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"SOIL RELEASE PROMOTING LIQUID DETERGENT"

- The present invention relates to liquid detergent compositions. More particularly, it relates to such compositions which contain a soil release promoting polymer which deposits on polyesters and polyester blend materials during washing thereof and promotes the release from them of subsequently applied lipophilic soils. Preferably the liquid detergent may include an enzyme to assist in cleaning, with a stabilizer for the enzyme, and may also include a fabric softening component, such as a quaternary ammonium salt. Surprisingly, the compositions of the present invention are physically and functionally stable on storage, even when they contain the enzyme(s) and fabric softener(s).
- Liquid detergents have been employed for the washing of household laundry items in washing machines and have often been applied to soiled areas of the laundry, such as shirt collars, before washing. The employment of copolymers of polyethylene terephthalate and polyoxyethylene terephthalate in detergent compositions as soil release promoting agents has been described in various patents, some of which related to liquid preparations. However, the liquid detergents described are not of the type of the present invention because those of the patents contain tri-ethanolamine and/or ionizable, water soluble salts (other than anionic detergents) which tend to cause separation of the liquid detergent and

destabilization the soil release promoting polymer on storage so that it becomes less effective for promoting soil release afterward.

- In liquid detergents enzymes tend to lose
5. activity on storage unless stabilized, as by salts, e.g. sodium formate, glycols, e.g. propylene glycol, or other such materials. However such salts tend to destabilize quaternary ammonium halide fabric softeners and the copolymer soil release promoting
 10. agents which are desirable components of the liquid detergents of the present invention, and such destabilization of the soil release agent is especially bad in the presence of lower alkanol-
 15. amines or salts thereof, such as triethanolamine (TEA), the presence of which will be avoided in accordance with the present invention. Therefore it was surprising that the present liquid detergents could be made in clear and stable non-separating form, with the various functional components thereof
 20. being effective after storage at elevated temperatures.

- In accordance with the present invention a soil release promoting liquid detergent comprises (A) a
25. deterative proportion of nonionic detergent or a mixture of nonionic and anionic detergents, the proportion of nonionic detergent or a mixture of nonionic and anionic detergents being within the range of 25 to 50%, (B) a soil release promoting proportion of a soil release promoting polymer of
 30. polyethylene terephthalate and polyoxyethylene terephthalate and an aqueous medium, (C) optionally a water soluble alkali metal lower carboxylate in an amount up to 2% by weight, (D) the composition being

- free of water soluble ionizable salt which is not an anionic surface active water soluble salt, and which is not component (C), or containing not more than 1% by weight of such salts, and (E) the composition
5. being free of triethanolamine or salts thereof or containing no more than 1% by weight thereof, the pH of the composition being in the range of 6 to 9. The invention also extends to a method of manufacturing compositions in accordance with the present
10. invention.

- Preferred liquid compositions in accordance with the present invention also contain enzymes and enzyme stabilizers, more preferably with fabric softener also being present. Thus a stable, enzyme-
15. containing liquid detergent in accordance with the present invention comprises a deterative proportion of a nonionic detergent, a detergent supplementing and fluorescent brightener substantivity increasing proportion of a higher fatty alcohol polyethoxylate
20. sulphate detergent, a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate, a proportion of enzyme sufficient to enzymatically hydrolyze proteinaceous and/or amylaceous soils
25. on fabrics during washing thereof with an aqueous washing solution of the liquid detergent, a stabilizing proportion of a stabilizer for the enzyme(s), and an aqueous medium, optionally a water soluble alkali metal lower carboxylate in an amount up to 2%
30. by weight, the composition being free of water

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- soluble ionizable material other than the higher fatty alcohol polyethoxylate sulphate detergent and which is not component (C), or containing not more than 1% by weight of such salts, and (E) the
5. composition being free of triethanolamine or salts thereof or containing no more than 1% by weight thereof, the pH of the composition being in the range of 6 to 9. Similarly a stable, fabric softening, soil release promoting, enzyme-containing
 10. liquid detergent in accordance with the present invention comprises a deterative proportion of a nonionic detergent, a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene
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- terephthalate, a softening proportion of a quaternary ammonium salt fabric softener, a proportion of enzyme sufficient to enzymatically hydrolyze proteinaceous and/or amylaceous soils, on fabrics
5. during washing thereof with an aqueous washing solution of the liquid detergent, a stabilizing proportion of a stabilizer for the enzyme(s), and an aqueous medium, optionally a water soluble alkali metal lower carboxylate in an amount up to 2% by
 10. weight, the composition being free of ionizable material, and which is not component (C), or containing no more than 1% by weight of such salt, and the composition being free of triethanolamine or salts thereof or containing no more than 1% by
 15. weight thereof, the pH of the composition being in the range of 6 to 9.

- Although various synthetic organic nonionic detergents of satisfactory physical characteristics may be utilized, including condensation products of
20. ethylene oxide and propylene oxide with each other and with hydroxyl-containing bases, such as nonyl phenol and Oxo-type alcohols, for best results it is highly preferred that the nonionic detergent be a condensation product of ethylene oxide and a higher
 25. fatty alcohol. In such products the higher fatty alcohol is of 10 to 20 carbon atoms, preferably 12 to 15 or 16 carbon atoms, and the nonionic detergent contains from 2 or 3 to 20 or 30 ethylene oxide groups per mole, preferably from 6 to 11 or 12.
 30. Most preferably, the nonionic detergent will be one in which the higher fatty alcohol is of about 12 to 15 or 12 to 14 carbon atoms and which contains from 6 or 7 to 11 moles of ethylene oxide, e.g. 7. Among

such detergents is Alfonic (Registered Trade Mark) 1214-60C, sold by the Conoco Division of E.I. DuPont de Nemours, Inc., and Neodols (Registered Trade Mark) 23-6.5 and 25-7, available from Shell Chemical Company. Among their especially attractive properties, in addition to good detergency with respect to oily and greasy soil deposits on goods to be washed, and excellent compatibility with the present polymeric soil release promoting agents, are compatibilities with soluble anionic detergents of the linear higher alkylbenzene sulphonate and higher fatty alcohol polyethoxylate sulphate types, enzymes, enzyme stabilizers, fabric softeners and other components of the compositions of the present invention, and long term viscosity stability in aqueous and aqueous alcoholic solutions.

The anionic detergent which may be employed in the liquid detergents within the broader aspects of the present invention is preferably a higher linear alkylbenzene sulphonate or a higher fatty alcohol polyethoxylate sulphate. Normally, water soluble salts of such materials are preferred, such as the alkali metal salts, and of these, sodium salts are usually preferred over the potassium salts. When the anionic detergent is a sodium higher alkylbenzene sulphonate the higher alkyl group will normally be of 10 to 18 carbon atoms, preferably 12 to 16 carbon atoms and more preferably 12 or 13 carbon atoms, e.g. 12. When such an anionic detergent is a higher fatty alcohol polyethoxylate

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5. sulphate, as is the case with the enzyme-containing liquids, in which the detergent increases detergency and promotes an increase in substantivity of any fluorescent brightener present, the higher fatty alcohol will preferably be of 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms and more preferably 12 to 13 or 12 to 15 carbon atoms, and the polyethoxylate will preferably include 1, 2 or 3 to 20 ethoxy groups, preferably 3 to 10 thereof, and
10. more preferably 3 to 6 or 7, e.g. 3, 5, 6.5 or 7. While not preferred, mixtures of such anionic detergents may be employed in the non-enzyme compositions usually in ratios of 1:10 to 10:1, such as 1:2 to 2:1. Anionic detergents and surfactants will
15. normally be omitted from the fabric softening liquid detergent compositions in accordance with the present invention.

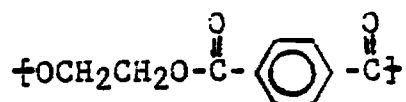
- The soil release promoting polymer, which is an essential component of the compositions of the
20. present invention, is a polymer of polyethylene terephthalate and polyoxyethylene terephthalate which is soluble (preferred) or dispersible in water and is depositable from wash water containing the detergent(s) onto synthetic organic polymeric
25. fibrous materials, especially polyesters and polyester blends, so as to impart soil release properties to them, while maintaining them comfortable to a wearer of clothing made from such materials and not preventing or significantly
30. inhibiting vapour transmission through such clothing.

- Such polyesters have also been found to possess anti-redeposition properties and often assist in removing stains from substrates. They tend to maintain soil, especially oily or greasy soil, dispersed in wash water during washing and rinsing, so that it is not redeposited on the laundry. Useful such products are copolymers of ethylene glycol or other suitable source of ethylene oxide moiety, polyoxyethylene glycol and terephthalic acid or other suitable source of the terephthalic moiety. The copolymers may also be considered to be condensation products of polyethylene terephthalate, which may sometimes be referred to as an ethylene terephthalate polymer, and polyoxyethylene terephthalate. While the terephthalic moiety is preferred as the sole dibasic acid moiety in the polymer it is within the scope of the present invention to utilize relatively small proportions of isophthalic acid and/or orthophthalic acid (and sometimes other dibasic acids, too) to modify the properties of the polymer. However, the proportions of such acids or sources of such supplemental moieties charged to any reaction mix, and the corresponding proportions in the final polymer will normally be less than 10% each of the total phthalic moieties present, and preferably will be less than 5% thereof.

