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LIQUID DETERGENT COMPOSITION

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This invention relates to detergents and more particularly to liquid detergents for use in the mechanical washing and the like.

In mechanical washing machines, such as dishwashing machines, it has been customary to use mixtures of inorganic salts such as sodium metasilicate, trisodium phosphate, sodium carbonate and sodium polyphosphates. In these compositions the alkaline components are responsible for the larger part of the cleaning operation and function by virtue of their power to saponify fats, dissolve proteins, etc. These alkalies, however, form precipitates by interaction with the calcium and magnesium salts present in most natural waters. Furthermore, the high alkalinity forms soaps by saponification of the fatty oils present and these soaps in turn react with the other hardness to form sticky soap curds.

In order to avoid all this it has become customary to add sodium polyphosphates to the alkaline salts. The relatively neutral polyphosphates (sodium hexametaphosphate, sodium tripolyphosphate, sodium tetraphosphate, etc.) sequester the water hardness by forming complexes with the calcium and magnesium ions which effectively remove them from the sphere of action. While this is definitely an improvement over simple alkalies, nevertheless the resultant products still leave much to be desired. Having little or no wetting power the film of solution left after washing tends to break up into droplets; due to the high salt content, these drops leave residual salts or so-called "waterspots" on drying. The large salt crystals normally present in these products tend to dissolve rather slowly, and if an undissolved crystal comes into contact with aluminumware, or sometimes silverware, pitting is likely to occur. The high alkalinity also tends to slowly remove glass from fine china and will sometimes etch soft glassware over long periods.

It has been proposed in the past to use organic detergents in addition to the alkalies, but organic detergents generally give far too much foam to be practical. Furthermore, it is desirable to provide a liquid detergent composition because of the ease of dissolving detergents in the machine but many organic detergents gel in concentrated solutions.

It is an object of the present invention to provide an improved liquid detergent composition.

It is a further object of the present invention to provide an improved liquid detergent composition containing an organic detergent.

It is a further object of the present invention to provide an improved liquid detergent composition, particularly suited to mechanical dishwashers.

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It is a further object of the present invention to provide a liquid detergent composition suitable for use in mechanical dishwashers, which gives substantially no foam.

These and other objects are obtained by the present invention which comprises an improved liquid detergent composition containing N-palmitoyl-N-cyclohexyl taurate, tetrapotassium pyrophosphate, and water. Preferably, the composition may also contain sodium metasilicate.

The amount of N-palmitoyl-N-cyclohexyl taurate may vary in range from 5 to 20 parts by weight. The amount of the tetrapotassium pyrophosphate may vary from 5 to 20 parts. The amount of the sodium metasilicate may be varied in range from 2 to 10 parts. The amount of water in the composition may vary in range from 50 to 88 parts. It will be understood, however, that the water content of the composition stated is the minimum amount adapted to give a concentrated solution, but any amount of water may be added since the solution is water-soluble. In actual practice the minimum amount of water is used in the composition sold commercially, but the addition of larger amounts of water is within the scope of the invention.

The following examples are illustrative of the invention but it will be understood that substitutions and variations may be made within the scope of the claims.

Example 1

10% N-palmitoyl-N-cyclohexyl taurate
10% Tetrapotassium pyrophosphate
2% Sodium metasilicate
78% Water

This formed a clear, moderately viscous solution stable on storage for several months. When 1 oz. of such a solution was used as the detergent in a General Electric or Hotpoint household dishwashing machine, it was found that little or no foam resulted, fat and protein soils were completely removed, and the dishes and glassware drained evenly after washing and rinsing to give bright, spot-free surfaces on drying.

Example 2

5% N-palmitoyl-N-cyclohexyl taurate
15% Tetrapotassium pyrophosphate
80% Water

This composition was also clear and stable. When 1 oz. of such a solution was used in a Gen-

eral Electric or Hotpoint household dishwashing machine, it was found little or no foam resulted. Fat and protein soils were completely removed and the dishes and glassware were bright and spot-free on drying.

