

BUILT LIQUID LAUNDRY DETERGENT COMPOSITION
CONTAINING SALT OF HIGHER FATTY ACID
STABILISER AND METHOD OF USE

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- The present invention relates to non-aqueous liquid fabric treating compositions. More particularly, the present invention relates to non-aqueous liquid laundry detergent compositions which are
5. easily pourable, are stable against phase separation and gelation and to the use of these compositions for cleaning soiled fabrics.

- Liquid non-aqueous heavy duty laundry detergent compositions are well known in the art. For instance,
10. compositions of that type may comprise a liquid non-ionic surfactant in which are dispersed particles of a builder, as shown for instance in the U.S. Patents Nos. 4,316,812; 3,630,929; 4,264,466; and British Patents Nos. 1,205,711, 1,270,040 and 1,600,981.

15. Liquid detergents are often considered to be more convenient to employ than dry powdered or particulate products and, therefore, have found substantial favour with consumers. They are readily measurable, speedily dissolved in the wash water, capable of being easily
20. applied in concentrated solutions or dispersions to soiled areas on garments to be laundered and are non-dusting, and they usually occupy less storage space. Additionally, the liquid detergents may have incorporated in their formulations materials
25. which could not stand drying operations without deterioration, which materials are often desirably employed in the manufacture of particulate detergent products. Although they are possessed of many advantages over unitary or particulate solid products,
30. liquid detergents often have certain inherent

disadvantages too, which have to be overcome to produce acceptable commercial detergent products. Thus, some such products separate out on storage and others separate out on cooling and are not readily redis-

5. persed. In some cases the product viscosity changes and it becomes either too thick to pour or so thin as to appear watery. Some clear products become cloudy and others gel on standing.

- The present inventors have been extensively
10. involved in studying the rheological behaviour of non-ionic liquid surfactant systems with and without particulate matter suspended therein. Of particular interest has been non-aqueous built laundry liquid detergent compositions and the problems of gelling
15. associated with non-ionic surfactants as well as settling of the suspended builder and other laundry additives. These considerations have an impact on, for example, product pourability, dispersibility and stability.

20. The rheological behaviour of the non-aqueous built liquid laundry detergents can be compared by analogy to the rheological behaviour of paints in which the suspended builder particles correspond to the inorganic pigment and the non-ionic liquid surfactant corresponds
25. to the non-aqueous paint vehicle. For simplicity, in the following discussion, the suspended particles, e.g. detergent builder, will sometimes be referred to as the "pigment".

- It is known that one of the major problems with
30. paints and built liquid laundry detergents is their physical stability. This problem stems from the fact

that the density of the solid pigment particles is higher than the density of the liquid matrix.

Therefore, the particles tend to separate out or sediment according to Stoke's law. Two basic

5. techniques exist

to solve the sedimentation problem: liquid matrix viscosity and reducing solid particle size.

- For instance, it is known that such suspensions can be stabilised against settling by adding inorganic or organic thickening agents or dispersants, such as, for example, very high surface area inorganic materials, e.g. finely divided silica or clays, or organic thickeners, such as the cellulose ethers, acrylic and acrylamide polymers or polyelectrolytes.

10. However, such increases in suspension viscosity are naturally limited by the requirement that the liquid suspension be readily pourable and flowable, even at low temperature. Furthermore, these additives do not contribute to the cleaning performance of the
15. formulation.

Grinding to reduce the particle size is more advantageous and provides two major consequences;

1. The pigment specific surface area is increased, and, therefore, particle wetting by the non- aqueous vehicle (liquid nonionic) is proportionately improved.
25. 2. The average distance between pigment

- particles is reduced with a proportionate increase in particle-to-particle interaction. Each of these effects contributes to increase the rest-gel strength and the suspension yield stress while at the same time,
- 30.

grinding significantly reduces plastic viscosity.

- The non-aqueous liquid suspensions of the detergent builders, such as the polyphosphate builders, especially sodium tripolyphosphate (TPP) in non-ionic surfactant are found to behave, rheologically, substantially according to the Casson equation:

$$\sigma^{1/2} = \sigma_0^{1/2} + \eta_{\infty}^{1/2} \dot{\gamma}^{1/2}$$

where $\dot{\gamma}$ is the shear rate,

10. σ is the shear stress,
 σ_0 is the yield stress (or yield value),
 and η_{∞} is the "plastic viscosity" (apparent viscosity at infinite shear rate).

- The yield stress is the minimum stress necessary to induce a plastic deformation (flow) of the suspension. Thus, visualising the suspension as a loose network of pigment particles, if the applied stress is lower than the yield stress, the suspension behaves like an elastic gel and no plastic flow will occur. Once the yield stress is overcome, the network breaks at some points and the sample begins to flow, but with a very high apparent viscosity. If the shear stress is much higher than the yield stress, the pigments are partially shear-deflocculated and the apparent viscosity decreases. Finally, if the shear stress is much higher than the yield stress value, the pigment particles are completely shear-deflocculated and the apparent viscosity is very low, as if no particle interaction were present. Therefore, the higher the yield stress of the suspension,

the higher the apparent viscosity at low shear rate and the better is the physical stability of the product.

In addition to the problem of settling or phase

separation the non-aqueous liquid laundry detergents

5. based on liquid non-ionic surfactants suffer from the drawback that the non-ionics tend to gel when added to cold water. This is a particularly important problem in the ordinary use of European household automatic washing machines where the user places the laundry
10. detergent composition in a dispensing unit (e.g. a dispensing drawer) of the machine. During the operation of the machine the detergent in the dispenser is subjected to a stream of cold water to transfer it to the main body of wash solution. Especially during
15. the winter months when the detergent composition and water fed to the dispenser are particularly cold, the detergent viscosity increases markedly and a gel forms. As a result some of the composition is not flushed completely off the dispenser during operation of the
20. machine, and a deposit of the composition builds up with repeated wash cycles, eventually requiring the user to flush the dispenser with hot water.

The gelling phenomenon can also be a problem

whenever it is desired to carry out washing using cold

25. water as may be recommended for certain synthetic and delicate fabrics or fabrics which can shrink in warm or hot water.

Partial solutions to the gelling problem in

aqueous, substantially builder-free compositions have

30. been proposed by the present inventors and others and include, for example, diluting the liquid non-ionic

- with certain viscosity controlling solvents and gel-inhibiting agents, such as lower alkanols, e.g. ethyl alcohol (see U.S. Patent 3,953,380), alkali metal formates and adipates (see U.S. Patent 4,368,147),
5. hexylene glycol or polyethylene glycol, and nonionic structure modification and optimisation.

- As an example of non-ionic surfactant modification one particularly successful result has been achieved by acidifying the hydroxyl moiety end group of the non-
10. ionic molecule. The advantages of introducing a carboxylic acid at the end of the non-ionic include gel inhibition upon dilution; decreasing the non-ionic pour point; and formation of an anionic surfactant when neutralised in the washing liquor. Non-ionic structure
 15. optimisation has centred on the chain length of the hydrophobic-lipophilic moiety and the number and make-up of alkylene oxide (e.g. ethylene oxide) units of the hydrophilic moiety. For example, it has been found that a C₁₃ fatty alcohol ethoxylated with 8 moles of
 20. ethylene oxide presents only a limited tendency to gel formation.

- Nevertheless, still further improvements are desired in the stability, viscosity control and gel inhibition of non-aqueous liquid detergent
25. compositions.