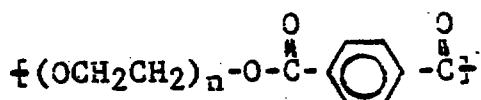
- The molecular weight of the polymer will be in the range of about 15,000 to 50,000, preferably being about 19,000 to 43,000, more preferably being about 19,000 to 25,000, e.g. about 22,000. Such

molecular weights are weight average molecular weights, which, in the case of the present polymers, are often lower. In the polymers utilized the polyoxyethylene will be of a molecular weight in the range of about 1,000 to 10,000, preferably about 2,500 to 5,000, more preferably 3,000 to 4,000, e.g. about 3,400. In such polymers the molar ratio of polyethylene terephthalate to polyoxyethylene terephthalate units (considering

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as such units) will preferably be within the range of 2:1 to 6:1, highly preferably 5:2 to 5:1, even more preferably 3:1 to 4:1, e.g. about 3:1. The proportion of ethylene oxide to phthalic moiety in the polymer will desirably be at least 10:1 and

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often will be 20:1 or more, preferably being within the range of 20:1 to 30:1 and more preferably being about 22:1. Thus, it is seen that the polymer may be considered as being essentially a modified ethylene oxide polymer, with the phthalic moiety

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being only a minor component thereof, whether calculated on a molar or weight basis. It is considered surprising that with such a small proportion of ethylene terephthalate or polyethylene terephthalate in the polymer the polymer is

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sufficiently similar to the polymer of the polyester

- fibres substrate (or other polymers to which it may be adherent, such as polyamides) as to be retained thereon during the washing, rinsing and drying operations. Yet, as shown by comparative
5. experiments and various washing tests in which soil release is measured, the described polymer, in the detergent compositions of the present invention, is effective to deposit on washed synthetics, especially polyesters, so as to make them better
10. able to be washed free of oily soil by a liquid nonionic detergent composition or other detergent product. It is considered that the polymer's increased hydrophilicity, attributable to the large proportion of hydrophilic ethylene oxide moieties
15. therein, may be responsible for the excellent soil release properties (for releasing lipophilic soils) which it imparts to the material upon which it is deposited, and such may also help it to coact with the component of the liquid nonionic detergent
20. product of the present invention.

- Various literature articles, texts and patents disclose methods for the manufacture of the present polymers, included among which are Journal of Polymer Science, Vol.3, pages 609-630 (1948) and Vol.8,
25. pages 1-22 (1951). Although suitable methods for making the polymers useful in the present invention are described in such references it is considered that none of them disclose the particular polymers which are utilized in the present invention (but
30. such are available commercially) and none disclose

- the detergent compositions of the present invention. Such polymers may be considered as having been randomly constructed from polyethylene terephthalate and polyoxyethylene terephthalate moieties, such as
5. may be obtained by reacting polyethylene terephthalate (e.g. spinning grade) and polyoxyethylene terephthalate or reacting the ethylene glycol, polyoxyethylene glycol and acid (or methyl ester) precursors thereof. Yet, it is also within
 10. the present invention to utilize more ordered copolymers, such as those made by reacting components of predetermined or known chain lengths or molecular weights, so as to produce what might be referred to as block copolymers or non-random
 15. copolymers. Graft polymers may also be practicable.

- The described materials are available from various sources, the products of one of which will be described in more detail here. Useful copolymers for the manufacture of the detergent compositions of
20. this invention are marketed by Alkaril Chemicals, Inc., and commercial products of such company that have been successfully employed to produce satisfactory soil release promoting detergent compositions are those sold by them under the trademarks
 25. Alkaril QCJ and Alkaril QCF, formerly Quaker QCJ and Quaker QCF. Products available from them in limited quantities, designated by them as 2056-34B and 2056-41, have also been found to be acceptable. The QCJ product, normally supplied as an aqueous disper-
 30. sion, of about 14 or 15% concentration in water, and

- preferably used to make the present liquid detergents, is also available as an essentially dry solid (QCF). In both such types of products the molar ratio of ethylene oxide to phthalic moiety is about 22:1. In a 16% dispersion in water, as QCJ, the viscosity at 100°C, is about 96 centistokes. The 2056-41 polymer is like a hard, light brown wax and in it the hydrophile:hydrophobe ratio is about 16 to 1, with the viscosity being about 265 centistokes. The 2056-348 polymer appears to be a hard brown wax, with a hydrophile:hydrophobe ratio of about 10.9:1 and its viscosity, under the same conditions as previously mentioned, is about 255 centistokes. The higher the molecular weight of the polymer the lower the hydrophile:hydrophobe molar ratio may be therein and still result in satisfactory soil release promotion by the detergent compositions of the present invention. The QCJ and QCF polymers have melting points (by differential thermal analysis) of about 50 to 60°C, a carboxyl analysis of 5 to 20 or 30 equivalents/10⁶ grams and a pH of 6 to 8 in distilled water at 5% concentration. The molecular weights (weight average) are in the range of 20,000 to 25,000 and the ethylene terephthalate:polyoxyethylene terephthalate units molar ratio is about 74:26. All of the mentioned trademarked products are water soluble in warm or hot water (at 40 to 70°C) or at least are readily dispersible, and may be characterised as of high molecular weight, over 15,000, generally in the
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range of 19,000 to 43,000, often preferably 20,000 to 25,000, e.g. about 22,000.

- The enzymes employed in some of the compositions of the present invention include both proteolytic and amylolytic enzymes, such as the alkaline proteases (subtilisin) and alpha-amylase. Among preferred enzyme preparations that are useful are Alcalase^{R.T.M.} 2.5L (2.5 Anson units per gram) and Termamyl (Registered Trade Mark) 120L, both manufactured by Novo Industri, A/S. However, other suitable proteolytic and amylolytic enzyme preparations may be used, too. The mentioned compositions are in liquid form and contain 5% of active enzyme in combination with 65% of propylene glycol and 30% of water. In this specification proportions referred to are of the active enzyme(s) in the preparations.

- The stabilizer or a mixture of stabilizers for the enzyme is most preferably sodium formate or includes such salt, but other water soluble formates, such as potassium formate, can also be employed and acetates may also be useful, as may be other equivalent salts or mixtures of such salts and alkali metal formate.

- The quaternary ammonium salt fabric softener that is employed in some of the liquid detergent compositions of the present invention may be any suitable such material which is stable in the compositions of the present invention. In some instances, known imidazolinium halides of satisfactory stability may be used instead of the

- usual quaternary ammonium halides. However, the quaternary ammonium halides are preferred. Such compounds will preferably be chlorides, although bromides and iodides may be useful. Of the four
5. substituents on the quaternary nitrogen atom at least one, and preferably two, will be a long chain substituent such as higher linear or fatty alkyl groups, and more preferably, two such substituents will be higher fatty alkyl groups. The chain length
 10. will usually be from 10 to 20 carbon atoms, preferably 12 to 18 carbon atoms, with chain lengths of 12 to 14 carbon atoms or mixtures thereof, such as coco alkyl (derived from coconut oil or equivalent feed stock), being most preferred. The
 15. other substituents on the nitrogen atom will be lower alkyl groups, usually of 1 to 3 carbon atoms, and of such the most preferred is methyl. Thus, although other quaternary ammonium halides can also be useful, at least when they constitute only some of
 20. the quaternary softener, that which is most preferred and of highest stability in the liquid detergents of the present invention is dicoco dimethyl ammonium chloride. Such product is available as a liquid comprising 75% active ingredient,
 25. 14% of isopropanol and 11% of water.

The aqueous medium employed includes water and preferably also includes a lower alkanol, e.g. of 1 to 3 carbon atoms. The water is desirably deionized water but city or tap water of a hardness content up to about 300 p.p.m., as calcium carbonate (the hardness is usually of mixed _____)

- magnesium and calcium ions) may be employed, although it is preferable for the hardness content to be less than 100 p.p.m. to help to avoid any destabilization of the liquid detergent or separations of parts thereof. Some water may be
5. introduced from the starting materials, such as aqueous soil release promoters, enzyme preparations, softeners, alkanols, and dyes. The lower alkanol may be any of ethanol, isopropanol or n-propanol,
 10. but ethanol is much preferred. When ethanol is employed it will normally be as a denatured alcohol, such as 3A, which includes a small proportion of water plus denaturant. Small amounts of compatible dissolved salts may also be present in the aqueous
 15. medium but normally such will be avoided to the extent feasible.

- Another liquid that may desirably be employed in some of the liquid detergents of the present invention, such as those containing enzymes and
20. fabric softeners, is a lower glycol, such as one of 3 to 6 carbon atoms in the alkyl group thereof. While hexylene glycol may be utilized in some formulations, in some others it can promote instability, so propylene glycol is preferred.

