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(56) Documents cited
**GB 2157716 A EP 0403296 A1 EP 0169604 A2
US 4987627 A US 4889644 A**

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(54) Liquid detergent compositions and their use

(57) Fabrics are washed by pre-diluting a heavy duty liquid detergent composition with water and dosing the fabrics wash load within one hour of effecting the pre-dilution. One preferred composition for this use comprises about 1% – 50% by weight of an amphoteric surfactant, more than 20% by weight of nonionic surfactant, an enzyme and an enzyme stabilizer/stabilizing system.

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LIQUID DETERGENT COMPOSITIONS AND THEIR USE

The present invention relates to a method of washing fabrics and compositions particularly suited for use in that method.

Although heavy duty liquid detergent compositions have been known for many years, recent developments in formulation technology have enabled more concentrated liquid products to be formulated. Concentrated liquid detergent products have high concentrations of one or more components which are beneficial in the wash, but especially they have high concentrations of surfactants.

Recently, it has become possible to formulate liquid detergent compositions which are so concentrated that either it is detrimental to dose them direct onto the fabrics or at least the consumer perceives such direct dosing as detrimental.

The applicants have conjectured that it would be possible to overcome this disadvantage by pre-diluting the concentrated product with water before mixing. However, many liquid detergent compositions contain ingredients which despite being stable in the undiluted composition, become unstable upon dilution. One example of this phenomenon is encountered with enzymes. It is normal to have to include an enzyme stabilizer such as glycerol/borax. If the composition is pre-diluted, then after a time, the enzyme is degraded because the concentration of the stabilizer is too low in dilution.

Although it might in principle be possible to increase the concentration of stabilizer in the undiluted composition in order to overcome this problem, in

principle it is often not realistic. Either the cost of the raw materials prohibits this or at higher concentration levels, these materials become detrimental to other components in the composition or to the rheology or another property of the composition as a whole.

The present invention provides a method of washing fabrics, the method comprising pre-diluting a heavy duty liquid detergent composition with water and dosing the fabric wash load with the diluted product within one hour after effecting the pre-dilution.

It is preferable that as little time as possible elapses between the step of pre-dilution and dosing of the wash load. Thus, the load is preferably dosed no more than 5 minutes after pre-dilution, more preferably after no more than 1 minute and most preferably, substantially immediately after the pre-dilution step.

We may also claim a method of preparing a diluted wash composition, the method comprising pre-diluting a concentrated heavy duty liquid detergent composition with water, prior to application to the wash load, washing machine etc, as appropriate.

Preferably, the pre-dilution involves admixture of the original composition and the water so that the resultant mixture is substantially homogeneous.

The present invention also extends to pre-dilutable liquid detergent compositions which are particularly, although not exclusively, suited to use in the method of the present invention. Moreover, the present invention includes the method of the present invention when employing any liquid detergent composition described herein.

Generally, pre-dilutable liquid detergent compositions should possess one or more features making them suitable for pre-dilution. Such features include: -

- (i) sufficiently high concentration of actives
(surfactants)
- (ii) ready miscibility with water without phase separation
- (iii) long-term stability

Concentrated liquid detergent compositions can conveniently be divided into three categories, all of which are suitable for use in methods according to the present invention. These categories are non-aqueous formulations, structured aqueous formulations and isotropic aqueous formulations.

Non-aqueous formulations comprise a substantially non-aqueous liquid phase comprising one or more liquid surfactants and optionally, one or more non-surfactant liquid solvents. Often, such formulations contain dispersed particulate solids such as builders. Example of such non-aqueous compositions are disclosed in our published European Patent Specification No. EP-A-266,199.

Structured aqueous formulations comprise surfactants, and optionally also electrolytes and/or polymers in water so that the surfactants form a liquid crystalline phase, for example lamellar droplets, to endow desirable rheological and/or solid-suspending properties. Solid-suspending properties allow particulate materials such as detergency builders to be suspended in the composition.

Isotropic aqueous formulations are water-based compositions containing surfactants and optionally,

other ingredients, but which do not comprise a liquid crystalline phase and consequently, contain substantially no suspended solids.

The pre-dilutable compositions for use in the method of the present invention may comprise any in the aforementioned three categories. However, one particularly preferred class of compositions, which form a separate aspect of the present invention are pre-dilutable heavy duty liquid detergent compositions comprising:

- from about 1% to about 50% by weight of the total composition of an amphoteric surfactant;
- more than 20% by weight of nonionic surfactant;
- an effective amount of an enzyme; and
- an enzyme stabilizer or enzyme stabilizing system in an amount effective to inhibit degradation of the enzyme in the undiluted composition.

The composition may also contain one or more other surfactants and optionally, other ingredients.