- The present invention aims to provide liquid fabric treating compositions which are suspensions of insoluble inorganic particles in a non-aqueous liquid and which are storage stable, easily pourable and
30. dispersible in cold, warm or hot water.

The present invention further also aims to

formulate highly built heavy duty non-aqueous liquid non-ionic surfactant laundry detergent compositions which can be poured at a wide range of temperatures and which can be repeatedly dispersed from the dispensing unit of European style automatic laundry washing machines without fouling or plugging of the dispenser even during the winter months.

According to the present invention there is provided a fabric treating composition which comprises a suspension of insoluble particles in a non-aqueous liquid and an aluminium salt of a higher aliphatic carboxylic acid effective to increase the stability of the suspension. The aluminium salt increases the yield stress of the composition thereby increasing its stability, i.e. tendency to prevent settling of particles such as builder particles, preferably while reducing or at least without increasing, the plastic viscosity (viscosity under shear conditions) of the composition.

Thus according to the present invention there is added to the non-aqueous liquid suspension an amount of aluminium fatty acid salt effective to inhibit settling of the suspended inorganic fabric treating particles, e.g. detergent builder, bleaching agent, antistatic agent, pigment, etc.

One aspect of the present invention provides a liquid heavy duty laundry composition composed of a suspension of a detergent builder salt in a liquid non-ionic surfactant, wherein the composition includes an amount of aluminium fatty acid salt to increase the stability of the suspension and lower its viscosity.

According to another aspect, the invention

provides a method for dispensing a liquid non-ionic laundry detergent composition containing a suspension of solid particles into and/or with cold water without undergoing gelation. In particular, a method is
5 provided for filling a container with a non-aqueous liquid laundry detergent composition in which the detergent is composed, at least predominantly, of a liquid non-ionic surface active agent and for dispensing the composition from the container into an
10 aqueous wash bath, wherein the dispensing is effected by directing a stream of unheated water onto the composition such that the composition is carried by the stream of water into the wash bath.

The non-ionic synthetic organic detergents
15 employed in the practice of the invention may be any of a wide variety of such compounds, which are well known and, for example, are described at length in the text Surface Active Agents, Vol. II, by Schwartz, Perry and Berch, published in 1958 by Interscience Publishers,
20 and in McCutcheon's Detergents and Emulsifiers, 1969 Annual, the relevant disclosures of which are hereby incorporated by reference. Usually, the non-ionic detergents are poly-lower alkoxyated lipophiles wherein the desired hydrophile-lipophile balance is
25 obtained by addition of a hydrophilic poly-lower alkoxy group to a lipophilic moiety. A preferred class of the non-ionic detergent employed is the poly-lower alkoxyated higher alkanol wherein the alkanol is of 10 to 18 carbon atoms and wherein the number of mols of
30 lower alkylene oxide (of 2 or 3 carbon atoms) is from 3 to 12. Of such materials it is preferred to employ those wherein the higher alkanol is a higher fatty

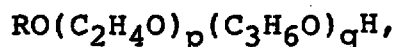
- alcohol of 10 to 11 or 12 to 15 carbon atoms and which contain from 5 to 8 or 5 to 9 lower alkoxy groups per mol. Preferably, the lower alkoxy is ethoxy but in some instances, it may be desirably mixed with propoxy,
5. the latter, if present, usually being a minor (less than 50%) proportion. Exemplary of such compounds are those wherein the alkanol is of 12 to 15 carbon atoms and which contain about 7 ethylene oxide groups per mole, e.g.-Neodol (Registered Trade Mark) 25-7 and
 10. Neodol 23-6.5, which products are made by Shell Chemical Company, Inc. The former is a condensation product of a mixture of higher fatty alcohols averaging about 12 to 15 carbon atoms, with about 7 mols of ethylene oxide and the latter is a corresponding
 15. mixture wherein the carbon atom content of the higher fatty alcohol is 12 to 13 and the number of ethylene oxide groups present averages about 6.5. The higher alcohols are primary alkanols. Other examples of such detergents include Tergitol (Registered Trade Mark)
 20. 15-S-7 and Tergitol 15-S-9, both of which are linear secondary alcohol ethoxylates made by Union Carbide Corp. The former is a mixed ethoxylation product of 11 to 15 carbon atoms linear secondary alkanol with seven mole of ethylene oxide and the latter is a similar
 25. product but with nine mols of ethylene oxide being reacted.

Also useful in the composition of the present invention as a component of the non-ionic detergent are higher molecular weight non-ionics, such as Neodol 45-

30. 11, which are similar ethylene oxide condensation products of higher fatty alcohols, with the higher

- fatty alcohol being of 14 to 15 carbon atoms and the number of ethylene oxide groups per mol being about 11. Such products are also made by Shell Chemical Company. Other useful non-ionics are represented by the Plurafac
5. (Registered Trade Mark). The Plurafacs are the reaction product of a higher linear alcohol and a mixture of ethylene and propylene oxides, containing a mixed chain of ethylene oxide and propylene oxide, terminated by a hydroxyl group. Examples include
 10. Plurafac RA30, Plurafac RA40 (a C₁₃-C₁₅ fatty alcohol condensed with 7 moles propylene oxide and 4 moles ethylene oxide), Plurafac D25 (a C₁₃-C₁₅ fatty alcohol condensed with 5 moles propylene oxide and 10 moles ethylene oxide), Plurafac B26, and Plurafac RA50 (a
 15. mixture of equal parts Plurafac D25 and Plurafac RA40)

Generally, the mixed ethylene oxide-propylene oxide fatty alcohol condensation products can be represented by the general formula



20. wherein R represents a straight or branched, primary or secondary aliphatic hydrocarbon group, preferably an alkyl or alkenyl group, especially preferably an alkyl group, of from 6 to 20, preferably 10 to 18, especially preferably 14 to 18 carbon atoms, p is a number of from
25. 2 to 12, preferably 4 to 10, and q is a number of from 2 to 7, preferably 3 to 6.

- Another group of liquid non-ionics are available from Shell Chemical Company, Inc. under the Dobanol trade mark: Dobanol 91-5 is an ethoxylated C₉-C₁₁ fatty
30. alcohol with an average of 5 moles ethylene oxide; and Dobanol 25-7 is an ethoxylated C₁₂-C₁₅ fatty alcohol

with an average of 7 moles ethylene oxide.

- In the preferred poly-lower alkoxyated higher alkanols, to obtain the best balance of hydrophilic and lipophilic moieties the number of lower alkoxies will
5. usually be from 40% to 100% of the number of carbon atoms in the higher alcohol, preferably 40 to 60% thereof and the non-ionic detergent will preferably contain at least 50% of such preferred poly-lower alkoxy higher alkanol. Higher molecular weight
 10. alkanols and various other normally solid non-ionic detergents and surface active agents may be contributory to gelation of the liquid detergent and consequently, will preferably be omitted or limited in quantity in the composition of the present invention,
 15. although minor proportions thereof may be employed for their cleaning properties. With respect to both preferred and less preferred non-ionic detergents the alkyl groups present therein are generally linear. although branching may be tolerated, such as at a
 20. carbon next to or two carbons removed from the terminal carbon of the straight chain and away from the ethoxy chain, if such branched alkyl is not more than three carbons in length. Normally, the proportion of carbon atoms in such a branched configuration will be minor
 25. rarely exceeding 20% of the total carbon atom content of the alkyl group. Similarly, although linear alkyls which are terminally joined to the ethylene oxide chains are highly preferred and are considered to result in the best combination of detergency,
 30. biodegradability and non-gelling characteristics, medial or secondary joinder to the ethylene oxide in

- the chain may occur. It is usually in only a minor proportion of such alkyls, generally less than 20% but, as is in the case of the mentioned Tegitols, may be greater. Also, when propylene oxide is present in the
5. lower alkylene oxide chain, it will usually be less than 20% thereof and preferably less than 10% thereof.

