wt.
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Builders/Electrolyte

Builders which can be used according to this invention include conventional alkaline detergency builders, inorganic or organic, which can be used at levels
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from about 0% to about 50% by weight of the composition, preferably from 3% to about 35% by weight.

As used herein, the term electrolyte means any water-soluble salt.

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Preferably the composition comprises at least 1.0% by weight, more preferably at least 5.0% by weight, most preferably at least 10.0% by weight of electrolyte. The electrolyte may also be a detergency builder, such as the inorganic builder sodium tripolyphosphate, or it may be a non-functional electrolyte such as sodium sulfate or chloride. Preferably the inorganic builder comprises all or part of the electrolyte.

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The composition may comprise at least 1%, preferably at least 3%, preferably 3% to as much as 50% by weight electrolyte.

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The compositions of the invention are capable of suspending particulate solids, although particularly preferred are those systems where such solids are actually in suspension. The solids may be undissolved electrolyte, the same as or different from the electrolyte in solution, the latter being saturated electrolyte. Additionally, or alternatively, they may be materials which are substantially insoluble in water alone. Examples of such substantially insoluble materials are aluminosilicate builders and particles of calcite abrasive.

20

Examples of suitable inorganic alkaline detergency builders which may be used are water-soluble alkali metal phosphates, polyphosphates, borates, silicates and also carbonates. Specific examples of such salts are sodium and potassium triphosphates, pyrophosphates, orthophosphates, hexametaphosphates, tetraborates, silicates, and carbonates.

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Examples of suitable organic alkaline detergency builder salts are: (1) water-

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soluble amino polycarboxylates, e.g., sodium and potassium ethylenediaminetetraacetates, nitrilotriacetates and N-(2 hydroxyethyl)-nitrilodiacetates; (2) water-soluble salts of phytic acid, e.g., sodium and potassium phytates (see U.S. Pat. No. 2,379,942); (3) water-soluble polyphosphonates, including specifically, sodium, potassium and lithium salts of ethane-1-hydroxy-1,1-diphosphonic acid; sodium, potassium and lithium salts of methylene diphosphonic acid; sodium, potassium and lithium salts of ethylene diphosphonic acid; and sodium, potassium and lithium salts of ethane-1,1,2-triphosphonic acid. Other examples include the alkali metal salts of ethane-2-carboxy-1,1-diphosphonic acid hydroxymethanediphosphonic acid, carboxyldiphosphonic acid, ethane-1-hydroxy-1,1,2-triphosphonic acid, ethane-2-hydroxy-1,1,2-triphosphonic acid, propane-1,1,3,3-tetraphosphonic acid, propane-1,1,2,3-tetraphosphonic acid, and propane-1,2,2,3-tetra-phosphonic acid; (4) water-soluble salts of polycarboxylates polymers and copolymers as described in U.S. Patent No. 3,308,067.

In addition, polycarboxylate builders can be used satisfactorily, including water-soluble salts of mellitic acid, citric acid, and carboxymethyloxysuccinic acid, salts of polymers of itaconic acid and maleic acid, tartrate monosuccinate, tartrate disuccinate and mixtures thereof (TMS/TPS).

Certain zeolites or aluminosilicates can be used. One such aluminosilicate which is useful in the compositions of the invention is an amorphous water-insoluble hydrated compound of the formula $\text{Na}_x[(\text{AlO}_2)_y(\text{SiO}_2)]$, wherein x is a number from 1.0 to 1.2 and y is 1, said amorphous material being further characterized by a Mg^{++} exchange capacity of from about 50 mg eq. CaCO_3/g . and a particle diameter of from 0.01 mm to 5 mm. This ion exchange builder is more fully described in British Patent No. 1,470,250.

A second water-insoluble synthetic aluminosilicate ion exchange material useful herein is crystalline in nature and has the formula $\text{Na}_2[(\text{AlO}_2)_y(\text{SiO}_2)]_x\text{H}_2\text{O}$, wherein

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z and y are integers of at least 6; the molar ratio of z to y is in the range from 1.0 to about 0.5, and x is an integer from 15 to 264; said aluminosilicate ion exchange material having a particle size diameter from 0.1 mm to 100 mm; a calcium ion exchange capacity on an anhydrous basis of at test about 200 milligrams equivalent of CaCO_3 hardness per gram; and a calcium exchange rate on an anhydrous basis of at least 2 grains/gallon/minute/gram. These synthetic aluminosilicates are more fully described in British Patent No. 1,429,143.