In the widest definition the detergent active materials in general, may comprise one or more surfactants, and may be selected from anionic, cationic, nonionic, zwitterionic and amphoteric species, and (provided mutually compatible) mixtures thereof. For example, they may be chosen from any of the classes, sub-classes and specific materials described in "Surface Active Agents" Vol. I, by Schwartz & Perry, Interscience 1949 and "Surface Active Agents" Vol. II by Schwartz, Perry & Berch (Interscience 1958), in the current edition of "McCutcheon's Emulsifiers & Detergents" published by the McCutcheon division of Manufacturing Confectioners Company or in "Tensid-Taschenburch", H. Stache, 2nd Edn., Carl Hanser Verlag, Munchen & Wien,

1981.

Suitable nonionic surfactants include, in particular, the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl (C6-C18) primary or secondary linear or branched alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine. Other so-called nonionic detergent compounds include long chain tertiary amine oxides, long chain tertiary phosphine oxides and dialkyl sulphoxides.

Preferably the composition comprises at least 22.5% by weight of the nonionic surfactant, for example about 24%.

Suitable anionic surfactants are usually water-soluble alkali metal salts of organic sulphates and sulphonates having alkyl radicals containing from about 8 to about 22 carbon atoms, the term alkyl being used to include the alkyl portion of higher acyl radicals. Examples of especially preferred synthetic anionic detergent compounds are sodium and potassium alkyl sulphates, for example those obtained by sulphating higher (C8-C18) alcohols produced for example from tallow or coconut oil, sodium and potassium alkyl (C9-C20) benzene sulphonates, particularly sodium linear secondary alkyl (C10-C15) benzene sulphonates; sodium alkyl glyceryl ether sulphates, especially those ethers of the higher alcohols derived from tallow or coconut oil and synthetic alcohols derived from petroleum; sodium coconut oil fatty monoglyceride sulphates and sulphonates; sodium and potassium salts of sulphuric

acid esters of higher (C8-C18) fatty alcohol-alkylene oxide, particularly ethylene oxide, reaction products; the reaction products of fatty acids such as coconut fatty acids esterified with isethionic acid and neutralised with sodium hydroxide; sodium and potassium salts of fatty acid amides of methyl taurine; alkane monosulphonates such as those derived by reacting alpha-olefins (C8-C20) with sodium bisulphite and those derived from reacting paraffins with S02 and Cl2 and then hydrolysing with a base to produce a random sulphonate; and olefin sulphonates, which term is used to describe the material made by reacting olefins, particularly C10-C20 alpha-olefins, with S03 and then neutralising and hydrolysing the reaction product. The preferred anionic detergent compounds are sodium (C11-C15) alkyl benzene sulphonates and sodium (C16-C18) alkyl sulphates.

Generally the level of the above mentioned non-soap anionic surfactant materials is from 1-40 % by weight of the composition.

Preferably the weight ratio of synthetic anionic surfactants to nonionic surfactants is from 10 : 1 to 1 : 10.

It is also possible, and sometimes preferred, to include an alkali metal soap of a mono- or di-carboxylic acid, especially a soap of an acid having from 12 to 18 carbon atoms, for example oleic acid, ricinoleic acid, and fatty acids derived from castor oil, rapeseed oil, groundnut oil, coconut oil, palmkernel oil, alk(en)yl succinates e.g. dodecyl succinates or mixtures thereof.

The sodium or potassium soaps of these acids can be

used. Preferably the level of soap in compositions of the invention is from 1 - 40 % by weight of the composition, more preferred from 5 - 25 %.

In any event, it is preferred that compositions according to the present invention include detergency builder material, some or all of which may be electrolyte. The builder material is any material capable of reducing the level of free calcium ions in the wash liquor and will preferably provide the composition with other beneficial properties such as the generation of an alkaline pH, the suspension of soil removed from the fabric.

Examples of phosphorous-containing inorganic detergency builders, when present, include the water-soluble salts, especially alkali metal pyrophosphates, orthophosphates, polyphosphates and phosphonates. Specific examples of inorganic phosphate builders include sodium and potassium tripolyphosphates, phosphates and hexametaphosphates. Phosphonate sequestrant builders may also be used. Sometimes, however, it is preferred to minimise the amount of phosphorous-containing builders.

Examples of non-phosphorus-containing inorganic detergency builders, when present, include water-soluble alkali metal carbonates, bicarbonates, silicates and crystalline and amorphous aluminosilicates. Specific examples include sodium carbonate (with or without calcite seeds), potassium carbonate, sodium and potassium bicarbonates, silicates and zeolites.

Examples of organic detergency builders, when present, include the alkaline metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates,

polyacetyl carboxylates and polyhydroxysulphonates, specific examples include sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediaminetetraacetic acid, nitrilotriacetic acid, oxydisuccinic acid, melitic acid, benzene polycarboxylic acids, CMOS, tartrate mono succinate, tartrate di succinate and citric acid.

In the context of organic builders, it is also desirable to incorporate polymers which are only partly dissolved, in the aqueous continuous phase as described in EP 301.882. This allows a viscosity reduction (due to the polymer which is dissolved) whilst incorporating a sufficiently high amount to achieve a secondary benefit, especially building, because the part which is not dissolved does not bring about the instability that would occur if substantially all were dissolved.