25. Various suitable adjuvants may be present in the liquid detergents of the present invention, such as fluorescent dyes, colourants (dyes and water dispersible pigments, such as ultramarine blue), bactericides, fungicides and perfumes. Concentra-
30. tions of such components will usually be kept low,

- often less than 1% and preferably less than 0.7%. Thus, the perfume concentration will usually be less than 1%, preferably 0.2 to 0.6%, e.g. 0.4%.
- Fluorescent brighteners or optical bleach compounds
5. may be present in the liquid detergent to an extent of 0.02 to 2%, preferably 0.1 to 1% and more preferably 0.2 to 0.5%. The percentages given are of the commercially supplied materials. Such brighteners are known as cotton brighteners, bleach soluble
 10. brighteners, polyamide brighteners and polyester brighteners and generally mixtures thereof are employed so as to make the detergent useful for brightening a wide variety of materials being washed, including cotton and synthetics. Exemplary
 15. of such good brighteners are those identified as: TA; DM; DMEA; DDEA; DMDDEA; BS; NTS; BBI; AC; DP; BBO; BOS; and NTSA, in a well known article entitled Optical Brighteners and Their Evaluation by Per S. Stensby, published in Soap and Chemical Specialties
 20. in April, May, July, August and September, 1967. Further discussions of the fluorescent brighteners may be found in an article entitled Optical Bleaches in the Soaps and Detergents by F.G. Villaume, appearing in The Journal of the American Oil
 25. Chemists' Society (October 1958), Vol. 35, No. 10, pp.558-566. Useful fluorescent brighteners are sold under the trade names: Calcofluor White ALF (American Cyanamid); ALF-N (American Cyanamid); SOF A-2001 (CIBA); CWD (Hilton-Davis); Phorwite RKH
 30. (Verona); CSL, powder, acid (American Cyanamid);

- FB 766 (Verona); Blancophor PD (GAF); UNPA (Geigy); Tinopal (Registered Trade Mark) RBS (Geigy), and RBS 200 (Geigy). The various brighteners are normally present as their water soluble salts but may also be
5. employed in the corresponding acid forms. Most such materials are useful for brightening cotton and are of the stilbene sulphonic acid (or salt) or amino-stilbene types, herein referred to as stilbene brighteners, and a preferred such brightener is
 10. Tinopal 5BM Extra Conc., from CIBA-Geigy. For the fabric softening detergent the preferred content of brightener will be from 0.05 to 0.25%, preferably 0.05 to 0.15%, e.g. 0.1%. Colourants, such as Polar Brilliant Blue, will preferably be from 0.001 to
 15. 0.03%, preferably 0.002 to 0.2% of the liquid detergent, e.g. 0.0025% or 0.01%, if present. The various adjuvant materials will be chosen for compatibility with the other formula components and for non-separating and non-settling characteristics.
 20. Because water soluble ionizable salts, whether inorganic or organic, are generally incompatible with soil release promoting agents, their presence will usually be avoided. Among such salts that are desirably avoided are sodium sulphate, potassium
 25. sulphate, sodium chloride, potassium chloride, ammonium chloride and ammonium sulphate, but these are only examples of such salts. While sodium formate should also be omitted from many liquid detergents, surprisingly, a limited proportion
 30. thereof has been found to be compatible with the

- other components of the formulations of the present invention in combination. The presences of ionizable species, such as triethanolamine (TEA), diethanolamine, ethanolamine, diisopropanolamine, n-propanolamine and of the lower mono-, di-, tri- and mixed lower alkanolamines of 2 to 4 carbon atoms per alkanol moiety will be avoided because, like the mentioned salts, they destabilize the soil release promoting polymer and/or the liquid detergent. Of these, TEA appears to be the most destabilizing, causing severe separations of the polymer. In this specification such ionizable species, which may form salts, should be counted as parts of the permissible proportions of any such salts that may be present.
5. Generally it will be desirable to avoid the presences of other adjuvants than colourants, perfumes, fluorescent brighteners, anti-oxidants and any neutralizing agents that may be employed to adjust the pH of the liquid detergent to the stable range. It is preferred that any neutralizing agent which may be employed, usually to increase the pH of the liquid detergent mixture, should be alkali metal hydroxide, such as sodium hydroxide, in aqueous solution at a concentration of from 5 to 40%, e.g.
 10. 15 to 25%. Especially to be avoided are triethanolamine salts and free triethanolamine.

The liquid detergent made will be of a desirable viscosity, often in the range of 50 to 500 centipoises, preferably 100 to 200 centipoises, and the viscosity may be adjusted by modifying the proportion

of lower alkanol, within the range given. The liquid detergent will be readily pourable but will possess a desired "body". The pH thereof will be in the range of 6 to 9, preferably 6.1 to 7.9 and often more preferably 6.5 to 7.5.

In the soil release promoting liquid detergents of the present invention, which are of improved stability on storage so that the soil release promoting polymer and enzyme(s) do not deteriorate and do not separate from the rest of the composition, the proportions of the various components are desirably as given below. All the various components recited, although stated in the singular, include mixtures too. The proportions of components that follow are for the broad invention, the enzyme-containing product and the enzyme- and softener-containing product, respectively.

The nonionic detergent (which includes mixtures thereof) or a mixture of nonionic and anionic detergents (both being of the synthetic organic type) will be within the range of 25 to 50% of the product, preferably being 20 to 40% for the nonionic detergent and 3 to 15% for the anionic detergent. More preferably, the proportions of such detergents will be 25 to 35% and 5 to 10%, respectively, e.g. about 32% and about 7%, respectively. The soil release promoting polymer will be about 0.5 to 10%, preferably 1 to 6% and more preferably 1 to 3%, e.g. about 2%. The lower alkanol content will be from 3 to 15%, preferably 5 to 12% and more preferably 6 to

- 10%, e.g. about 8%, and the water content, when lower alkanol is present, will be about 30 to 60%, preferably 45 to 55%, e.g. about 51%, and if no lower alkanol is present such ranges will be increased to
5. allow for replacement of the lower alkanol with water. The contents of ionizable water soluble salts, whether organic or inorganic, should be kept low, usually being no more than 1% of the liquid detergent, preferably less than 0.5% and more
 10. preferably less than 0.3%, and the content of triethanolamine will similarly be limited, to avoid separation of the soil release promoting polymer, with the desirable limits being 0.5%, preferably 0.2% and most preferably 0%. In some instances the
 15. salt content will be held to limits lower than the allowed alkanolamine content because some salts can be even more detrimental to product stability than the alkanolamines. Of course, the content of anionic detergent present, which may be considered
 20. to be an ionizable salt, will not be included in the limiting proportions of such salt present because it does not appear to have the same type of destabilizing influence on the compositions of the present invention. While suitable adjuvants may be present
 25. in the liquid detergent, such as the colourant, perfume and fluorescent brightener, previously mentioned, normally the contents of such adjuvants will be minimized, usually being less than 2%, preferably less than 1% and more preferably less
 30. than 0.8%, but the dye and brightener are not destabilizing.

- For the enzyme-containing product (without softener) the synthetic organic nonionic detergent content will normally be within the range of 25 to 40% of the product, preferably being 28 to 36% and more preferably 30 to 34%, e.g. 32%. The fatty alcohol alkoxylate sulphate content will usually be 1 to 8%, preferably 2 to 7% and more preferably 2 to 6%, e.g. 3% or 5%. The fluorescent brightener content may be in the range of 0.02 to 2% and preferably 0.1 to 1%, e.g. 0.2% or 0.4%. The percentage of active ingredient of the brightener may often be 0.01 to 1%, such as 0.01 to 0.1%. The soil release promoting polymer content will desirably be about 0.5 to 5%, preferably 0.8 to 3% and more preferably 0.8 to 2.5%, e.g. about 1% or 2% (on an active ingredient basis). The total enzyme content will usually be in the range from 0.0005 to 0.15%, preferably 0.025 to 0.1%, of which the protease content is preferably 0.005 to 0.1% and the amylase content, if amylase is present, is 0.005 to 0.05%. Preferred contents of the enzymes are 0.01 to 0.1% and 0.01 to 0.03%, respectively. More preferably, 0.02 to 0.05% is the percentage of protease. Specific formula percentages are about 0.03 and 0.02%, respectively. The stabilizer for the enzymes, usually an alkali metal salt of a lower aliphatic acid of 1 to 3 carbon atoms, such as sodium formate, will usually be from 0.2 to 2%, preferably 0.5 to 1.5%, and more preferably 0.7 to 1.3%, e.g. 1%. The lower alkanol content will
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desirably be from 3 to 12%, preferably 4 to 9% and more preferably 5 to 8%, e.g. 5.5 or 7.5%. The water content will desirably be about 40 to 65%, preferably 46 to 62%, more preferably 50 to 60%, e.g. about 54 or 55%.

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The contents of ionizable water soluble salts, whether organic or inorganic, should be kept low, less than 2%, usually being no more than 1% of the liquid detergent, preferably less than 0.5% and more preferably less than 0.3%, and the content of tri-ethanolamine will similarly be limited to avoid separation of the soil release promoting polymer, with the desirable limits being 0.5%, preferably 0.2%, and most preferably 0%. In some instances the

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salt content will be held to limit lower than the allowed alkanolamine content because some salts can be even more detrimental to product stability than the alkanolamine. However, in the compositions of the present invention the contents of water soluble alkali metal lower carboxylate, such as sodium formate, may be up to 2% because such components stabilize the enzymes, and at such concentrations, especially at about 1% or less, are compatible with the detergent product and the soil release promoting polymer, so that polymer separation does not occur.

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For the enzymatic and softening liquid detergents the content of the synthetic organic nonionic detergent (which includes mixtures thereof) will desirably be within the range of 10 to 35% of the product, preferably being 15 to 30% and more prefer-

- ably 20 to 25%, e.g. 22%. The soil release promoting polymer content will desirably be about 0.5 to 5%, preferably 0.7 to 2% and more preferably 0.8 to 1.5%, e.g. about 1%, (on an active ingredient
5. basis). The content of quaternary compound will desirably be 1 to 10%, preferably 3 to 8% and more preferably 3 to 6%, e.g. 4.5%. The enzyme content may be from 0.005 to 0.15%, preferably 0.025 to 0.05%, of which the protease content is preferably
 10. 0.005 to 0.1% and the amylase content, if amylase is present, is 0.005 to 0.05%. Preferred contents of the enzymes are 0.01 to 0.05% and 0.01 to 0.025%, respectively. More preferably, the content of protease will be from 0.015 to 0.03 or 0.04%.
 15. Specific formula percentages are about 0.023 and 0.015%, respectively. The stabilizer for the enzymes, a lower aliphatic acid salt, such as sodium formate, will usually be from 0.2 to 2%, preferably 0.5 to 1.5%, and more preferably 0.7 to 1.3%, e.g.
 20. 1%. The lower alkanol content will desirably be from 1 to 10%, preferably 1.5 to 3% and more preferably 2 to 2.5%, e.g. 2 or 2.2%. The lower glycol content is desirably 2 to 10%, preferably 3 to 8%, more preferably 4 to 7%, e.g. 6%. The water
 25. content will desirably be about 40 to 80%, preferably 50 to 70%, more preferably 60 to 65%, e.g. about 63%.