Enzymes

Enzymes which may be used in the subject invention are described in greater detail below.

If a lipase is used, the lipolytic enzyme may be either a fungal lipase producible by Humicola lanuginosa and Thermomyces lanuginosus, or a bacterial lipase which show a positive immunological cross-reaction with the antibody of the lipase produced by the microorganism *Chromobacter viscosum* var. *lipolyticum* NRRL B-3673. This microorganism has been described in Dutch patent specification 154,269 of Toyo Jozo Kabushiki Kaisha and has been deposited with the Fermentation Research Institute, Agency of Industrial Science and Technology, Ministry of International Trade and Industry, Tokyo, Japan, and added to the permanent collection under nr. KO Hatsu Ken Kin Ki 137 and is available to the public at the United States Department of Agriculture, Agricultural Research Service, Northern Utilization and Development Division at Peoria, Ill., USA, under the nr. NRRL B-3673. The lipase produced by this microorganism is commercially available from Toyo Jozo Co., Tagata, Japan, hereafter referred to as "TJ lipase". These bacterial lipases should show a positive immunological cross-reaction with the TJ lipase antibody, using the standard and well-known immune diffusion procedure according to Ouchterlony (*Acta. Med. Scan.*, 133. pages 76-79 (1930)).

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The preparation of the antiserum is carried out as follows:

Equal volumes of 0.1 mg/ml antigen and of Freund's adjuvant (complete or incomplete) are mixed until an emulsion is obtained. Two female rabbits are
5 injected 45 with 2 ml samples of the emulsion according to the following scheme:

day 0: antigen in complete Freund's adjuvant

day 4: antigen in complete Freund's adjuvant

day 32: antigen in incomplete Freund's adjuvant

day 64: booster of antigen in incomplete Freund's adjuvant

10

The serum containing the required antibody is prepared by centrifugation of clotted blood, taken on day 67.

The titre of the anti-TJ-lipase antiserum is determined by the inspection of
15 precipitation of serial dilutions of antigen and antiserum according to the Ouchterlony procedure. A dilution of antiserum was the dilution that still gave a visible precipitation with an antigen concentration of 0.1 mg/ml.

All bacterial lipases showing a positive immunological cross reaction with the TJ-lipase antibody as hereabove described are lipases suitable in this embodiment of
20 the invention. Typical examples thereof are the lipase ex *Pseudomonas fluorescens* IAM 1057 (available from Amano Pharmaceutical Co., Nagoya, Japan, under the trade-name Amano-P lipase), the lipase ex *Pseudomonas fragi* FERM P 1339 (available under the trade-name Amano B), the lipase ex
25 *Pseudomonas nitroreducens* var. *lipolyticum* FERM P1338, the lipase ex *Pseudomonas* sp. (available under the trade-name Amano CES), the lipase ex *Pseudomonas cepacia*, lipases ex *Chromobacter viscosum*, e.g. *Chromobacter viscosum* var. *lipolyticum* NRRL B-3673, commercially available from Toyo Jozo Co., Tagata, Japan; and further *Chromobacter viscosum* lipases from U.S.
30 Biochemical Corp. USA and Diosynth Co., The Netherlands, and

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lipases ex *Pseudomonas gladioli*.

An example of a fungal lipase as defined above is the lipase ex *Humicola lanuginosa* available from Amano under the tradename Amano CE; the lipase ex
5 *Humicola lanuginosa* as described in the aforesaid European Patent Application 0,258,068 (NOVO), as well as the lipase obtained by cloning the gene from *Humicola lanuginosa* and expressing this gene in *Aspergillus oryzae*, commercially available from NOVO industri A/S under the tradename "Lipolase". This lipolase is a preferred lipase for use in the present invention.

10 While various specific lipase enzymes have been described above, it is to be understood that any lipase which can confer the desired lipolytic activity to the composition may be used and the invention is not intended to be limited in any way by specific choice of lipase enzyme.