- When greater proportions of non-terminally alkoxyated alkanols, propylene oxide-containing poly-lower alkoxyated alkanols and less hydrophile-
10. lipophile balanced non-ionic detergents than mentioned above are employed and when other non-ionic detergents are used instead of the preferred non-ionics recited herein, the product resulting may not have as good detergency, stability, viscosity and non-gelling
 15. properties as the preferred compositions but use of the viscosity and gel controlling compounds of the present invention can also improve the properties of the detergents based on such non-ionics. In some cases, as when a higher molecular weight poly lower alkoxyated
 20. higher alkanol is employed, often for its detergency, the proportion thereof will be regulated or limited as in accordance with the results of routine experiments, to obtain the desired detergency and still have the product non-
 25. gelling and of desired viscosity. Also, it has been found that it is only rarely necessary to utilise the higher molecular weight non-ionics for their detergent properties since the preferred non-ionics described herein are excellent detergents and additionally,
 30. permit the attainment of the desired viscosity in the liquid detergent without gelation at low temperatures.

Mixtures of two or more of these liquid non-ionics can also be used and in some cases advantages can be obtained by the use of such mixtures.

- As mentioned above, the structure of the liquid
5. non-ionic surfactant may be optimised with regard to their carbon chain length and configuration (e.g. linear versus branched chains) and their content and distribution of alkylene oxide units. Extensive research has shown that these structural
 10. characteristics can and do have profound effect on such properties of the non-ionic as pour point, cloud point, viscosity, gelling tendency, as well, of course, as on detergency.

- Typically, most commercially available non-ionics
15. have a relatively large distribution of ethylene oxide (EO) and propylene oxide (PO) units and of the lipophilic hydrocarbon chain length, the reported EO and PO contents and hydrocarbon chain lengths being overall averages. This "polydispersity" of the
 20. hydrophilic chains and lipophilic chains can have great importance on the product properties as can the specific values of the average values. The relationship between "poly-
 25. dispersity" and specific chain lengths with product properties for a well-defined non-ionic can be shown by the following data for the "Surfactant T" series of non-ionics available from British Petroleum. The Surfactant T non-ionics are obtained by ethoxylation of secondary C₁₃ fatty alcohols having a narrow EO
 30. distribution and have the physical characteristics given in Table 1 below:

TABLE 1

	EO	Pour Point	Cloud Point
5.	Content	(°C)	(1% soln.)
			(°C)
Surfactant T5	5	<-2	<25
Surfactant T7	7	-2	38
Surfactant T9	9	6	58
10. Surfactant T12	12	20	88

To assess the impact of EO distribution, a "Surfactant T8" was artificially prepared in two ways:

- a) 1:1 mixture of T7 and T9 (T8a);
 15. b) 4:3 mixture of T5 and T12 (T8b).

The following properties given in Table 2 below were found:

TABLE 2

20.	EO	Pour Point	Cloud Point
	Content	(°C)	(1% soln.)
	(avg)		(°C)
25. Surfactant T8a	8	2	48
Surfactant T8b	8	15	<20

From these results, the following general
 30. observations can be made:

1. T8a corresponds closely to an actual

surfactant T8 as it interpolates well between T7 and T9 for both pour point and cloud point.

2. T8b is highly polydisperse and would be generally unsatisfactory in view of its high pour point and low cloud point temperatures.
- 5.

3. The properties of T8a are basically additive between T7 and T9 whereas for T8b the pour point is close to the long EO chain (T12) while the cloud point is close to the short EO chain (T5).

10. The viscosities of the Surfactant T non-ionics were measured at 20%, 30%, 40%, 50%, 60%, 80% and 100% non-ionic concentrations for T5, T7, T7/T9 (1:1), T9 and T12 at 25°C with the following results given in Table 3 below (when a gel is obtained, the viscosity is the apparent viscosity) at 100-sec:
- 15.

TABLE 3

	Non-ionic type	Viscosity (mPa.s)				
		T5	T7	T7/T9	T9	T12
20.	Non-ionic % 0.1					
	100	36	63	61	149	
	80	65		104	112	165
25.	60	750	78	188	239	32200
	50	4000	123	233	634	89100
	40	2050	96	149	211	187
	30	630	58		38	27
	20	170	78		28	100

30.

From these results, it may be concluded that

Surfactant T7 is less gel-sensitive than T5, and T9 is less gel-sensitive than T12; moreover, the mixture of T7 and T9 (T8) does not gel, and its viscosity does not exceed 225 m Pa.s. T5 and T12 do not form the same gel structure.

Although not wishing to be bound by any particular theory, it is presumed that these results may be accounted for by the following hypothesis:

For T5: with only 5 EO, the hydrodynamic volume of the EO chain is almost the same as the hydrodynamic volume of the fatty chain. Surfactant molecules can accordingly arrange themselves to form a lamellar structure.

For T12: with 12 EO, the hydrodynamic volume of the EO chain is greater than that of the fatty chain. When molecules try to arrange themselves together, an interface curvature occurs and rods are obtained. The superstructure is then hexagonal; with a longer EO chain, or with a higher hydration, the interface curvature can be such that actual spheres are obtained, and the arrangement of the lowest energy is a face-centered cubic lattice.

From T5 to T7 (and T8), the interface curvature increases, and the energy of the lamellar structure increases. As the lamellar structure loses stability, its melting temperature is reduced.

From T12 to T9 (and T8), the interface curvature decreases, and the energy of the hexagonal structure increases (rods become bigger and bigger). As the loss in stability occurs, the structure melting temperature is also reduced.

Surfactant T8 appears to be at the critical point at which the lamellar structure is destabilised, i.e. the hexagonal structure is not yet stable enough and no gel is obtained during dilution. In fact, a 50% solution of T8 will finally gel after two days, but the superstructure formation is delayed long enough to allow easy water dispersibility.

The effects of the molecular weight on physical properties of the non-ionics were also considered.

Surfactant T8 (1:1 mixture of T7 to T9) exhibits a good compromise between the lipophilic chain (C_{13}) and the hydrophilic chain (EO8), although the pour point and maximum viscosity on dilution at 25°C are still high.

The equivalent EO compromise for C10 and C8 lipophilic chains was also determined using the Dobanol 91-x series from Shell Chemical Co. which are ethoxylated derivatives of C_9 - C_{11} fatty alcohols (average: C_{10}); and the Alfonic (Registered Trade Mark) 610-y series from Conoco which are ethoxylated derivatives of C_6 - C_{16} fatty alcohols (average C_8); and x and y represent the EO weight percentage.

The next Table 4 reports the physical characteristics of the Alfonic 610-y and Dobanol 91-x series;

TABLE 4

Non-ionic	EO Content (Avg.)	Pour Point (°C)	Cloud Point (°C)	Max. viscosity on dilution (%) at 25°C (mPa.s)
Alfonic 610-50R	3	-15		Gel (60%)

Alfonic 610-60	4.4	-4	41	36 (60%)
Dobanol 91-5	5	-3	33	Gel (70%)
Dobanol 91-5T	6	+2	55	126 (50%)
Dobanol 91-8	8	+6	81	Gel (50%)

5.