- The contents of ionizable water soluble salts, whether organic or inorganic, should be kept low,
30. usually being no more than 1% of the liquid detergent, preferably less than 0.5% and more

- preferably less than 0.3%, and the content of triethanolamine will similarly be limited to avoid separation of the soil release promoting polymer, with the desirable limits being 0.5%, preferably 0.2%, and most preferably 0%. In some instances the salt content will be held to limits lower than the allowed alkanolamine content because some salts can be even more detrimental to product stability than the alkanolamine. However, in the compositions of the present invention the contents of water soluble alkali metal lower carboxylate, such as sodium formate, may be up to 2% because such components stabilize the enzymes, and at such concentrations, especially at about 1% or less, are compatible with the detergent product.

- The liquid detergents of the present invention may be made by mixing the various components thereof with the aqueous medium, preferably containing at least some of the lower alkanol, until they dissolve (or satisfactorily disperse) therein, or different components may be selectively dissolved in portions of the water and/or lower alkanol and/or lower glycol, and/or liquid soil release promoting polymer preparation, and/or liquid enzyme preparation, and then the various liquid fractions may be mixed together. It will often be preferable to adjust the pH of the liquid to within the range of 6.1 to 7.9, often more preferably 6.5 to 7.5, by addition of a suitable neutralizing agent (not triethanolamine) which will not have a destabilizing influence on the

- soil release promoting polymer, the enzyme(s), the softener, or the liquid product containing them, so that such will not deteriorate and will not separate from the liquid detergent on storage, especially at elevated temperature. The preferred neutralizing agent is an aqueous solution of sodium hydroxide, which will normally be between 10 and 40% sodium hydroxide, preferably 15 to 25%, although more dilute concentrations may sometimes be desirable.
5. Subsequently, the viscosity of the product may be adjusted by means of alkanol and/or water addition.
- 10.

- The liquid detergent composition of the present invention may be used to wash (and treat) laundry containing synthetic fibres, such as those of polyester, e.g. Dacron (Registered Trade Mark), in the normal manner used in washing with other liquid detergents. However, less of the present product may need to be employed because of the soil release promoting action thereof, and in many cases the cleaning and softening effects obtained will be superior. Different concentrations of the liquid detergent may be used, normally being from about 0.02 or 0.04 to 0.3 or 0.6%, preferably 0.05 or 0.1 to 0.15 or 0.3%, with the concentration generally being about 1/2 cup per wash in a top loading machine for the product containing softener, and about 1/4 cup per wash for the other two types of products. Generally, it will be advisable to use about 1/4 or 1/2 cup (about 60 or 120 ml) of the liquid detergent per standard wash load (about
- 15.
- 20.
- 25.
- 30.

- 17 U.S. gallons (64 litres), for a top loading washing machine), which is a concentration of about 0.1 or 0.2% of the liquid detergent in the wash water. About the same concentration may be used
5. when washing is in a front loading machine, although the water employed is less (so less detergent composition is employed). Normally about 7 or 8 pounds (3 to 3.5 kg), of laundry will be charged to the washing machine. The wash water temperature will
10. preferably be at least 120°F (49°C) but good washing and treatments by the soil release promoting polymer, the enzymes and the softener in the liquid detergent, are obtainable at temperatures in the range of about 40 to 80°C, preferably 45 to 70°C.
15. The dry weight of materials being washed and treated will usually be from about 5 to 15 or 20% of the weight of the aqueous washing medium, preferably about 5 to 10% thereof. The wash will be conducted with agitation over a period of about five minutes
20. to one-half hour or one hour, often from 10 to 20 minutes. Then the washing materials will be rinsed, usually with several rinses, and will be dried, as in an automatic laundry dryer. Preferably, the first washing of the material to be treated will be
25. when that material is not unduly dirty, so that the soil release promoting polymer will be deposited on as clean a surface as possible. However, this is not necessary, and improvements in the cleaning of subsequently soiled materials and swatches will be
30. observed when no special effort is made to have the

- first washing be that of a cleaner substrate. Up to a limit, sometimes about 3 or 5 treatments, plural washings with the liquid detergent of the present invention increase the soil releasing properties of the treated material.
- 5.

- When polyester and polyester/cotton blend fabrics are washed in the manner described with the detergent compositions of the present invention, and are then soiled or spotted with dirty motor oil and washed with a detergent composition of the present invention or another commercial detergent (often of the built type), significant removal of the lipophilic soil is noted, compared to similar treatments in which the liquid detergent employed initially did not contain any soil release promoting polymer. In other comparisons, when substantial proportions of water soluble ionizable salt, such as 5% of sodium sulphate, or more than 1% of triethanolamine or a salt thereof, are present in the liquid detergent it is found that after storage at elevated temperature (43°C) for two weeks, simulating a lengthier storage at room temperature, phases separate from the liquid detergent body and the soil release promoting properties of the polymer contained therein are diminished, as are the enzymatic and softening activities, when such materials are in the formula. When the enzyme stabilizer is omitted enzymatic action is decreased substantially on storage. Thus, the compositions of the present invention are important because they are stable, resulting in more
- 10.
- 15.
- 20.
- 25.
- 30.

5. effective products for the purposes intended, soil release improvement, cleaning effects and softening of the fabrics laundered, and also resulting in a more attractive liquid detergent composition, which does not separate on storage.

10. The invention may be put into practice in various ways and a number of specific embodiments will be described to illustrate the invention with reference to the accompanying examples. Unless otherwise indicated, all parts are by weight and all temperature are in °C.

EXAMPLES 1A to 1F

Example 1A

15. A liquid detergent is made up having the following ingredients in the proportions specified in Table 1.

TABLE 1

	<u>Component</u>	<u>Percent</u>
20.	Neodol 23-6.5 (condensation product of approximately 6.5 moles of ethylene oxide and a higher fatty alcohol averaging 12 to 13 carbon atoms per mole)	32.0
	Sodium linear dodecylbenzene sulphonate (LDBS)	7.0
25.	Sodium sulphate (accompanies the LDBS)	0.2
30.	Soil release promoting polymer (a copolymer of polyethylene terephthalate and polyoxyethylene terephthalate of a molecular weight of about 22,000 wherein the polyoxyethylene is of a molecular weight of about 3,400, the molar ratio of polyethylene terephthalate to polyoxyethylene tereph-	14.3

TABLE 1 (continued)

<u>Component</u>	<u>Percent</u>
5. thalate units is about 3:1 and the proportion of ethylene oxide to phthalic moiety in the polymer is about 22:1 sold by Alkaril Chemicals, Inc. as Alkaril QCJ, as a 14% solution in water)	
Denatured ethanol (3A)	8.0
Fluorescent brightener (Tinopal 5BM, Extra Conc.)	0.24
10. Dye (Polar Brilliant Blue)	0.01
Perfume	0.4
Deionized water	<u>q.s. (37.85)</u>
	100.00

15.

The liquid detergent having the above formula is made by mixing together a portion of the water with the nonionic and anionic detergents, followed by addition of the soil release promoting polymer, the ethanol, fluorescent brightener, dye and any remaining water. Then, an acid or base (NaOH is preferred) may be used, if desired, to adjust the pH to within the desired range. In the above example the pH is 7.8 (undiluted). However, when the pH is lower than desired an aqueous solution of sodium hydroxide (20%) is used to raise it to the desired level, e.g. 7.5, and the proportion employed is small, e.g. about 0.2% or less of NaOH. Next, the formula proportion of perfume is added. The product made is tested by being stored at 43.3°C for two

30.

weeks, after which it is observed to be in a single phase, essentially like that when first produced.

- Shortly after making the liquid detergent it is used to wash a test load of clean fabrics, including
5. some of polyester material and others of 65% polyester and 35% cotton material. The washing concentration is 0.1% by weight of the liquid detergent, on the basis of the weight of the wash water, and the swatches washed are about 5% by weight of
 10. the wash water. After washing in a standard testing washing machine, using standard conditions previously described, is completed, the swatches are rinsed and dried. Subsequently each test swatch is stained with about three drops of dirty motor oil of
 15. a standard type used for such testing and is washed in the same type of machine, using a commercial detergent. As controls, swatches that were not previously treated with the present liquid detergent are employed. The washing-treating and subsequent
 20. washing temperatures are the same in all cases, being 49°C, which is considered to be an optimum temperature for treatment. In some experiments, the subsequent washing is with the liquid detergent composition of the present invention. In all
 25. experiments the treated swatches are significantly whiter to the eye and by reflectometer testing than the control swatches, showing that the soil release promoting component of the liquid detergent composition effectively aided in the removal of such
 30. applied soil from the swatches during the subsequent

washings. Also, it is noted that the redeposition onto unsoiled portions of the fabrics of the dirty motor oil removed (from the spotting application) is diminished when soil release polymer is applied to the fabric before test soiling thereof. Thus, the liquid detergent containing soil release promoting polymer, in addition to aiding removal of the soil, also helps to maintain it suspended, inhibiting deposition of such removed soil on other parts of the test material.