15 The lipases of this embodiment of the invention are included in the liquid detergent composition in such an amount that the final composition has a lipolytic enzyme activity of from 100 to 0.005 LU/ml in the wash cycle, preferably 25 to 0.05 LU/ml when the formulation is dosed at a level of about 0.1-10, more
20 preferably 0.5-7, most preferably 1-2 g/liter.

A Lipase Unit (LU) is that amount of lipase which produces 1/mmol of titratable fatty acid per minute in a pH state under the following conditions: temperature
25 30°C.; pH =9.0; substrate is an emulsion of 3.3 wt. % of olive oil and 3,3% gum arabic, in the presence of 13 mmol/l Ca^{2+} and 20 mmol/l NaCl in 5 mmol/l Trisbuffer.

Naturally, mixtures of the above lipases can be used. The lipases can be used in their non-purified form or in a purified form, e.g. purified with the aid of well-known
30 absorption methods, such as phenyl sepharose absorption techniques.

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If a protease is used, the proteolytic enzyme can be of vegetable, animal or microorganism origin. Preferably, it is of the latter origin, which includes yeasts, fungi, molds and bacteria. Particularly preferred are bacterial subtilisin type proteases, obtained from e.g. particular strains of *B. subtilis* and *B. licheniformis*.

- 5 Examples of suitable commercially available proteases are AlcalaseTM, SavinaseTM, EsperaseTM, all of NOVO Industri A/S; MaxataseTM and MaxacalTM of Gist-Brocades; KazusaseTM of Showa Denko; BPN and BPN' proteases and so on. The amount of proteolytic enzyme, included in the composition, ranges from 0.05-50,000 GU/mg. preferably 0.1 to 50 GU/mg, based on the final composition.
- 10 Naturally, mixtures of different proteolytic enzymes may be used.

- While various specific enzymes have been described above, it is to be understood that any protease which can confer the desired proteolytic activity to the composition may be used and this embodiment of the invention is not limited in
- 15 any way be specific choice of proteolytic enzyme.

- In addition to lipases or proteases, it is to be understood that other enzymes such as cellulases, oxidases, amylases, peroxidases and the like which are well known in the art may also be used with the composition of the invention. The enzymes
- 20 may be used together with cofactors required to promote enzyme activity, i.e., they may be used in enzyme systems, if required. It should also be understood that enzymes having mutations at various positions (e.g., enzymes engineered for performance and/or stability enhancement) are also contemplated by the invention. One example of an engineered commercially available enzyme is
- 25 Durazym from Novo.

The formulation may be enzyme free i.e. 0% by weight of enzymes.

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Optional Ingredients

In addition to the enzymes mentioned above, a number of other optional ingredients may be used.

5

Alkalinity buffers which may be added to the compositions of the invention include monoethanolamine, triethanolamine, borax, sodium silicate and the like.

10

Hydrotropes which may be added to the invention include ethanol, sodium xylene sulfonate, sodium cumene sulfonate and the like.

15

Other materials such as clays, particularly of the water-insoluble types, may be useful adjuncts in compositions of this invention. Particularly useful is bentonite. This material is primarily montmorillonite which is a hydrated aluminum silicate in which about 1/6th of the aluminum atoms may be replaced by magnesium atoms and with which varying amounts of hydrogen, sodium, potassium, calcium, etc. may be loosely combined. The bentonite in its more purified form (i.e. free from any grit, sand, etc.) suitable for detergents contains at least 30% montmorillonite and thus its cation exchange capacity is at least about 50 to 75 meg per 100g of bentonite. Particularly preferred bentonites are the Wyoming or Western U.S. bentonites which have been sold as Thixo-jels 1, 2, 3 and 4 by Georgia Kaolin Co. These bentonites are known to soften textiles as described in British Patent No. 401,413 to Marriott and British Patent No. 461,221 to Marriott and Guam.

20

25

In addition, various other detergent additives or adjuvants may be present in the detergent product to give it additional desired properties, either of functional or aesthetic nature.

30

Improvements in the physical stability and anti-settling properties of the composition may be achieved by the addition of a small effective amount of an

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aluminum salt of a higher fatty acid, e.g., aluminum stearate, to the composition. The aluminum stearate stabilizing agent can be added in an amount of 0 to 3%, preferably 0.1 to 2.0% and more preferably 0.5 to 1.5%.