Dobanol 91-5 and Dobanol 91-8 are commercially available products; Dobanol 91-5 topped (T) is a lab scale product: it is Dobanol 91-5 from which free alcohol has been removed. As the lowest ethoxylation

10. members are also removed, the average EO number is 6. Dobanol

91-5T provides the best results of C₁₀ lipophile chain as it does not gel at 25°C. The 1% cloud point (55°C) is higher than for surfactant T8 (48°C). This is

15. presumably due to the lower molecular weight since the mixture entropy is higher. Alfonic 610-60 provides the best results of the C₈ lipophile chain series.

A summary of the best EO contents for each tested lipophilic chain length is provided in the following

20. Table 5:

TABLE 5

Non-ionic	C No.	EO No.	Pour Point (°C)	Cloud Point (1% soln.) (°C)	Max. viscosity on dilution (%) at 25°C
					(mPa.s)
25. Surfactant T8	13	8	+2	48	223 (50%)
Dobanol 91-5T	10	6	+2	55	126 (50%)
Alfonic 610-60	8	4.4	-4	41	36 (60%)

30.

From this data, the following conclusions were reached:

5. - Pour points: as the non-ionic molecular weight decreases, its pour point decreases too. The relatively high pour point of Dobanol 91-5T can be accounted for by the higher polydispersity. This was also noticed for T8a and T8b, i.e. the chain polydispersity increases the pour point.

10. Cloud points: theoretically, as the number of molecules increases (if the molecular weight decreases), the mixing entropy is higher, so the cloud point would increase as the molecular weight decreases. It is actually the case from Surfactant T8 to Dobanol 91-5T but it has not been confirmed with Alfonic 610-60. Here it is presume that the lipophilic hydrocarbon chain polydispersity is responsible for the theoretically too low cloud point. The relatively large amount of C10-EO present reduces the solubility.

20. Maximum viscosity on dilution at 25°C: none of these non-ionics gel at 25°C when they are diluted with water. The maximum viscosity decreases sharply with the molecular weight. As the non-ionic molecular weight decreases, the less efficient become the hydrogen bridges. Unfortunately, too low molecular weight non-ionics are not suitable for laundry washing: their micellar critical concentration (MCC) is too high, and a true solution, with only a limited detergency would be obtained under practical laundry conditions.

30. Accordingly, in the compositions of the present invention, one particularly preferred class of nonionic surfactants includes the C₁₂-C₁₃ secondary

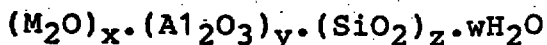
- fatty alcohols with relatively narrow contents of ethylene oxide in the range of from about 7 to 9 moles, especially about 8 moles ethylene oxide per molecule and the C₉ to C₁₁, especially C₁₀ fatty alcohols ethoxylated with about 6 moles ethylene oxide.
- 5.

- The detergent compositions of the present invention also include water soluble and/or water insoluble detergent builder salts. Typical suitable
10. builders include, for example, those disclosed in U.S.

- patents 4,316,812, 4,264,466 and 3,630,929. Water-soluble inorganic alkaline builder salts which can be used alone with the detergent compound or in admixture with other builders are alkali metal carbonates,
5. borates, phosphates, polyphosphates, bicarbonates and silicates. (Ammonium or substituted ammonium salts can also be used.) Specific examples of such salts are sodium tripolyphosphate, sodium carbonate, sodium tetraborate, sodium pyrophosphate, potassium
 10. pyrophosphate, sodium bicarbonate, potassium tripolyphosphate, sodium hexametaphosphate, sodium sesquicarbonate, sodium mono and diorthophosphate, and potassium bicarbonate. Sodium tripolyphosphate (TPP) is especially preferred. The alkali metal silicates
 15. are useful builder salts which also function to make the composition anticorrosive to washing machine parts. Sodium silicates of $\text{Na}_2\text{O}/\text{SiO}_2$ ratios of from 1.6/1 to 1/3.2 especially about 1/2 to 1/2.8 are preferred. Potassium silicates of the same ratios can also be
 20. used.

- Another class of builders useful herein are the water-insoluble aluminosilicates, both of the crystalline and amorphous type. These builders are particularly compatible with the aluminium tristearate
25. stabilising agent of the present invention. Various crystalline zeolites (i.e. alumino-silicates) are described in British patent 1,504,168, US patent 4,409,136 and Canadian patents 1,072,835 and 1,087,477, all of which are hereby incorporated by reference for
 30. such descriptions. An example of amorphous zeolites useful herein can be found in Belgian patent 835,351

and this patent, too, is incorporated herein by reference. The zeolites generally have the formula:



5.

wherein x is 1, y is from 0.8 to 1.2 and preferably 1, z is from 1.5 to 3.5 or higher and preferably 2 to 3 and w is from 0 to 9, preferably 2.5 to 6 and M is preferably sodium. A typical zeolite is type A or

10. similar structure, with type 4A particularly preferred. The preferred aluminosilicates have calcium ion exchange capacities of about 200 milliequivalents per gram or greater, e.g. 400 meq/g.

Other materials such as clays, particularly of the
15. water insoluble types, may be useful adjuncts in compositions of the present invention. Particularly useful is bentonite. This material is primarily montmorillonite which is a hydrated aluminium silicate in which about 1/6th of the aluminium atoms may be
20. replaced by magnesium atoms and with which varying amounts of hydrogen, sodium, potassium and calcium, may be loosely combined. The bentonite in its more purified form (i.e. free from any grit, sand or the like) suitable for detergents invariably contains at
25. least 50% montmorillonite and thus its cation exchange capacity is at least about 50 to 75 meq. per 100 g of bentonite. Particularly preferred bentonites are the Wyoming or Western US bentonites which have been sold as Thixojels 1, 2, 3 and 4 by Georgia Kaolin Co. These
30. bentonites are known to soften textiles as described in British patent 401,413 to Marriott and British patent

461,221 to Marriott and Dugan.

5 Examples of organic alkaline sesquestrant builder salts which can be used alone with the detergent or in admixture with other organic and inorganic builders are alkali metal, ammonium or substituted ammonium, aminopolycarboxylates, e.g. sodium and potassium ethylene diaminetetraacetate (EDTA), sodium and potassium nitrilotriacetates (NTA) and triethanolammonium N-(2-hydroxyethyl)nitrilodiacetates. 10 Mixed salts of these polycarboxylates are also suitable.

15 Other suitable builders of the organic type include carboxymethyl succinates, tartronates and glycollates. Of special value are the polyacetyl carboxylates. The polyacetal carboxylates and their use in detergent compositions are described in US patent 4,144,226; 4,315,092 and 4,146,495. Other US patents on similar builders include 4,141,676; 4,169,934; 4,201,858; 4,204,852; 4,224,420; 4,225,685; 20 4,226,960; 4,233,422; 4,233,423; 4,302,564 and 4,303,777. Also relevant are European patent applications nos. 0015024; 0021491 and 0063399.

25 According to the present invention the physical stability of the suspension of the detergent builder compound or compounds and any other suspended additive, such as bleaching agent, etc., in the liquid vehicle is drastically improved by the presence of the stabilising agent which is an aluminium salt of a higher fatty acid.

30 The preferred higher aliphatic fatty acids will have from 8 to 22 carbon atoms, more

preferably from 10 to 20 carbon atoms, and especially preferably from 12 to 18 carbon atoms. The aliphatic radical may be saturated or unsaturated and may be straight or branched. As in the case of the nonionic surfactants, mixtures of fatty acids may also be used, such as those derived from natural sources, such as tallow fatty acid, and coco fatty acid.