Examples 1B to 1D

These are comparison examples. The formula of Example 1A is modified by the addition of 2% or 3% of triethanolamine in replacement of part of the water thereof. After two weeks of storage at 43.3°C of these formulations the detergent is found to have separated. Separation also occurs under such conditions when the triethanolamine is absent and 5% of sodium sulphate is present in the formula (Example 1D). Also, when the triethanolamine is present, the soil removal promoting action of the liquid detergent is significantly decreased, compared to the experimental formula of this invention after two weeks of elevated temperature aging at 43.3°C, followed by testing in the manner previously described. Furthermore, storage at room temperature also results in such diminution of soil release promoting activity of the formula containing triethanolamine, compared to the experimental formula.

Examples 1E and 1F

- When the amount of soil release promoting polymer in the formula of Example 1A is decreased to 1% (Example 1E) or increased to 3% (Example 1F) the same results reported above are obtained, with the modifications that the 3% release polymer formulation is more effective than the 2% formula in promoting soil release according to the tests described, and the 1% formula is slightly less effective, although at both 1% and 3% concentrations good and excellent results, respectively, are obtained.

- When similar tests are made using other lipophilic soils, such as corn oil (red), butter, shoe polish, lipstick, French dressing and barbecue sauce, similar results are obtained, with the greatest improvements of the experimental over the control being with respect to the corn oil, lipstick and dirty motor oil. Release is 100% for the corn oil, butter, French dressing and barbecue sauce stains and is almost 100% for lipstick. Similar results are obtained when the test fabrics are single knit Dacron (Registered Trade Mark), double knit Dacron and Dacron/cotton blends, and are also obtained with treatment temperatures above 32°C. Such results are also obtained when a commercial or home laundry machine of the top loading or side loading type is employed instead of the laboratory testing washing machine.

30.

EXAMPLES 2A to 2DExamples 2A and 2B

- In the formula of Example 1A the sodium linear dodecylbenzene sulphonate is replaced with the
5. corresponding tridecylbenzene sulphonate in one instance (Example 2A) and with Neodol 25-3-S, which is the sodium salt of a sulphated condensation product of approximately 3 moles of ethylene oxide and a higher fatty alcohol averaging between 12 and
10. 15 carbon atoms per mole, in another instance (Example 2B); and the nonionic detergent is replaced by Neodol 25-7 in both cases. When the resulting compositions are tested for elevated temperature stability and for storage stability, as described in
15. Example 1, similar good results are obtained.

Examples 2C and 2D

- Similarly, when more than 0.5% of triethanolamine (Example 2C) is present in the compositions in place of an equal proportion of water and/or when 2% of
20. sodium sulphate or other water soluble ionizable salt is present (Example 2D) separation of components of the liquid detergent takes place. When the liquid detergents of this example are employed in washing polyester fabrics of the types mentioned in Example
25. 1, after which the fabrics are soiled and subsequently washed, improved lipophilic soil removals result, compared to controls which contain no soil release promoting polymer of the type used in the formulas of this example. Also, when the
30. formulas of Example 2C and 2D contain more than 0.5%

- of triethanolamine and/or 2% of water soluble ionizable salt, such as sodium sulphate, respectively, after elevated temperature or room temperature aging for periods of two weeks and three months, respectively, are shaken to redisperse the various components thereof and are then used in the manner previously described the soil release effect thereof is still diminished significantly, compared to the experimental formulas (Examples 2A and 2B) containing neither triethanolamine nor such salt.

EXAMPLES 3A to 3C

- The formula of Example 1A is modified by replacing the anionic detergent thereof with Neodol 25-7, so that the product contains 39% of nonionic detergent, and replacing the ethanol with deionized water (Example 3A). The product is non-separating on storage and is of soil removing characteristics similar to those of the products of Examples 1A, 1E and 1F and 2A and 2B. Also, the experimental product is stable during accelerated aging at elevated temperature storage and during longer periods of room temperature storage, whereas comparative products (Examples 3B and 3C) containing 1% of triethanolamine and/or 2% of sodium sulphate separate. Similarly, such comparative products (Examples 3B and 3C) do not help to release deposited lipophilic soil to the extent that is obtainable with the experimental products of Example 3A.

EXAMPLES 4A to 4D

- When the contents of the various experimental formulas of this invention, given in Examples 1-3 are varied $\pm 10\%$ and $\pm 25\%$, while keeping the proportions of the various materials within the ranges recited in the specification and when, in such formulations instead of employing the QCJ soil release polymer (aqueous solution), 2% of QCF (Alkaril Chemicals CAS 9016-88-0) and 12.3% of water are substituted, with the QCF first being dissolved in the water, good soil release promotings result, like those described in Examples 1-3, and the products made are stable and non-separating on storage. Such is also the case when the fluorescent dye, colourant and perfume are omitted from the formulas of this example.
- 5.
- 10.
- 15.

- Similarly, when triethanolamine or ionizable salt is present in such formulas (Example 4B and 4C) beyond the limits given the product becomes less stable and less effective in promoting soil release during washing.
- 20.

- In other variations in this Example 4A the nonionic detergent is a mixture of equal parts of Neodol 25-7 and Neodol 91-6 and the anionic detergent is Neodol 45-2.25-S (Example 4D). Results like those previously reported in Examples 1-3 are obtainable in both test washing machines and actual laundering, employing either top loading or side loading commercial or household washing machines. Such is also the situation when pH adjustments are
- 25.
- 30.

- with potassium hydroxide and when such adjustments, made with sodium hydroxide or potassium hydroxide, are to pH's of 7.0, 6.6 and 7.4. Normally such pH adjustments will utilize less than 1% of sodium hydroxide solution, preferably less than 0.5% thereof and more preferably less than 0.2% thereof. In some instances the sodium hydroxide may be added as a formula constituent in said proportion as is known to give the desired pH control (based on past experience with the formula) but it will still be preferred for it to be added before the perfume, although such is not necessary. Similarly, while a 20% sodium hydroxide solution concentration may often be preferable, other concentrations thereof may be employed, too.

EXAMPLES 5A to 5G

Example 5A

- A liquid detergent is made up having the following ingredients in the proportions specified in Table 2 below.

TABLE 2

	<u>Component</u>	<u>Percent</u>
	Neodol 25-7 ¹	32.0
	Neodol 45-2.25S ²	3.0
25.	Alkaril QCJ soil release promoting polymer (15% aqueous solution)	13.4
	Denatured ethanol (3A)	5.5
	Sodium formate	1.0
	Alcalase 2.5L ³	0.6
30.	Termamyl 120L ⁴	0.4

TABLE 2 (continued)

<u>Component</u>		<u>Percent</u>
Tinopal 5BM ⁵		0.27
Dye (Polar Brilliant Blue)		0.0025
5.	Perfume	0.4
Deionized water		<u>q.s. (43.4275)</u>
		100.00

Notes on Table 2

1. Condensation product of approximately 7 moles of ethylene oxide and a higher fatty alcohol averaging 12 to 15 carbon atoms per mole.
2. Sodium salt of the sulphuric acid ester of the nonionic condensation product of higher fatty alcohol averaging 14 to 15 carbon atoms, with 2.25 moles of ethylene oxide.
3. Proteolytic enzyme, sold by Novo Industri, A/S (5% enzyme active ingredient, 65% propylene glycol and 30% water).
4. Amylolytic enzyme sold by Novo Industri, A/S (5% enzyme A.I., 65% propylene glycol and 30% water).
5. A stilbene-type fluorescent brightener, sold by CIBA-Geigy.

The liquid detergent having the above formula is made up in a manner like that of Example 1A, by mixing together a portion of the water with the anionic and nonionic detergents, followed by additions of the soil release promoting polymer, the ethanol, fluorescent brightener (sometimes dissolved in ethanol or ethanol-water solutions) enzymes, sodium formate (dissolved in some water), dye, and

- any remaining water. Then, an acid or base (NaOH is preferred) may be used, if desired, to adjust the pH to within the desired range, e.g. 7. When the pH is lower than desired an aqueous solution of sodium hydroxide (20%) is used to raise it to the desired level. The proportion employed is small, e.g. about 0.2% or less of NaOH. Next, the formula proportion of perfume is added. The product made is tested by being stored at 43.3°C for a week, after which it is
5. observed to be a clear light blue liquid in a stable single phase, essentially like that when it was made. The protease activity is better than that of a control liquid detergent (Example 5B) containing 7% sodium dodecyl benzene sulphonate, 2.8% of
10. triethanolamine (TEA) and no alcohol ether sulphate, and is much better than in other compositions like the control but containing no sodium formate in one case (Example 5C) and no TEA (Example 5D) in the other. When both the formate and TEA are omitted
15. from the control formula (in all cases the differences are made up with water) (Example 5E) both protease and amylase activities are drastically reduced. The control and the first two variations (Examples 5B to 5D) are unstable on storage, with
20. the polymer settling out.
- 25.

Shortly after making the liquid detergent of Example 5A, it is used to wash a test load of clean fabrics, including some of polyester materials and others of 65% polyester and 35% cotton material.

30. The washing conditions are the same as those in

- Example 1A and the results are very similar, except for the additional enzymatic cleaning action obtained. Such desirable activities are obtained despite the presence in the liquid of the sodium formate and any other salt(s).
- 5.

Examples 5F and 5G

- When 2.8% of triethanolamine or TEA salt is present in the liquid detergent of the formula previously given (Example 5F), in replacement of part of the water thereof, after storage for a week at 43.3°C the detergent is found to have separated. Separation also occurs under such conditions when the triethanolamine is absent and 5% of sodium sulphate is present in the formula (Example 5G).
- 10.
- 15.
- Storage at room temperature also results in such separation and corresponding diminution of soil release promoting activity of formulas containing the indicated proportions of triethanolamine and/or sodium sulphate, compared to the experimental formula of Example 5A.
- 20.