- 5 There also may be included in the formulation, minor amounts of soil suspending or anti-redeposition agents, e.g. polyvinyl alcohol, fatty amides, sodium carboxymethyl cellulose, hydroxy-propyl methyl cellulose, A preferred anti-redeposition agent is sodium carboxymethyl cellulose having a 2:1 ratio of CM/MC which is sold under the tradename Relatin DM 4050.

10

Another minor ingredient is soil releasing agents, e.g. deflocculating polymers. In general, a deflocculating polymer comprises a hydrophilic backbone and one or more hydrophobic side chains.

- 15 The deflocculating polymer of the invention is described in greater detail in U.S. Pat. No. 5,147,576.

The deflocculating polymer generally will comprise, when used, from 0.1 to 5% of the composition, preferably 0.1 to 2% and most preferably, 0.5 to 1.5%.

20

Optical brighteners for cotton, polyamide and polyester fabrics can be used. Suitable optical brighteners include TinopalTM, stilbene, triazole and benzidine sulfone compositions, especially sulfonated substituted triazinyl stilbene, sulfonated naphthotriazole stilbene, benzidine sulfone, etc., most preferred are
25 stilbene and triazole combinations. A preferred brightener is Stilbene Brightener N4 which is a dimorpholine dianilino stilbene sulfonate.

Anti-foam agents, e.g. silicone compounds, such as Silicane L 7604, can also be added in small effective amounts.

30

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Bactericides, e.g. tetrachlorosalicylanilide and hexachlorophene, fungicides, dyes, pigments (water dispersible), preservatives, e.g. formalin, ultraviolet absorbers, anti-yellowing agents, such as sodium carboxymethyl cellulose, pH modifiers and pH buffers, color safe bleaches, perfume and dyes and bluing agents such as
5 Iragon Blue L2D, Detergent Blue 472/372 and ultramarine blue can be used.

Also, soil release polymers and cationic softening agents may be used.

The list of optional ingredients above is not intended to be exhaustive and other
10 optional ingredients which may not be listed, but are well known in the art, may also be included in the composition.

Optionally, the inventive compositions may contain all or some the following ingredients: zwitterionic surfactants (e.g. MirataineTM BET C-30 from Rhone-
15 Poulenc Co.), cationic surfactants (e.g. SchercamoxTM DML from Scher Chemicals, Inc.), fluorescent dye, antiredeposition polymers, antidye transfer polymers, soil release polymers, protease enzymes, lipase enzymes, amylase enzymes, cellulase enzymes, peroxidase enzymes, enzyme stabilizers, perfume, opacifiers, UV absorbers, builders, and suspended particles of size range 300-
20 5000 microns.

The compositions of the invention have at least 50% transmittance of light using a 1 centimeter cuvette, at a wavelength of 410-800 nanometers, preferably 570-690 nm wherein the composition is substantially free of dyes.

25

Alternatively, transparency of the composition may be measured as having an absorbency in the visible light wavelength (about 410 to 800 nm) of less than 0.3 which is in turn equivalent to at least 50% transmittance using cuvette and wavelength noted above. For purposes of the invention, as long as one

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wavelength in the visible light range has greater than 50% transmittance, it is considered to be transparent/translucent.

Measurement of Absorbency and Transmittance

5

Instrument: Milton Roy Spectronic 601

Procedure:

- 10 1. Both the spectrophotometer and the power box were turned on and allowed to warm up for 30 minutes.
2. Set the wavelength
 - type in the desired wavelength on the keypad (i.e., 590, 640, etc.)
 - 15 - press the [second function] key
 - press the "go to 8" [yes] key
 - machine is then ready to read at the chosen wavelength.
3. Zero the instrument
 - 20 - press the [second function] key
 - press the "zero A" [% T/A/C]
 - instrument should then read "XXX NM 0.000 A T"
4. Open the cover, place sample vertically and in front of the sensor.
- 25 5. Close the lid and record reading (ex. 640 NM 0.123 A T)

*Note: all readings are taken in "A" mode (absorbency mode)

*Note: zero instrument with every new wavelength change and/or new sample.