Examples of the fatty acids from which the aluminium salt stabilisers can be formed include, decanoic acid, dodecanoic acid, palmitic acid, myristic acid, stearic acid, oleic acid, eicosanoic acid, tallow fatty acid, coc fatty acid and mixtures of these acids. The aluminium salts of these acids are generally commercially available, and are preferably used in the triacid form, e.g. aluminium stearate as aluminium tristearate $\text{Al}(\text{C}_{17}\text{H}_{35}\text{COO})_3$. The monoacid salts, e.g. aluminium monostearate $\text{Al}(\text{OH})_2(\text{C}_{17}\text{H}_{35}\text{COO})$ and diacid salts, e.g. aluminium distearate, $\text{Al}(\text{OH})(\text{C}_{17}\text{H}_{35}\text{COO})_2$, and mixtures of two or three of the mono-, di- and triacid aluminium salts can also be used. It is most preferred, however, that the triacid aluminium salts comprises at least 30%, preferably at least 50%, especially preferably at least 80% of the total amount of aluminium fatty acid salt.

The aluminium salts, as mentioned above, are commercially available and can be easily produced by, for example, saponifying a fatty acid, e.g. animal fat, stearic acid, etc., followed by treatment of the resulting soap with alum, alumina, etc.

Although the applicants do not wish to be bound by any particular theory of the manner by which the

aluminium salt functions to prevent settling of the suspended particles, it is presumed that the aluminium salt increases the wettability of the solid surfaces by the non-ionic surfactant. This increase in

5. wettability, therefore, allows the suspended particles to more easily remain in suspension.

- The increased physical stability is manifested by an increase in the yield stress of the composition by as much as about 500% or more, for example, in the case
10. of aluminium stearate by up to about 1000%, as compared to the same composition without the aluminium stearate stabilising agent. As described above, the higher is the yield stress, the higher is the apparent viscosity at low shear rate and the better is the physical
 15. stability.

- Only very small amounts of the aluminium salt stabilising agent is required to obtain the significant improvement in physical stability. For example, based on the total weight of the composition, suitable
20. amounts of the aluminium salt are in the range of from about 0.1% to about 3%, preferably from about 0.3% to about 1%.

- In addition to its action as a physical stabilising agent, the aluminium salt has the
25. additional advantages over the physical stabilising agents that it is non-ionic in character and is compatible with the non-ionic surfactant component and does not interfere with the overall detergency of the composition; it exhibits some anti-foaming effect; it
 30. can function to boost the activity of fabric softeners, and it confers a longer relaxation time to the

suspensions.

While the aluminium salt alone is effective in its physical stabilising action, further improvements may be achieved in certain cases by incorporation of other known physical stabilisers, such as, for example, an acidic organic phosphorous compound having an acidic - POH group, such as a partial ester of phosphorous acid and an alkanol.

As disclosed in the commonly assigned co-pending US application Serial No. 597,948 filed 9 April 1984, corresponding to British patent application no. 8509083, Serial no. 2158453A, the disclosure of which is incorporated herein by reference, the acidic organic phosphorous compound having an acidic - POH group can increase the stability of the suspension of builder, especially polyphosphate builders, in the non-aqueous liquid non-ionic surfactant.

The acidic organic phosphorous compound may be, for instance, a partial ester of phosphoric acid and an alcohol such as an alkanol which has a lipophilic character having, for instance, more than 5 carbon atoms, e.g. 8 to 20 carbon atoms.

A specific example is a partial ester of phosphoric acid and a C₁₆ to C₁₈ alkanol (Empiphos (Registered Trade Mark) 5632 from Marchon); it is made up of about 35% monoester and 65% diester.

The inclusion of quite small amounts of the acidic organic phosphorous compound makes the suspension significantly more stable against settling on standing but remains pourable, presumably, as a result of increasing the yield value of the suspension, while,

- for the low concentration of stabiliser, e.g. below about 1%, its plastic viscosity will generally decrease. It is believed that the use of the acidic phosphorous compound may result in the formation of a
5. high energy physical bond between the -POH portion of the molecule and the surfaces of the inorganic polyphosphate builder so that these surfaces take on an organic character and become more compatible with the non-ionic surfactant.
 10. The acidic organic phosphorous compound may be selected from a wide variety of materials, in addition to the partial ester of phosphoric acid and alkanols mentioned above. Thus, one may employ a partial ester of phosphoric or phosphorous acid with a mono or
 15. polyhydric alcohol such as hexylene glycol, ethylene glycol, di- or tri-ethylene glycol or higher polyethylene glycol, polypropylene glycol, glycerol, sorbitol or mono or diglycerides of fatty acids, in which one, two or more of the alcoholic OH groups of
 20. the molecule may be esterified with the phosphorous acid. The alcohol may be a non-ionic surfactant such as an ethoxylated or ethoxylated-propoxylated higher alkanol, higher alkyl phenol, or higher alkyl amide. The -POH group need not be bonded to the organic
 25. portion of the molecule through an ester linkage; instead it may be directly bonded to carbon (as in a phosphonic acid, such as a polystyrene in which some of the aromatic rings carry phosphonic acid or phosphinic acid groups; or an alkylphosphonic acid, such as propyl
 30. or laurylphosphonic acid) or may be connected to the carbon through other intervening linkage (such as

linkages through O, S or N atoms). Preferably, the carbon:phosphorous atomic ratio in the organic phosphorous compound is at least about 3:1, such as 5:1, 10:1, 20:1, 30:1 or 40:1.

5. Furthermore, in the compositions of the present invention, it may be advantageous to include compounds which function as viscosity control and gel-inhibiting agents for the liquid nonionic surface active agents such as low molecular weight amphiphilic compounds
10. which can be considered to be analogous in chemical structure to the ethoxylated and/or propoxylated fatty alcohol non-ionic surfactants but which have relatively short hydrocarbon chain lengths (C_2-C_8) and a low content of ethylene oxide (about 2 to 6 EO units per
15. molecule).

Suitable amphiphilic compounds can be represented by the following general formula:



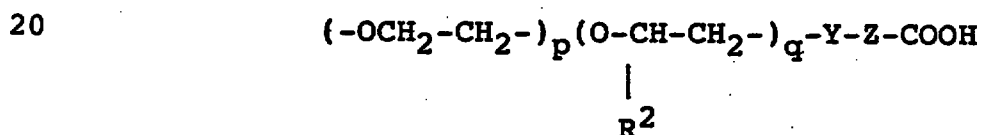
20. where R represents a C_2-C_8 alkyl group, and n is a number of from about 1 to 6, on average.

- Specific examples of suitable amphiphilic compounds include theylene glycol monoethyl ether
25. ($C_2H_5-O-CH_2CH_2OH$), diethylene glycol monobutyl ether ($C_4H_9-O-(CH_2CH_2O)_2H$), and tetraethylene glycol monobutyl ether ($C_8H_{17}-O-(CH_2CH_2O)_4H$). Diethylene glycol monoethyl ether is especially preferred.

30. Further improvements in the rheological properties of the liquid detergent compositions can be obtained by including in the composition a small amount of a non-

ionic surfactant which has been modified to convert a free hydroxyl group thereof to a moiety having a free carboxyl group, such as a partial ester of a non-ionic surfactant and a polycarboxylic acid.