- Tests on the liquid detergent for enzymatic cleaning power are satisfactory, indicating that the proteolytic and amylolytic enzymes are functionally effective in the stable liquid detergent. This is so despite the fact that enzymes are often unstable in liquid detergent systems, especially at elevated temperatures.
- 25.

EXAMPLE 6

- In a modification of the formula of Example 5A when the proportion of Neodol 45-2.25S is increased
- 30.

- to 5%, the proportion of ethanol is increased to 7.5%, 0.01% of Polar Brilliant Blue dye is used instead of 0.0025%, and the brightener is replaced by 0.24% of Tinopal 5BM and 0.1% of Phorwite BHC, a stable liquid detergent having soil release promoting properties, enzymatic effectiveness and detergency like that of the composition of Example 5, or better, results. The liquid detergent is clear blue and in the absence of dye may be of a light colour, so that it can be desirably coloured by use of other dyes, too. Instead of the brightener system mentioned, equivalent proportions of Tinopal RBS-200, Tinopal 4226 (CIBA-Geigy) or Phorwite RKH (Mobay Chemical Company) and mixtures thereof may be substituted. In all such cases the substantivity of the fluorescent brightener is improved due to the presence of the higher fatty alcohol ethoxylate sulphate and, unlike other anionic detergents, such as sodium linear dodecyl benzene sulphonate, the fatty alcohol ethoxylate sulphate does not destabilize the polymer soil release promoting agent in the presence of enzyme and enzyme stabilizer.

EXAMPLES 7A and 7B

Example 7A

- The formula of Example 5A is changed so that 5% of Neodol 25-3S is present instead of the 3% of Neodol 45-2.25S. The product made is stable and clear after storage at elevated temperature, and the Alcalase and Termamyl stabilities equal those for the primary control (Example 5B) mentioned in

Example 5.

- However, when 2.8% of TEA is also present in the formula (Example 7B) the product is unstable, with the QCJ soil release polymer flocculating out after storage at 43°C for one week.
- 5.

EXAMPLE 8

- The contents of the various experimental formulas of this invention given in Examples 5A, 6 and 7A are varied $\pm 10\%$ and $\pm 25\%$, while keeping the proportions of the various materials within the ranges recited in the specification. In such formulations instead of employing the QCJ soil release polymer (aqueous solution), 2% of QCF (Alkaril Chemicals CAS 9016-88-0) and 11.4% of water are substituted, with the QCF first being dissolved in the water. Also other enzymes, stabilizers, alcohols and colourants, as described in the specification, may be employed within the ranges of proportions given. The detergents resulting are clear, stable and non-separating and possess good soil release promoting, cleaning and brightening properties, like those described in Examples 5A, 6 and 7A. Such is also the case when the fluorescent dye, colourant and perfume are omitted from the formulas of this example. Similarly, when tri-ethanolamine or ionizable salt is present in such formulas beyond the limits given, and when other anionic detergents, such as sodium higher alkyl benzene sulphonates, are substituted for the alcohol ethoxylate sulphate the product becomes less stable
- 10.
- 15.
- 20.
- 25.
- 30.

and less effective in promoting soil release during washing, and when the sodium formate is omitted the effects of the enzyme are lost after only a few days storage at the elevated test temperature.

5. In other variations in this example the nonionic detergent is Neodol 23-6.5 or a mixture of equal parts of Neodol 23-6.5 and Neodol 25-7, with the same total proportion being employed and a stable effective product results. Also, the alcohol
10. ethoxylate sulphate may be an equal mixture of Neodols 25-3S and 45-2.25S, and good results are obtained. With such variations results like those previously reported in Examples 5A, 6 and 7A are obtainable in both test washing machines and house-
15. hold and commercial washing machines, which are either top loading or side loading. Such is also the situation when pH adjustments are made with potassium hydroxide and when such adjustments, made with sodium hydroxide or potassium hydroxide, are to
20. pH's of 6.6, 7.4, 7.9 and 8.6. Normally such pH adjustments will utilize less than 1% of sodium hydroxide solution, preferably less than 0.5% thereof and more preferably less than 0.2% thereof. In some instances the sodium hydroxide may be added
25. as a formula constituent, in said proportion as is known to give the desired pH control (based on past experience with the formula) but it will still be preferred for it to be added before the perfume, although such is not necessary. Similarly, while a
30. 20% sodium hydroxide solution concentration may

often be preferable, other concentrations thereof may be employed too.

- From Examples 5-8 and the preceding description it is seen that the present invention provides a
5. stable and attractive liquid detergent which contains various components that might have been expected to interfere with the stability of the final product. Yet, surprisingly, a stable product is obtainable in accordance with the present
 10. invention. Such product has desirable soil release promoting, soil decomposing, fluorescent brightening (when the brightener is present) and detergent properties. Several of the components of the compositions of the present invention exert dual
 15. effects therein. For example, the alcohol ethoxylate sulphate aids detergency and helps to make the substrates (laundry fibres) more substantive so that the fluorescent brighteners are more effective. The sodium formate, which is a
 20. stabilizer for enzymes, does not destabilize the soil release agent, as would have been expected. The various components of these liquid detergents coact to produce a surprisingly attractive, stable and effective detergent composition. Thus, it is
 25. seen that the present compositions represent an unpredictable advance in the art of making stable products which are preferably attractively clear (transparent or translucent), although in some instances opalescent and semi-clear or intentionally
 30. creamy products may be made.

EXAMPLES 9A to 9EExample 9A

5. A liquid detergent is made up havint the following ingredients in the proportions specified in Table 3.

TABLE 3

	<u>Component</u>	<u>Percent</u>
	Neodol 25-7	22.0
	Alkaril QCJ soil release promoting polymer	6.7
10.	(15% aqueous solution)	
	Adogen 462 ⁶	6.0
	Propylene glycol	5.0
	Denatured ethanol (3A)	2.2
	Sodium formate	1.0
15.	Alcalase 2.5L	0.45
	Termamyl 120L	0.3
	Dye (Polar Brilliant Blue)	0.0025
	Perfume	0.4
	Deionized water	<u>q.s. (55.9475)</u>
20.		100.00

Note on Table 3

6. Di-coco dimethyl ammonium chloride, sold by Sherex Industries (contains 75% active ingredient, 14% isopropanol and 11% water).
25. The liquid detergent having the above formula is made up in a manner essentially like that used for Examples 5-8 but including the fabric softener and omitting anionic detergent. The product made is tested by being stored at 43.3°C for a week, after
30. which it is observed to be a clear light blue liquid

in a stable single phase, essentially like that when it was made. The protease activity is 70% of that when the liquid detergent was made and the amylase activity is 85% of its initial value.

5. Shortly after making the liquid detergent it is used to wash a test load of clean fabrics, including some of polyester materials and others of 65% polyester and 35% cotton material. The washing concentration and the other conditions for that
10. washing are the same as in Example 5A and the results are essentially the same, too, except for improved fabric softening being obtained in this example.

Example 9B

15. This is a comparison example. When 2% or 3% of triethanolamine or TEA salt is present in the liquid detergent of Example 9A in replacement of part of the water thereof, after two weeks of storage at 43.3°C the detergent is found to have separated.

20. Example 9C

- Separation also occurs under such conditions when the triethanolamine is absent and 5% of sodium sulphate is present in the formula of Example 9A. Also, when the triethanolamine is present (Example
25. 9B), the soil release promoting action of the liquid detergent is significantly decreased. Storage at room temperature also results in such diminution of soil release promoting activity of formulas containing the indicated proportions of triethanol-
30. amine and/or sodium sulphate, compared to the

experimental formula.

Examples 9D and 9E

- When the amount of soil release promoting polymer is decreased to 0.8% (Example 9D) or increased to 2% (Example 9E) the same types of results as given above for Example 9A are obtained.
- Tests on the liquid detergent of Example 9A for fabric softening and enzymatic cleaning power are satisfactory, indicating that the quaternary ammonium halide and the proteolytic and amylolytic enzymes are functionally effective in the stable liquid detergent. This is so despite the fact that enzymes and quaternary ammonium halides are often unstable in liquid detergent systems, especially at elevated temperatures. However, replacement of propylene glycol with higher glycols, such as those of 8 to 12 carbon atoms, will result in separation of the product into two phases. In the particular formula given a complete replacement of propylene glycol with hexylene glycol will also cause phase separation although hexylene glycol and amylene glycol are considered to be useful glycol components of the detergents according to the present invention if employed in lesser proportions and if employed in conjunction with lower glycols, such as propylene glycol. Similarly, if the di-coco dimethyl ammonium chloride is replaced by di-hydrogenated tallow dimethyl ammonium chloride, the liquid detergent also separates into two phases, especially in the presence of the hexylene glycol (in replacement of

- propylene glycol). However, again, in some circumstances the di-hydrogenated tallow dimethyl ammonium chloride can be employed in a stable product in accordance with the present invention, by decreasing the proportion thereof present and mixing it with dicoco dimethyl ammonium chloride or other di-higher alkyl di-lower alkyl quaternary ammonium halides wherein the higher alkyl groups are of 12 to 14 carbon atoms and the lower alkyl groups are of 1 or 2 carbon atoms. As an alternative, a more hydrophilic quaternary ammonium halide, such as ditallow dimethyl ammonium chloride, which possesses a greater degree of unsaturation and thus is more tolerant of electrolytes, may be successfully used.

15. EXAMPLE 10

- When, in the formula of Example 9A, the nonionic detergent is replaced by Neodol 23-6.5, 0.01% of Polar Brilliant Blue dye is used instead of 0.0025%, and a stilbene fluorescent brightener is present, e.g. Tinopal RBS-200, Tinopal 5BM or Tinopal 4226 (all sold by CIBA-Geigy), or Phorwite RKH or Phorwite BBP (sold by Mobay Chemical Co.) to the extent of 0.1%, a stable and effective product which functions like that of Example 9A results but it has a greater whitening power due to the presence of the brightener, which is stable in the product. The product of this example is also of attractive clear appearance and is stable on storage.