30

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Absorbency Values for Two Typical Plastic Bottles		
Wavelength Nm	Polyethylene (HDPE); 0.960 mm thickness	Polypropylene (PP); 0.423 mm thickness
254 (non-visible)	1.612	1.886
310 (non-visible)	1.201	0.919
360 (non-visible)	0.980	0.441
590 (visible range)	0.525	0.190
640 (visible range)	0.477	0.169

Various non-limiting embodiments of the invention will now be more particularly described.

5 Figure 1 shows a front view of a bottle according to embodiments of the invention.

Referring to fig 1, a package comprising a deformable, plastic bottle 1 is shown containing a highly viscous transparent liquid or gel composition 17 (filled to level 19 although this is not visible) according to Table 1 below.

10

The composition is transparent with 50% light transmittance using a 1 cm cuvette at wavelength of 410-800 nanometers.

15 The bottle 1 has a container 2 comprising a front wall 10 and opposing rear wall 11, visible through uppermost of sections 13 (described below) and side walls (not shown) each wall 10, 11 comprising an inner layer which is transparent such that its light transmittance is greater than 25% at wavelength of about 410-800 nm, and an outer layer which is opaque such that its light transmittance is less than 25% at wavelength of about 410-800 nm. The outer layer is achieved by means
20 of a shrink sleeve.

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The entire inner surface area of the rear outer wall 11 is vividly coloured in bands or zones 7 each of a different vivid colour 7 and borders 27 between the zones 7 and the outer layer of the front layer has windows 5a 5b (which in this embodiment are cut-outs or through-holes) through which colours of the coloured back wall 11 are visible.

The colours are bright vivid colours, and are defined by the CIE L*C*H* colour space. The L*C*H* colour space is in the form of a sphere.

10 The vertical L* axis represents Luminance or lightness: from 0 representing no lightness (absolute black) at the bottom, with 50 at the middle to 100 representing maximum lightness (i.e. absolute white) at the top.

15 H* or H° axis represents Hue and is a circular horizontal axis passing through the centre. The units are in the form of degrees°, ranging from 0° (red) through 90° (yellow), 180° (green), 270° (blue) back to 0°.

The C* axis represents *Chroma* or "saturation": 0 at the centre of the circle is completely unsaturated (i.e. a neutral grey, black or white) through to 100 at the edge of the circle which is maximum Chroma or saturation.

20 The or each colour of the rear wall can be located in the region forming a horizontal spherical segment which passes through and is asymmetrical about the centre and occupies less than a third of the volume of the sphere.

25

Each window comprises elongate sections 13, each elongate section 13 corresponding positionally (when viewed from the front i.e. as in figure 1) with at least three colours on the inner surface of the outer rear wall. Together the windows 5a 5b correspond positionally with all the colours of the rear wall.

30 Positional correspondence is achieved by overlapping with zones 7.

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The elongate zones are branched for added visual stimulus.

Suitable materials for the layers of the package include, but are not limited to: polypropylene (PP), polyethylene (PE), polycarbonate (PC), polyamides (PA) and/or polyethylene terephthalate (PETE), polyvinylchloride (PVC); and

5 polystyrene (PS). The container is formed from.

The opaque layer of the package can be any suitably opaque material with a transmittance of 5% in the visible part of the spectrum (approx. 410-800 nm).

The transparent layer of the package is the rigid bottle body and is 0.2 mm thick
10 PET and has a transmittance of 50% in the visible part of the spectrum (approx. 410-800 nm).

The opaque layer is a tightly fitted sleeve and is applied to the bottle (after the stretch blow moulding) by heat shrinking. The windows may be defined by lines of
15 perforations so that the unwanted material is removed to form the windows after application of the sleeve.

The package 1 is bottom-dispensing and accordingly comprises a dispensing device 9 located at the base of the container 2. The dispensing device 9 shown
20 comprises a pretreater 11 but this is optional. The dispensing device 9 is enclosed by a dosing closure device 15 which itself comprises a supportive base of the package. The bottle container 2 and dispensing device 9 are connected to each other by threaded or snap-fit connections.

25 The top 29 of the bottle is shown flat but in other embodiments it may be curved as shown in dotted line 31 to discourage storage top-down.

The closure 15 includes an enlarged (with respect to at least the neck region of the bottle) flat, generally planar bottom surface 15. By providing an enlarged flat
30 top surface 15, the surface allows the closure 13 to function as a supportive base

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13 with the bottle 7 in an inverted position thereby allowing the composition to accumulate (under gravity) during storage at the dispensing device 9.