5 As disclosed in the commonly assigned co-pending application US Serial No. 597,948, filed 9 April 1984 corresponding to British patent application no. 8509084, Serial No. 2158454A, the disclosure of which is incorporated herein by reference, the free carboxyl
10 group modified non-ionic surfactants, which may be broadly characterised as polyether carboxylic acids, function to lower the temperature at which the liquid non-ionic forms a gel with water. The acidic polyether compound can also decrease the yield stress of such
15 dispersion, aiding in their dispensibility, without a corresponding decrease in their stability against settling. Suitable polyether carboxylic acids contain a grouping of the formula:

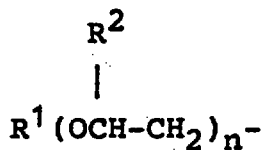


where R_2 represents a hydrogen atom or a methyl group,
25 Y represents oxygen or sulphur, Z represents an organic linkage, p is a positive number of from 3 to 50 and q is zero or a positive number of up to 10. Specific examples include the half-ester of Plurafac RA30 with succinic anhydride, the half ester of Dobanol 25-7 with
30 succinic anhydride, and the half ester of Dobanol 91-5 with succinic anhydride. Instead

- of a succinic acid anhydride, other polycarboxylic acids or anhydrides may be used, e.g. maleic acid, maleic anhydride, glutaric acid, malonic acid, succinic acid, phthalic acid, phthalic anhydride, or citric acid. Furthermore, other linkages may be used, such as ether, thioether or urethane linkages, formed by conventional reactions. For instance, to form an ether linkage, the non-ionic surfactant may be treated with a strong base (to convert its OH group to a ONa group for instance) and then reacted with a halocarboxylic acid such as chloroacetic acid or chloropropionic acid or the corresponding bromo compound. Thus, the resulting carboxylic acid may have the formula $R-Y-ZCOOH$, where R is the residue of a non-ionic surfactant (on removal of a terminal OH), Y represents oxygen or sulphur and Z represents an organic linkage such as a hydrocarbon group of, say, 1 to 10 carbon atoms which may be attached to the oxygen (or sulphur) of the formula directly or by means of an intervening linkage such as an oxygen containing linkage, e.g. a
- | | | |
|-----|----|--------|
| O | or | O |
| " | | " |
| -C- | | -C-NH- |

linkage.

- The polyether carboxylic acid may be produced from a polyether which is not a non-ionic surfactant, e.g. it may be made by reaction with a polyalkoxyl compound such as polyethylene glycol or a monoester or monoether thereof which does not have the long alkyl chain characteristic of the non-ionic surfactants. Thus, R may have the formula:



5 where R^2 represents a hydrogen atom or a methyl group, R^1 represents an alkylphenyl or alkyl or other chain terminating group and "n" is at least 3, such as 5 to 25. When the alkyl group of R^1 is a higher alkyl group, R is a residue of a non-ionic surfactant. As
10 indicated above, R^1 may instead be hydrogen or lower alkyl (e.g. methyl, ethyl, propyl, butyl) or lower acyl (e.g. acetyl). The acidic polyether compound if present in the detergent composition, is preferably added dissolved in the non-ionic surfactant.

15 Since the compositions of the present invention are generally highly concentrated, and, therefore, may be used at relatively low dosages, it is desirable to supplement any phosphate builder (such as sodium tripolyphosphate) with an auxiliary builder such as a
20 polymeic carboxylic acid having high calciumbinding capacity to inhibit incrustation which could otherwise be caused by formation of an insoluble calcium phosphate. Such auxiliary builders are also well known in the art. For example, mention can be made of
25 Sokolan (Registered Trade Mark) CP5 which is a copolymer of about equal moles of methacrylic acid and maleic anhydride, completely neutralised to form the sodium salt thereof.

30 In addition to the detergent builders, various other detergent additives or adjuvants may be present in the detergent product to give it additional desired properties, either of functional or aesthetic nature. Thus, there may be included in the formulation, minor

- amounts of soil suspending or anti-redeposition agents, e.g. polyvinyl alcohol, fatty amides, sodium carboxymethyl cellulose, hydroxypropyl methyl cellulose; optical brighteners, e.g. cotton, polyamide and polyester brighteners, for example, stilbene, triazole and benzidine sulphone compositions, especially sulphonated substituted triazinyl stilbene, sulphonated naphthotriazole stilbene or benzidine sulphone, most preferred are stilbene and triazole combinations.

- Blueing agents such as ultramarine blue; enzymes, preferably proteolytic enzymes, such as subtilisin, bromelin, papain, trypsin and pepsin, as well as amylase type enzymes, lipase type enzymes, and mixtures thereof; bactericides, e.g. tetrachlorosalicylanilide, hexachlorophene; fungicides; dyes; pigments (water dispersible); preservatives; ultraviolet absorbers; anti-yellowing agents, such as sodium carboxymethyl cellulose, complex of C_{12} to C_{22} alkyl alcohol with C_{12} to C_{18} alkylsulphate; pH modifiers and pH buffers; colour safe bleaches, perfume and anti-foam agents or suds-suppressors, e.g. silicone compounds can also be used.

- The bleaching agents are classified broadly, for convenience, as chlorine bleaches and oxygen bleaches. Chlorine bleaches are typified by sodium hypochlorite ($NaOCl$), potassium dichloroisocyanurate (59% available chlorine), and trichloroisocyanuric acid (95% available chlorine). Oxygen bleaches are preferred and are represented by percompounds which liberate hydrogen peroxide in solution. Preferred examples include

sodium and potassium perborates, percarbonates and perphosphates, and potassium monopersulphate. The perborates, particularly sodium perborate monohydrate are especially preferred.

5. The peroxygen compound is preferably used in admixture with an activator therefor. Suitable activators which can lower the effective operating temperature of the peroxide bleaching agent are disclosed in US patent 4,264,466 or in Column 1 of US
10. patent 4,430,244, the relevant disclosures of which are incorporated herein by reference. Polyacylated compounds are preferred activators; among these, compounds such as tetraacetyl ethylene diamine ("TAED") and pentaacetyl glucose are particularly preferred.
15. Other useful activators include, for example, acetylsalicylic acid derivatives, ethylidene benzoate acetate and its salts, ethylidene carboxylate acetate and its salts, alkyl and alkenyl succinic anhydride, tetraacetylglucouril ("TAGU"), and the derivatives of
20. these. Other useful classes of activators are disclosed, for example, in US patents 4,111,826, 4,422,950 and 3,661,789.

- The bleach activator usually interacts with the peroxygen compound to form a peroxyacid bleaching agent
25. in the wash water. It is preferred to include a sequestering agent of high complexing power to inhibit any undesired reaction between such peroxyacid and hydrogen peroxide in the wash solution in the presence of metal ions. Preferred sequestering agents are able
30. to form a complex with Cu^{2+} ions, such that the stability constant (pK) of the complexation is equal to

- or greater than 6, at 25°C, in water, of an ionic strength of 0.1 mole/litre, pK being conventionally defined by the formula: $pK = -\log K$, where K represents the equilibrium constant. Thus, for example, the pK values for complexation of copper ion with NTA and EDTA at the stated conditions are 12.7 and 18.8, respectively. Suitable sequestering agents include, for example, in addition to those mentioned above, diethylene triamine pentaacetic acid (DETPA);
5. values for complexation of copper ion with NTA and EDTA at the stated conditions are 12.7 and 18.8, respectively. Suitable sequestering agents include, for example, in addition to those mentioned above, diethylene triamine pentaacetic acid (DETPA);
 10. diethylene triamine pentamethylene phosphonic acid (DTPMP); and ethylene diamine tetramethylene phosphonic acid (EDITEMPA).