30.

EXAMPLES 11A to 11DExample 11A

- The contents of the experimental formulas of Examples 9A and 10 are varied $\pm 10\%$ and $\pm 25\%$, while
5. keeping the proportions of the various materials within the ranges recited in the specification. In such formulations instead of employing the QCJ soil release polymer (aqueous solution), 1% of QCF (Alkaril Chemicals CAS 9016-88-0) and 5.7% of water
10. are substituted, with the QCF first being dissolved in the water. Also other enzymes, stabilizers, fabric softeners, glycols, alcohols and colourants, as described in the specification, may be employed within the ranges of proportions given. The
15. resulting detergents are clear, stable and non-separating and possess good soil release promoting, softening, cleaning and brightening properties, like those described in Examples 9A and 10. Such is also the case when the fluorescent dye, colourant and
20. perfume are omitted from the formulas of this example.

Examples 11B and 11C

- When triethanolamine or ionizable salt is present in such formulas beyond the limits given,
25. the product becomes less stable and less effective in promoting soil release during washing, and when the sodium formate and glycol are omitted the effects of the enzyme are lost after only a few days storage at the elevated testing temperature.

30.

Example 11D

- In other variations in Example 11A the nonionic detergent is a mixture of equal parts of Neodol 23-6.5 and Neodol 25-7, with the same total proportion being employed. Results like those previously reported in Examples 9A and 10 are obtainable in both test washing machines and household and commercial washing machines, which are either top loading or side loading. Such is also the situation when pH adjustments are made with potassium hydroxide and when such adjustments, made with sodium hydroxide or potassium hydroxide, are to pH's of 6.6, 7.4, 7.9, and 8.6.

- From Examples 9-11 and the preceding examples, as well as the description, it can be seen that the present invention provides a stable and attractive liquid detergent despite the fact that it contains various components that might have been expected to interfere with the stability of the final product. Yet, surprisingly, a stable product is obtained, which has desirable soil release promoting, fabric softening, soil decomposing and detergent properties. Several of the components of the compositions of the present invention exert dual effects therein. For example, the propylene glycol may help to solubilize lipophilic materials in the formulation while at the same time helping to stabilize the enzymes. The sodium formate, which is a stabilizer for enzymes, does not destabilize the soil release agent, as would have been expected.

- Although some quaternary ammonium halides and some glycols can destabilize liquid detergent formulas like those of the present invention, the present materials do not do so. This is surprising because
5. hydrophobic quaternary ammonium halides, which are normally flocculated from solution by electrolytes, are stable in the liquid detergents of the present invention. Thus, it can be seen that the compositions of the present invention represent an
10. unpredictable advance in the art of making stable liquid detergents.

- The invention has been described with respect to various illustrations and preferred embodiments thereof but is not to be limited to these because
15. one of skill in the art, with the present specification before him, will be able to utilize substitutes and equivalents without departing from the invention.

CLAIMS

1. A soil release promoting liquid detergent comprising (A) a deterative proportion of nonionic detergent or a mixture of nonionic and anionic detergents, the proportion of nonionic detergent or
5. a mixture of nonionic and anionic detergents being within the range of 25 to 50%, (B) a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate and an aqueous medium,
10. (C) optionally a water soluble alkali metal lower carboxylate is an amount up to 2% by weight, (D) the composition being free of water soluble ionizable salt which is not an anionic surface active water soluble salt, and which is not component (C), or
15. containing no more than 1% by weight of such salt, and (E) the composition being free of triethanolamine or salts thereof or containing no more than 1% by weight thereof, the pH of the composition being in the range of 6 to 9.
- 20.
2. A stable, soil release promoting enzyme-containing liquid detergent comprising a deterative proportion of a nonionic detergent, a detergent supplementing and fluorescent brightener
25. substantivity increasing proportion of a higher fatty alcohol polyethoxylate sulphate detergent, the proportion of nonionic detergent or a mixture of nonionic and anionic detergents being within the



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51.

- range of 25 to 50%, a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate, a proportion of enzyme sufficient to
5. enzymatically hydrolyze proteinaceous and/or amylaceous soils on fabrics during washing thereof with an aqueous washing solution of the liquid detergent, a stabilizing proportion of a stabilizer for the enzyme(s), and an aqueous medium, optionally
10. a water soluble alkali metal lower carboxylate in an amount up to 2% by weight, the composition being free of water soluble ionizable material other than the higher fatty alcohol polyethoxylate sulphate detergent, and which is not component (C), or
15. containing no more than 1% by weight of such salt, and the composition being free of triethanolamine or salts thereof or containing no more than 1% by weight thereof, the pH of the composition being in the range 6 to 9.
- 20.
3. A stable, fabric softening, soil release promoting enzyme-containing liquid detergent comprising a deterative proportion of a nonionic detergent, the proportion of nonionic detergent or a
25. mixture of nonionic and anionic detergents being within the range of 25 to 50%, a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate, a fabric softening
30. proportion of a quaternary ammonium halide fabric



51a.

- softener, a proportion of enzyme sufficient to enzymatically hydrolyze proteinaceous and/or amylaceous soils on fabrics during washing thereof with an aqueous washing solution of the liquid
5. detergent, a stabilizing proportion of a stabilizer for the enzyme(s), and an aqueous medium, optionally a water soluble alkali metal lower carboxylate in an amount up to 2% by weight, the composition being free of water soluble ionizable material, and which
10. is not component (C), or containing no more than 1% by weight of such salt, and the composition being free of triethanolamine or salts thereof or containing no more than 1% by weight thereof, the pH of the composition being in the range of 6 to 9.
- 15.
4. A liquid detergent as claimed in any one of Claims 1 to 3 in which the nonionic detergent is a condensation product of higher fatty alcohol of 10 to 20 carbon atoms and 3 to 20 moles of ethylene
20. oxide per mole of higher fatty alcohol.
5. A liquid detergent as claimed in any one of Claims 1 to 4 in which the nonionic detergent is a condensation product of a higher fatty alcohol of 12
25. to 15 carbon atoms and 6 to 11 moles of ethylene oxide per mole of higher fatty alcohol.
- 30.



6. A liquid detergent as claimed in any one of Claims 1 to 5 in which the nonionic detergent is a condensation product of a higher fatty alcohol of 12 to 15 carbon atoms and about 7 moles of ethylene oxide per mole of higher fatty alcohol.

7. A liquid detergent as claimed in any one of Claims 1 to 6 which comprises a deterative proportion of a mixture of nonionic and anionic detergents and in which the anionic detergent is a sodium linear higher alkylbenzene sulphonate wherein the higher alkyl group is of 10 to 18 carbon atoms, or a sodium higher fatty alcohol polyethoxylate sulphate wherein the higher fatty alcohol is of 10 to 20 carbon atoms and the polyethoxy is of 1 to 20 ethoxy groups or a mixture thereof.

8. A liquid detergent as claimed in Claim 7 in which the anionic detergent is a sodium linear higher alkylbenzene sulphonate wherein the higher alkyl group is of 12 to 13 carbon atoms.

9. A liquid detergent as claimed in Claim 8 in which the anionic detergent is sodium dodecyl benzene sulphonate.

10. A liquid detergent as claimed in Claim 7 in which the anionic detergent is a higher fatty alcohol polyethoxylate wherein the alcohol is of 10 to 15 carbon atoms and contains 1 to 5 ethoxy groups per mole.



11. A liquid detergent as claimed in Claim 10 in which the anionic detergent is a higher fatty alcohol polyethoxylate sulphate wherein the higher fatty alcohol is of 12 to 15 carbon atoms and the ethoxylate is of about 3 moles of ethylene oxide per mole of higher fatty alcohol.

12. A liquid detergent as claimed in any one of Claims 1 to 11 in which the soil release promoting polymer is a polymer of polyethylene terephthalate and polyoxyethylene terephthalate of a molecular weight in the range of about 15,000 to 50,000, wherein the polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight in the range of about 1,000 to 10,000, with the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units being within the range of 2:1 to 6:1.

13. A liquid detergent as claimed in Claim 12 in which the soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate is of a molecular weight in the range of 19,000 to 25,000, the polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight in the range of 3,000 to 4,000, the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units of the polymer is within the range of 3:1 to 4:1 and the molar ratio of ethylene oxide to phthalic moiety therein is from 20:1 to 30:1.

14. A liquid detergent as claimed in Claim 13 in which the soil release promoting polymer is of a weight average molecular weight of about 22,000, in which the polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight of about 3,400, the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units of the polymer is about 3:1 and the molar ratio of ethylene oxide to phthalic moiety therein is about 22:1.

10.

15. A liquid detergent composition as claimed in any one of Claims 1 to 14 containing a lower alkanol of 1 to 3 carbon atoms.

15. 16. A liquid detergent as claimed in Claim 15 in which the lower alkanol is ethanol.

20. 17. A liquid detergent as claimed in any one of Claims 1 to 16 which contains a fluorescent brightener.

25. 18. A liquid detergent as claimed in Claim 17 in which the fluorescent brightener is a stilbene brightener.

30. 19. A liquid detergent as claimed in Claim 2 and any one of Claims 4 to 18 when dependent on Claim 2 in which the enzyme includes a proteolytic enzyme, and 0.005 to 0.1% thereof is present.