The advantages of organic detergents in dishwashing are twofold: In the first place, the synthetic organic detergents do not react with water hardness to give film-forming precipitates, and some of them may in fact disperse and wash away such precipitates as may be formed by other materials present. In the second place, a trace of these detergents will usually be left after washing and rinsing and, by their wetting power, will cause the water film to spread or "drain" uniformly instead of breaking into droplets, thus ensuring rapid drying and absence of water spotting. The excessive foaming of previously available synthetic detergents and wetting agents has, however, interfered with efficient performance of the machines and caused unsightly "bubbling" through hinges, etc. besides making rinsing difficult. I have now discovered that a new synthetic detergent, viz. N-palmitoyl-N-cyclohexyl taurate is admirably suited for this application due to its combination of good wetting and detergent properties with exceptionally low foaming power.

In order to combine this material with mild alkalies and at the same time eliminate the presence of difficultly soluble crystals it was found preferable to prepare the new composition in liquid form. In certain types of household machines only a liquid detergent is in fact capable of acting, due to inadequate agitation of the wash water. It was soon found, however, that suitable solutions could not readily be made. In the first place, the new organic detergent was not easily dissolved in water: solutions containing about ten percent of this compound varied from thick gels to white pastes, depending on the purity of the plant batches. In many cases even five percent solutions were turbid and gelatinous, and tended to separate out on standing. On adding alkalies to such systems the condition became even worse. Thus the addition of 5–10% potassium carbonate to a 10% gel of the detergent caused separation of an oily phase; addition of sodium tripolyphosphate caused a stiffening or "livering" to occur; tetrasodium pyrophosphate gave only a white paste. The following compounds were thus found to be incompatible with the 10% N-palmitoyl-N-cyclohexyl taurate solutions: sodium carbonate, potassium carbonate, dipotassium hydrogen phosphate, sodium silicate, potassium silicate, sodium hydroxide, potassium hydroxide, tetrasodium pyrophosphate, sodium tetraphosphate, trisodium phosphate, sodium sesquicarbonate, sodium hexametaphosphate, sodium bicarbonate and sodium tripolyphosphate.

Although 5% "solutions" of the organic detergent appeared to be more compatible with some of these, such as trisodium phosphate, the combinations were cloudy, and gelling began to set in after several days' storage. Potassium tetraborate showed some compatibility but gelled eventually.

It was surprising that only one alkali possesses the desirable property of thinning out and clarifying the gelatinous "solution" of the organic detergent and remaining indefinitely compatible with it on storage. This alkali is tetrapotassium pyrophosphate. The preferred dishwashing compositions of this invention are therefore aqueous solutions of N-palmitoyl-N-cyclohexyl taurate and tetrapotassium pyrophosphate. In some cases a small amount of sodium metasilicate may also be added to prevent tarnishing of aluminum, the potassium pyrophosphate permitting the addition of this normally incompatible alkali.

What I claim is:

1. A liquid detergent composition adapted for use in mechanical dishwashing operations comprising from 5 to 20 parts of N-palmitoyl-N-cyclohexyl taurate, from 5 to 20 parts tetrapotassium pyrophosphate and water.

2. A liquid detergent composition adapted for use in mechanical dishwashing operations comprising from 5 to 20 parts of N-palmitoyl-N-cyclohexyl taurate, from 5 to 20 parts tetrapotassium pyrophosphate, from 2 to 10 parts sodium metasilicate, and water.

3. A liquid detergent composition adapted for use in mechanical dishwashing operations comprising from 5 to 20 parts of N-palmitoyl-N-cyclohexyl taurate, from 5 to 20 parts tetrapotassium pyrophosphate, and at least 50 parts water.

4. A liquid detergent composition adapted for use in mechanical dishwashing operations comprising from 5 to 20 parts of N-palmitoyl-N-cyclohexyl taurate, from 5 to 20 parts tetrapotassium pyrophosphate, from 2 to 10 parts sodium metasilicate, and at least 50 parts water.

5. A liquid detergent composition adapted for use in mechanical dishwashing operations comprising from 5 to 20 parts of N-palmitoyl-N-cyclohexyl taurate, from 5 to 20 parts tetrapotassium pyrophosphate, from 2 to 10 parts sodium metasilicate, and from 50 to 88% water.

6. A liquid detergent composition adapted for use in mechanical dishwashing operations consisting essentially of 10% N-palmitoyl-N-cyclohexyl taurate, 10% tetrapotassium pyrophosphate, 2% sodium metasilicate, and 78% water.

7. A liquid detergent composition adapted for use in mechanical dishwashing operations consisting essentially of 5% N-palmitoyl-N-cyclohexyl taurate, 15% tetrapotassium pyrophosphate and 80% water.

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