- In order to avoid loss of peroxide bleaching agent, e.g. sodium perborate, resulting from enzyme-
15. induced decomposition, such as by catalase enzyme, the compositions may additionally include an enzyme inhibitor compound, i.e. a compound capable of inhibiting enzyme-induced decomposition of the peroxide bleaching agent. Suitable inhibitor compounds are
 20. disclosed in US patent 3,606,990, the relevant disclosure of which is incorporated herein by reference.

- Of special interest as the inhibitor compound, mention can be made of hydroxylamine sulphate and other
25. water-soluble hydroxylamine salts. In the preferred non-aqueous compositions of the present invention, suitable amounts of the hydroxylamine salt inhibitors can be as low as about 0.01 to 0.4%. Generally, however, suitable amounts of enzyme inhibitors are up
 30. to about 15%, for example, 0.1 to 10%, by weight of the composition.

The composition may also contain an inorganic insoluble thickening agent or dispersant of very high surface area such as finely divided silica of extremely fine particle size (e.g. of 5-100 millimicrons

5. diameters such as sold under the name Aerosil (Registered Trade Mark)) or the other highly voluminous inorganic carrier materials disclosed in US patent 3,630,929, in proportions of 0.1-10%, e.g. 1 to 5%. It is preferable, however, that compositions which form
10. peroxyacids in the wash bath (e.g. compositions containing peroxygen compound and activator therefor) be substantially free of such compounds and of other silicates; it has been found, for instance, that silica and silicates promote the undesired decomposition of
15. the peroxyacid.

- In a preferred form of the invention, the mixture of liquid non-ionic surfactant and solid ingredients is subjected to an attrition type of mill in which the particle sizes of the solid ingredients are reduced to
20. less than about 10 microns, e.g. to an average particle size of 2 to 10 microns or even lower (e.g. 1 micron). Preferably less than about 10%, especially less than about 5% of all the suspended particles have particle sizes greater than 10 microns. It is found that the
 25. acidic polyether compound can decrease the yield stress of such dispersions, aiding in their dispensibility without a corresponding decrease in their stability against settling.

- In the grinding operation, it is preferred that
30. the proportion of solid ingredients be high enough (e.g. at least about 40% such as about 50% that the

solid particles are in contact with each other and are not substantially shielded from one another by the non-ionic surfactant liquids. Mills which employ grinding balls (ball mills) or similar mobile grinding elements have given very good results. Thus, one may use a laboratory batch attritor having 8 mm diameter steatite grinding balls. For larger scale work a continuously operating mill in which there are 1 mm or 1.5 mm diameter grinding balls working in a very small gap between a stator and a rotor operating at a relatively high speed (e.g. a CoBall mill) may be employed; when using such a mill, it is desirable to pass the blend of non-ionic surfactant and solids first through a mill which does not effect such fine grinding (e.g. a colloid mill) to reduce the particle size to less than 100 microns (e.g. to about 40 microns) prior to the step of grinding to an average particle diameter below about 10 microns in the continuous ball mill.

In the preferred heavy duty liquid detergent compositions of the present invention, typical proportions (based on the total composition, unless otherwise specified) of the ingredients are as follows:

Suspended detergent builder, within the range of about 10 to 60% such as about 20 to 50%, e.g. about 25 to 40%.

Liquid phase comprising non-ionic surfactant and dissolved amphiphilic gel-inhibiting compound, within the range of about 30 to 70%, such as about 40 to 60%; this phase may also include minor amounts of diluent such as a glycol, e.g. polyethylene glycol (e.g. "PEG (Registered Trade Mark) 400"), or hexylene glycol, such as up to 10%,

preferably up to 5%, for example 0.5 to 2%. The weight ratio of non-ionic surfactant to amphiphilic compound is in the range of from about 100:1 to 1:1, preferably from about 50:1 to about 2:1;

5. Aluminium salt of the higher aliphatic fatty acid - at least 0.1%, preferably from about 0.1 to about 3%, more preferably from about 0.3 to about 1%;

10. Polyether carboxylic acid gel-inhibiting compound, in an amount to supply in the range of about 0.5 to 10 parts (e.g. about 1 to 6 parts, such as about 2 to 5 parts) of -COOH (M.W. 45) per 100 parts of blend of such acid compound and non-ionic surfactant.

15. Typically, the amount of the polyether carboxylic acid compound is in the range of about 0.01 to 1 part per part of non-ionic surfactant, such as about 0.05 to 0.6 parts, e.g. about 0.2 to 0.5 part;

20. Acidic organic phosphoric acid compound, as anti-settling agent: up to 5%, for example, in the range of 0.01 to 5%, such as about 0.05 to 2%, e.g. about 0.1 to 1%.

25. Suitable ranges of other optional detergent additives are: enzymes - 0 to 2%, especially 0.7 to 1.3%; corrosion inhibitors - about 0 to 40%, and preferably 5 to 30%; anti-foam agents and suds-suppressors - 0 to 15%, preferably 0 to 5%, for example 0.1 to 3%; thickening agent and dispersants - 0 to 15%, for example, 0.1 to 10%, preferably 1 to 5%; soil suspending or anti-redeposition agents and anti-yellowing agents - 0 to 10%, preferably 0.5 to 5%;
30. colourants, perfumes, brighteners and blueing agents total weight 0% to about 2% and preferably 0% to about

- 1%; pH modifiers and pH buffers - 0 to 5%, preferably 0 to 2%; bleaching agent - 0% to about 40% and preferably 0% to about 2%, for example 2 to 20%; bleach stabilisers and bleach activators 0 to about 15%, preferably 0 to 10%, for example, 0.1 to 8%; enzyme-inhibitors - 0 to 15%, for example 0.01 to 15%, preferably 0.1 to 10%; sequestering agent of high complexing power, in the range of up to about 5%, preferably 0.25 to 3%, such as about 0.5 to 2%. In the selection of the adjuvants, they will be chosen to be compatible with the main constituents of the detergent composition.

- One specific preferred composition in accordance with the present invention is a non-aqueous heavy duty, built laundry detergent composition which is pourable at high and low temperatures and does not gel when mixed with cold water, the said composition comprising

- at least one liquid nonionic surfactant in an amount of from about 20% to about 70% by weight;
- at least one detergent builder suspended in the nonionic surfactant in an amount of from about 10 to about 60% by weight;
- a compound of the formula $RO(CH_2CH_2O)_nH$ where R represents a C_2 to C_8 alkyl group and n is a number having an average value in the range of from about 1 to 6,
- as a gel-inhibiting additive in an amount up to about 5% by weight;
- an acid organic phosphoric acid compound, as an anti-settling additive, in an amount up to about 5% by weight;
- an acid-terminated nonionic surfactant as a gel-inhibiting additive, in an amount up to about 1 part per part of the said liquid nonionic surfactant;

an aluminium salt of a C₈ to C₂₂ higher aliphatic carboxylic acid in an amount of from about 0.1 to about 3% by weight; and

5 optionally, one or more detergent adjuvants selected from the group consisting of enzymes, corrosion inhibitors, anti-foam agents, suds suppressors, soil suspending or anti-redeposition agents, anti-yellowing agents, colourants, perfumes, optical brighteners, bluing agents, pH modifiers, pH
10 buffers, bleaching agents, bleach stabilizers, bleach activators, enzyme inhibitors and sequestering agents.