20. A liquid detergent as claimed in Claim 19 which contains 0.01 to 0.1% of proteolytic enzyme and 0.005 to 0.05% of amylolytic enzyme.
5. 21. A liquid detergent as claimed in Claim 20 which contains about 0.03% of proteolytic enzyme and about 0.02% of amylolytic enzyme.
10. 22. A liquid detergent as claimed in any one of Claims 19 to 21 which contains a stabilizer for the enzyme or enzymes.
15. 23. A liquid detergent as claimed in Claim 22 which contains from 0.2 to 2% of stabilizer for the enzyme.
20. 24. A liquid detergent as claimed in Claim 23 which contains 0.5 to 1.5% of stabilizer for the enzyme.
25. 25. A liquid detergent as claimed in Claim 22, 23 or 24 in which the enzyme stabilizer is sodium formate.
30. 26. A liquid detergent as claimed in Claim 3 and any one of Claims 4 to 25 when dependent on Claim 3 in which the quaternary ammonium halide fabric softener is a dihigher alkyl dimethyl ammonium halide.



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27. A liquid detergent as claimed in Claim 26 in which the quaternary ammonium halide is a chloride and in which the higher alkyls are of 12 to 18 carbon atoms.
- 5.
28. A liquid detergent as claimed in Claim 27 in which the quaternary ammonium halide is a di-coco dimethyl ammonium chloride.
- 10.
29. A liquid detergent as claimed in Claim 26, 27 or 28 which contains 1 to 10% of the quaternary ammonium halide fabric softener.
- 15.
30. A liquid detergent as claimed in any one of Claims 1 to 29 in which the proportion of soil release promoting polymer is within the range of 0.5 to 10%.
- 20.
31. A liquid detergent as claimed in any one of Claims 1 to 30, which comprises from 20 to 40% of nonionic detergent, from 3 to 15% of anionic detergent and from 3 to 15% of a lower alkanol.
- 25.
32. A liquid detergent comprising nonionic detergent which is a condensation product of a higher fatty alcohol of 12 to 15 carbon atoms and 6 to 11 moles of ethylene oxide per mole of higher fatty alcohol, anionic detergent which is a sodium
- 30.



- linear higher alkylbenzene sulphonate wherein the higher alkyl group is of 12 to 13 carbon atoms, a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate of a
5. molecular weight in the range of 19,000 to 25,000, wherein the polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight in the range of 3,000 to 4,000, the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units of
10. the polymer is within the range of 3:1 to 4:1 and the molar ratio of ethylene oxide to phthalic moiety therein is from 20:1 to 30:1, and ethanol, the content of water soluble ionizable salt other than anionic surface active water soluble salt being less
15. than 0.5%, the liquid detergent containing no triethanolamine or less than 0.2% thereof and the proportions of nonionic detergent, anionic detergent, soil release promoting polymer, alcohol and water being within the ranges of 25 to 35%, 5 to
20. 10%, 1 to 6%, 5 to 12% and 30 to 60%, respectively.

33. A liquid detergent consisting essentially of about 32% of nonionic detergent which is a condensation product of a higher fatty alcohol of 12 to 15
25. carbon atoms and about 7 moles of ethylene oxide per mole of higher fatty alcohol, about 7% of sodium dodecylbenzene sulphonate, about 2% of soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate of a weight average
30. molecular weight of about 22,000, in which the



- polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight of about 3,400, the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units of the polymer is about 3:1 and
5. the molar ratio of ethylene oxide to phthalic moiety therein is about 22:1, about 0.2% of fluorescent brightener, about 8% of ethanol, and about 51% of water, wherein the pH is about 7.8, which liquid detergent contains no triethanolamine and in which
10. the content of any water soluble ionizable salt other than anionic surface active water soluble salt that may be present is less than 0.3%.

34. A liquid detergent as claimed in Claim 2 or
15. in any one of Claims 4 to 25 when dependent on Claim 2 wherein the proportion of nonionic detergent is within the range of 25 to 40%, the higher fatty alcohol polyethoxylate sulphate is a sodium salt and 1 to 8% thereof is present.

20. 35. A liquid detergent as claimed in Claim 34 which comprises from 28 to 36% of nonionic detergent, 2 to 7% of sodium higher fatty alcohol polyethoxylate sulphate, 0.02 to 2% of fluorescent
25. brightener(s), and from 3 to 12% of a lower alkanol.

36. A liquid detergent as claimed in Claim 35 in which the fluorescent brightener is a stilbene brightener, the lower alkanol is ethanol, and
30. wherein the nonionic detergent, the higher fatty

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alcohol polyethoxylate sulphate, the fluorescent brightener, the soil release promoting polymer, proteolytic enzyme, amylolytic enzyme, sodium formate, ethanol, and water are present in proportions within the ranges of 30 to 34%, 2 to 6%, 0.1 to 1%, 0.8 to 3%, 0.02 to 0.05%, 0.01 to 0.03%, 0.7 to 1.3%, 4 to 9%, and 46 to 62%, respectively.

37. A liquid detergent as claimed in Claim 36 which is clear and consists essentially of about 32% of a nonionic detergent which is a condensation product of a higher fatty alcohol of 12 to 15 carbon atoms and about 7 moles of ethylene oxider per mole of higher fatty alcohol, about 5% of sodium higher fatty alcohol polyethoxylate sulphate, about 0.3% of stilbene fluorescent brightener, about 2% of the soil release promoting polymer, about 0.03% of the proteolytic enzyme, about 0.02% of the amylolytic enzyme, about 1% of sodium formate, about 5.5% of ethanol, about 0.4% of perfume and about 54% of deionized water.

38. A liquid detergent as claimed in Claim 3 or in any one of Claims 4 to 29 when dependent on Claim 3 wherein the proportion of nonionic detergent is within the range of 10 to 35%, 0.5 to 5% of the soil release promoting polymer is present, 1 to 10% of the quaternary ammonium halide is present, the enzyme includes a proteolytic enzyme, and 0.005 to 0.1% thereof is present, and from 0.2 to 2% of the stabilizer for the enzyme is present.

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39. A liquid detergent as claimed in Claim 38 which comprises from 15 to 30% of nonionic detergent, 3 to 8% of quaternary ammonium halide, which is a chloride, 0.005 to 0.05% of proteolytic enzyme, 0.005 to 0.05% of amylolytic enzyme, 0.5 to 1.5% of a stabilizer for the enzymes and from 1 to 10% of a lower alkanol.
40. A liquid detergent as claimed in Claim 39 in which the enzyme stabilizer is sodium formate, the lower alkanol is ethanol, from 2 to 8% of propylene glycol is present and the proportions of nonionic detergent, soil release promoting polymer, fabric softener, proteolytic enzyme, amylolytic enzyme, sodium formate, ethanol, propylene glycol and water are within the ranges of 20 to 25%, 0.8 to 1.5%, 3 to 6%, 0.015 to 0.03%, 0.01 to 0.025%, 0.7 to 1.3%, 1.5 to 3%, 3 to 8%, and 50 to 70%, respectively.
41. A liquid detergent as claimed in Claim 40 which is clear and consists essentially of about 22% of the nonionic detergent, about 1% of the soil release promoting polymer, about 4.5% of di-coco dimethyl ammonium chloride, about 0.023% of proteolytic enzyme, about 0.015% of amylolytic enzyme, about 1% of sodium formate, about 2% of ethanol, about 6% of propylene glycol, about 0.4% of perfume and about 63% of deionized water.



42. A liquid detergent as claimed in Claim 1 substantially as specifically described herein with reference to any one of Examples 1A, 1E, 1F, 2A, 2B, 3A, 4A, 4D, 5A, 6, 7A, 8, 9A, 9D, 9E, 10, 11A, and 11D.

43. A process for making a soil release promoting liquid detergent as claimed in any one of Claims 1 to 3 which comprises mixing together a deterative proportion of a nonionic detergent or a mixture of nonionic and anionic detergents and a soil release promoting proportion of a soil release promoting polymer of polyethylene terephthalate and polyoxyethylene terephthalate in an aqueous medium and admixing with such mixture an aqueous neutralizing agent to adjust the pH of the detergent to within the range of 6.1 to 7.9, which detergent, after such neutralization, contains no more than 1% of water soluble ionizable salt other than anionic surface active water soluble salt.

44. A process as claimed in Claim 43 in which the liquid detergent comprises 25 to 35% of a non-ionic detergent, 5 to 10% of anionic detergent, 1 to 6% of the soil releasing polymer, 5 to 12% of ethanol, 0.1 to 0.5% of fluorescent brightener and 30 to 60% of water, with the content of water soluble ionizable salt other than anionic surface active water soluble salt being less than 0.5%, triethanolamine being absent or present in an amount less than 0.2%, and in which the neutralization is effected with an aqueous solution of sodium hydroxide.



45. A process as claimed in Claim 43 or Claim 44, wherein the nonionic detergent is a condensation product of a higher fatty alcohol of 12 to 15 carbon atoms and 6 to 11 moles of ethylene oxide per mole of higher fatty alcohol.

46. A process as claimed in Claim 43, 44 or 45, wherein the anionic detergent is a sodium linear higher alkylbenzene sulphonate wherein the higher alkyl group is of 12 to 13 carbon atoms.

47. A process as claimed in any one of Claims 43 to 46, wherein the soil release promoting polymer is of a molecular weight in the range of 19,000 to 25,000 and the polyoxyethylene of the polyoxyethylene terephthalate is of a molecular weight in the range of 3,000 to 4,000, the molar ratio of ethylene terephthalate to polyoxyethylene terephthalate units of the polymer being within the range of 3:1 to 4:1 and the molar ratio of ethylene oxide to phthalic moiety thereof being from 20:1 to 30:1.