5 In addition, the closure 15 includes a reservoir portion 17 in which the pretreater 12 is enclosed. The closure is taped outwardly toward the surface 15 to provide a stable base. The area of the surface 15 is greater than that of the top 21 of the device.

10 The dispensing device 9 comprises an orifice through which dispensing may occur. The orifice includes a valve 21 in fluid communication via duct 23. The valve 21 comprises a membrane extending across an orifice 25 in the dispensing part 9.

15 In one embodiment, the membrane has an arcuate portion (not shown) directed toward the container 7. The arcuate portion of the membrane is provided with a intersecting slits to define a plurality of generally triangular leaves. When contents of the container are pressurized for dispensing, the triangular leaves bend toward the open end of the orifice 25 allowing product to pass through the orifice 25. When the dispensing pressure is released, the triangular leaves spring back to
20 their original position and operate to block passage of product through the orifice 25. The leaves of the valve are sufficiently resilient that they do not bend open unless the applied pressure exceeds the hydraulic static head pressure generated by a full of condiment. In use, the fluid is pressurised to flow past and partially collect on the pretreater part 12 ready for cleaning.

25

Any of the fluid which remains on the pretreater part 12, can drip from the pretreater during storage and is collected in the reservoir portion 17 for use in the next wash. This reduces waste of product.

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In both embodiments described here, the container is rigid. However, it will be appreciated that the present invention can be adapted for use with flexible packages such as bags, pouches and the like.

Table 1. Exemplary Transparent Detergent Formulation

5

Ingredient as 100% active	Wt %
Neodol 25-9*	6-8
Alcohol ethoxy sulfate	12-15
Linear alkylbenzene sulfonate	6-9
Sodium citrate, dihydrate	3-6
Propylene glycol	4-8
Sorbitol	3-6
Sodium tetraborate pentahydrate	2-4
Minor additives and water	to 100%

*C₁₂-C₁₅ alkoxyated (9EO) chain group

10 The advantage of this arrangement is that the liquid 17, although transparent, appears vividly coloured, deep colours being used to create a stunning effect whilst still enabling formulation to be suitable for sensitive skin.

15 It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiments which are described by way of example only.

- 30 -

CLAIMS

1. A transparent fluid composition in packaging, the composition:

- 5 (a) comprising 10 to 85% by wt. of a surfactant selected from the group consisting of anionic, nonionic, cationic, amphoteric, zwitterionic surfactants and mixtures thereof; and
- (b) having about 50% light transmittance or greater using a 1 cm cuvette at wavelength of 410-800 nanometers; and
- 10 (c) having a viscosity of at least 100 Pa.s at rest or up to a shear stress of 10 Pa being

contained within a deformable, bottom-dispensing packaging comprising:

- 15 (i) a container comprising a front wall and opposing rear wall,
- (ii) each wall comprising an inner layer which is transparent such that its light transmittance is greater than 25% at wavelength of about 410-800 nm,
- (iii) and an outer layer which is opaque such that its light transmittance
- 20 is less than 25% at wavelength of about 410-800 nm;

characterised in that at least a portion of the inner surface of the rear outer wall is coloured and the outer layer of the front wall incorporates one or more windows through which the coloured portion of the inner surface is visible.