The invention may be put into practice in various ways and a number of specific embodiments will be described to illustrate the invention with
15 reference to the accompanying examples.

All proportions and percentages are by weight and atmospheric pressure is used unless otherwise indicated.

EXAMPLE 1

20 A non-aqueous built liquid detergent composition according to the present invention is prepared by mixing and finely grinding the following ingredients (ground base A) and thereafter adding to the resulting dispersion, with stirring, the components
25 B, as set out in Tables 5 and 6 below:

TABLE 5

	<u>Ground Base A</u>	<u>Amount</u> <u>Weight% (based on A+B)</u>
	Plurafac RA50	32%
5.	Acid Terminated Nonionic (7 EO) ¹	16%
	Sodium tripolyphosphate	30%
	Sokolan CP5	4%
	Sodium carbonate	2.5%
10.	Sodium perborate monohydrate	4.5%
	Tetraacetylenediamine	5%
	Ethylenediamine tetraacetic acid, disodium salt	0.5%
	Tinopal ATS-X (optical brightener)	0.5%
15.	Aluminium stearate	1%

TABLE 6

	<u>Post Addition B</u>	
20.	Esperase slurry ²	1%
	Plurafac RA50	3%

Notes on Tables 5 and 6

- 1 The esterification product of Dobanol 25-7 with
25. succinic anhydride at a 1:1 molar ratio.
- 2 Proteolytic enzyme slurry (in nonionic
surfactant).

30. The yield stress and plastic viscosity of the
composition were measured at 25°C and the values were

19 Pa and 1,150 Pa·sec, respectively.

EXAMPLE 2

For comparison, the composition of Example 1 was prepared except that the aluminium stearate was omitted. The yield stress and plastic viscosity values were again measured at 25°C and were 3Pa and 1,400 Pa·sec, respectively.

It can be seen, therefore, that the presence of even small amounts of aluminium stearate greatly improves product stability while lowering product viscosity.

Similar results will be obtained by replacing the aluminium stearate in the above composition with an equal amount of aluminium myristate, aluminium palmitate, aluminium oleate, aluminium dodecanoate, or aluminium tallowate.

Reference has been made to USP 3606990 for inhibitors of enzyme induced decomposition of bleaching agents, and reference made to the use of hydroxylamine sulphate for such purpose.

USP 3606990 also lists hydroxylamine hydrochloride, hydrazine hydrochloride, 2,4-dinitrophenolhydrazine, p-chlorophenol, 4-chloro-2-aminophenol, o-cresol, p-chloro-m-cresol, 2,4-dichlorophenol, resorcinol, pyrocatechol, pyrogallol, beta-naphthol, 2,7-dihydroxynaphthalene, hydroquinone, hydroquinone sulphate, 1,2-naphthoquinone, 1,2-cyclohexanediol, aminotriazole, sodium chlorate and sodium nitride.

30.

CLAIMS

- 5 1. A fabric treating composition which comprises a suspension of insoluble particles in a non-aqueous liquid and an aluminium salt of a higher aliphatic carboxylic acid effective to increase the stability of the suspension.
- 10 2. A composition as claimed in Claim 1 in which the higher aliphatic carboxylic acid is a straight or branched, saturated or unsaturated carboxylic acid having from 8 to 22 carbon atoms.
- 15 3. A composition as claimed in Claim 2 in which the higher aliphatic carboxylic acid is a straight or branched, saturated or unsaturated carboxylic acid having from 10 to 20 carbon atoms.
- 20 4. A composition as claimed in Claim 3 in which the higher aliphatic carboxylic acid is a straight or branched, saturated or unsaturated carboxylic acid having from 12 to 18 carbon atoms.
- 25 5. A composition as claimed in Claim 1 in which the aluminium salt is aluminium stearate.
- 30 6. A composition as claimed in any one of Claims 1 to 5 in which the non-aqueous liquid comprises a nonionic surfactant.



7. A composition as claimed in any one of Claims 1 to 6 in which the particles comprise at least one member selected from the group consisting of inorganic detergent builders, bleaching agents, antistatic agents, and pigments.
8. A composition as claimed in any one of Claims 1 to 6 in which the insoluble particles are inorganic.
9. A composition as claimed in Claim 7 or Claim 8 in which the particles comprise an alkali metal polyphosphate detergent builder salt.
10. A composition as claimed in Claim 7, 8 or 9 in which the particles comprise a crystalline aluminosilicate detergent builder salt.
11. A composition as claimed in any one of Claims 1 to 10 in which the particles have a particle size distribution such that no more than about 10% by weight of the said particles have a particle size of more than about 10 microns.
12. A composition as claimed in any one of Claims 1 to 11 which further comprises a polyether carboxylic acid in an amount to decrease the temperature at which the surfactant forms a gel with water.



13. A composition as claimed in any one of Claims 1 to 12 which contains from about 0.1 to about 3% by weight, based on the total composition, of the said aluminium salt.

5.

14. A composition as claimed in any one of Claims 1 to 13 which further comprises at least one additional suspension stabilizing agent selected from the group consisting of quaternary ammonium compounds, phosphoric esters, modified clays and mixtures thereof.

10.

15. A non-aqueous heavy duty, built laundry detergent composition which is pourable at high and low temperatures and does not gel when mixed with cold water, the said composition comprising

15.

at least one liquid nonionic surfactant in an amount of from about 20 to about 70% by weight;

at least one detergent builder suspended in the nonionic surfactant in an amount of from about 10 to about 60% by weight;

20.

a compound of the formula $RO(CH_2CH_2O)_nH$

where R represents a C_2 to C_8 alkyl group and n is a number having an average value in the range of from about 1 to 6,

25.

as a gel-inhibiting additive in an amount up to about 5% by weight;

an acid organic phosphoric acid compound, as an anti-settling additive, in an amount up to about 5% by weight;

30.



* C L M S *

an acid-terminated nonionic surfactant as a gel-inhibiting additive, in an amount up to about 1 part per part of the said liquid nonionic surfactant;

5. an aluminium salt of a C₈ to C₂₂ higher aliphatic carboxylic acid in an amount of from about 0.1 to about 3% by weight; and

10. optionally, one or more detergent adjuvants selected from the group consisting of enzymes, corrosion inhibitors, anti-foam agents, suds suppressors, soil suspending or anti-redeposition agents, anti-yellowing agents, colourants, perfumes, optical brighteners, bluing agents, pH modifiers, pH buffers, bleaching agents, bleach stabilizers, bleach activators, enzyme inhibitors and sequestering agents.

15.

16. A composition as claimed in Claim 15 substantially as specifically described herein with reference to Example 1.

20.

17. A method for cleaning soiled fabric which comprises contacting the soiled fabrics with the laundry detergent composition as claimed in Claim 5 or Claim 16 in an aqueous wash bath.

25.

18. A method as claimed in Claim 17 in which the aluminium salt is aluminium stearate.

30.

19. In a method for filling a container with a non-aqueous liquid laundry detergent composition in which the detergent is composed at least predominantly



of a liquid nonionic surface active agent containing
a suspension of solid particles and for dispensing
the composition from the container into a water bath
in which the laundry is to be washed, wherein the
dispensing is effected by directing a stream of
unheated tap water onto the composition in the
container whereby the composition is carried by the
stream of water, into the water bath, the improvement
comprising including in the non-aqueous composition
from about 0.1 to about 3% by weight of an aluminium
salt of a C₈ to C₂₂ higher aliphatic carboxylic acid.

20. A method as claimed in Claim 19 in which
the aluminium salt is aluminium stearate.