It is further possible to include in the compositions of the present invention, alternatively, or in addition to the partly dissolved polymer, yet another polymer which is substantially totally soluble in the aqueous phase and has an electrolyte resistance of more than 5 grams sodium nitrilotriacetate in 100ml of a 5% by weight aqueous solution of the polymer, said second polymer also having a vapour pressure in 20% aqueous solution, equal to or less than the vapour pressure of a reference 2% by weight or greater aqueous solution of polyethylene glycol having an average molecular weight of 6000; said second polymer having a molecular weight of at least 1000. Use of such polymers is generally described in our EP 301,883.

Preferably the level of non-soap builder material is from 5-50 % by weight of the composition, more preferred from 5 to 35 %.

It is possible to incorporate minor amounts, of hydrotropes other than water-miscible solvents to ensure that the compositions are isotropic. By hydrotrope is meant any water soluble agent which tends to enhance the solubility of surfactants in aqueous solution.

Apart from the ingredients already mentioned, a number of optional ingredients may also be present, for example lather boosters such as alkanolamides, particularly the monoethanolamides derived from palm kernel fatty acids and coconut fatty acids, fabric softeners such as clays, amines and amine oxides, lather depressants, inorganic salts such as sodium sulphate, and, usually present in very minor amounts, fluorescent agents, perfumes, and colourants.

The enzymes may be selected from any of those known in the art, for example proteases, amylases and lipases (including lipolase (Trade Mark) ex Novo).

Examples of suitable enzyme stabilizers/stabilizing systems are boric acid or borax in the presence of an appropriate diol or polyol such as glycerol or propylene glycol.

The pre-dilution method of the present invention may be effected in any suitable container including a dosing device of the type which is filled with a liquid detergent product and then placed in a washing machine to release its contents during the wash.

The dilution ratio of the composition to water will depend for example on the concentration of that composition, the local water hardness and the nature of the wash load. However, typical ratios are from 10:1 to

1:10, for example 1:1 of the composition to water by volume.

The invention will now be illustrated by the following example.

Example 1

| <u>Component</u> | <u>%wt</u> |
|------------------------------|------------|
| Sodium Paraffin Sulphonate | 10.00 |
| C13/15 Alcohol 7EO | 24.00 |
| Sodium Carboxymethyl Tallow | |
| Polypropylamine-4 | 3.00 |
| Oleic/Coconut Fatty Acid Mix | 1.50 |
| Aqueous Solution of Sodium | |
| Polycarboxylate | 6.00 |
| Na/K Primary Alkyl Sulphate | 2.50 |
| 1-2 Propane Diol | 5.00 |
| Boric Acid | 0.50 |
| Cotton Fluorescer E1:1140 | 0.15 |
| Antifoam | 0.30 |
| Protease | 0.60 |
| Amylase | 0.30 |
| Dequest Sodium Salt | 0.40 |
| Latex (Lytron) | 0.50 |
| Amino Alcohol | 1.00 |

The composition of Example 1 is diluted 1:1 by volume with water and then immediately dosed into the washing machine.

CLAIMS

1. A method of washing fabrics, the method comprising pre-diluting a heavy duty liquid detergent composition with water and dosing the fabrics washload with the diluted product within one hour after effecting the pre-dilution.

2 A pre-dilutable heavy duty liquid detergent composition comprising:

from about 1% to about 50% by weight of an amphoteric surfactant;

more than 20% by weight of nonionic surfactant;

an effective amount of an enzyme; and

an enzyme stabilizer or enzyme stabilizing system in an amount effective to inhibit degradation of the enzyme in the undiluted composition.

**Examiner's report to the Comptroller under
Section 17 (The Search Report)**

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Relevant Technical fields

(i) UK Cl (Edition K) D1A (ADKA,ADKF,ADKG,AERA)

(ii) Int CL (Edition 5) D06F 39/00, 39/02

Search Examiner

ALEX LITTLEJOHN

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES : WPI

Date of Search

24 JUNE 1992

Documents considered relevant following a search in respect of claims

1

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|--|-------------------------|
| X | GB 2157716 A (UNILEVER) See whole document, eg. page 1 lines 34-36 and 56-66 | 1 |
| X | EP 0403296 A1 (DIVERSEY) See whole document, eg. column 6 lines 16-29 | 1 |
| X | EP 0169604 A2 (PHILIPS) See whole document, eg. page 2 lines 20-26 | 1 |
| X | US 4987627 (CUR) See whole document, eg. column 2 lines 61-67 and column 5 lines 25-59 | 1 |
| X | US 4889644 (AMBERG) See whole document eg. column 2 lines 11-34 | 1 |

| Category | Identity of document and relevant passages | Relevant to claim(s) |
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Categories of documents

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P: Document published on or after the declared priority date but before the filing date of the present application.

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