25

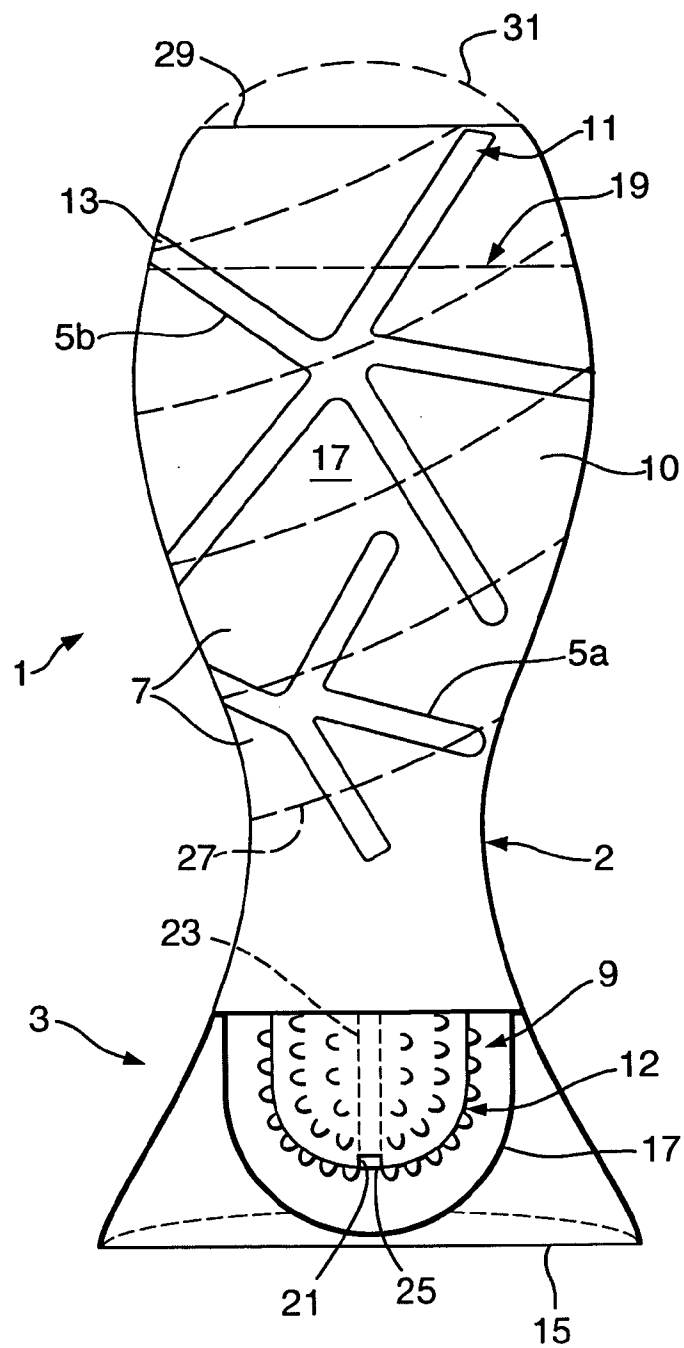
2. A transparent fluid composition in packaging according to claim 1 wherein the entire inner surface of the rear wall is coloured.

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3. A transparent fluid composition in packaging according to any preceding claim wherein the surface of the rear outer wall is coloured with multiple colours.
- 5 4. A transparent fluid composition in packaging according to any preceding claim wherein the or each window comprises one or more elongate sections, each elongate section corresponding positionally (when viewed from the front) with at least three colours on the inner surface of the outer rear wall.
- 10 5. A transparent fluid composition in packaging according to any preceding claim wherein the packaging comprises a dispensing device at the base of the container.
- 15 6. A transparent fluid composition in packaging according to any preceding claim wherein the dispensing device is enclosed by a closure device which also provides a supportive base of the package.
- 20 7. A transparent fluid composition in packaging according to any preceding claim in which the closure device also comprises a dosing device, for dosing the composition.
- 25 8. A transparent fluid composition in packaging according to any preceding claim wherein the package has a curved top.
9. The combination of any preceding claim wherein the transparent layer has a transmittance of more than 25% in the visible part of the spectrum.
10. The combination of any preceding claim wherein the opaque layer has a transmittance of less than 25% in the visible part of the spectrum.

1/1

Fig.1.



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/065441

A. CLASSIFICATION OF SUBJECT MATTER
 INV. C11D17/04 B65D65/16

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D C11D

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

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

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2007/052226 A (PROCTER & GAMBLE [US]; DAVIS CHANDA JANESE [US]; CAIN DAVID EDWARD [US] 10 May 2007 (2007-05-10) page 5, line 3 - line 12; claims 1-9; figure 2 page 6, line 27 - line 31 page 10, line 9 page 7, line 14 - line 15 -----	1-10
Y	WO 2007/130569 A (PROCTER & GAMBLE [US]; DE BUZZACCARINI FRANCESCO [BE]; DE WREE ANN [BE] 15 November 2007 (2007-11-15) claims 1-10 -----	1-10
A	WO 01/85568 A (UNILEVER PLC [GB]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]) 15 November 2001 (2001-11-15) claims 1-22 ----- -/-	1-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/065441

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2009/065441

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