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METHOD OF IMPROVING THE STORAGE PROPERTIES OF ALKALINE DETERGENT COMPOSITIONS

Abraham Mankowich, Bel Air, Md., assignor to the United States of America as represented by the Secretary of the Army

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a process for improving the storage properties of alkaline detergent compositions. More particularly it relates to a process for improving the storage properties of mixtures of alkaline salt detergents and suitable quantities of specific stable surface active agents through elimination of the caking tendencies of such mixtures by utilization of a definite order of mixing of the ingredients thereof.

The caking of powder detergent compositions in storage, with consequent loss of free flowing and granular characteristics, has been a serious problem of the cleaning compound manufacturers. The phenomenon has been said to occur chiefly as the result of either of two actions; namely, (1) because of transfer of water of crystallization from one ingredient of a compound to another ingredient, usually anhydrous, or (2) because of absorption of moisture and carbon dioxide from the warm atmosphere by the compound. Heretofore the problem has been fought in many ways, but without success. Some of the expedients resorted to in attempting to control caking have included: (1) use of compositions of hydrated ingredients only, (2) use of compositions of anhydrous ingredients only, (3) use of polyethylenelined fibre drums, (4) use of steel drums provided with gasketed-closures, (5) incorporation of Na_2CO_3 in the composition to absorb moisture, (6) use of talc or metallic soaps as anti-coagulants. A conventional method of preparing detergent compositions has been to blend the powdered ingredients in rotating mixing barrels, and then if required by the formulation, to spray the liquid surfactant ingredient into the rotating blended mixture of dry powders. This method of preparing detergent compositions, together with the anticaking expedients enumerated above, has not been successful in eliminating the caking.

The primary object of this invention, is, therefore, the development of a process for improving the storage properties of detergent compositions by eliminating the caking thereof.

Other and further objects will be apparent to those skilled in the art from the following specification and claims.

I have discovered that the above-mentioned objective can be attained by the utilization of a definite order of mixing of the ingredients of the detergent composition provided the latter includes a small amount of a specific, liquid nonionic surfactant. As little as 0.5 percent up to 5 percent, preferably 2 percent, by weight of any liquid, water soluble alkyl aryl polyethylene glycol ethers, such as, nonyl phenyl pentadecaethylene glycol ether, nonyl phenyl eicosaethylene glycol ether, nonyl phenyl decaethylene glycol ether, octyl phenyl pentadecaethylene glycol ether, octyl phenyl pentaethylene glycol ether, dodecyl phenyl polyethylene glycol ether, and octyl phenyl poly-(9,10)-ethylene glycol ether is a sufficient amount of surfactant in this composition. It has been additionally found that alkaline detergent formulations

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not containing one of the afore-mentioned surfactants will benefit by the addition of about 2 percent by weight of one of them (detergency of the composition will be improved, since a polyethenoxyether of an alkyl phenol forms a synergistic surfactant of the conventional alkaline detergent composition).

The present discovery can best be described by reference to a typical alkaline detergent composition. Ingredients of such a cleaner may consist of one or more alkaline salts, such as, sodium sesquisilicate, sodium orthosilicate, trisodium phosphate, and sodium trisilicate; one or more acidic salts, such as, sodium bicarbonate, secondary sodium phosphate, and sodium sesquicarbonate; or relatively acidic (compared to the alkaline salt ingredients) salts, such as, sodium pyrophosphate, sodium hexametaphosphate, and sodium metasilicate; and soluble alkyl aryl sulphonates, such as, sodium docetyl benzene sulphonate and sodium tridecyl benzene sulphonate, or the solid water soluble alkyl sulphates, such as, sodium lauryl sulphate and sodium octyl sulphate; and/or one of the liquid polyethylene glycol ether surfactants mentioned in the preceding paragraph. A typical detergent composition in which the present invention could be employed would consist of sodium metasilicate pentahydrate as the alkaline detergent salt which simultaneously serves as the inhibitor of corrosion of aluminum, sodium tripolyphosphate as the principal detergent builder and water softener, sodium primary phosphate present for the purpose of reducing the pH of aqueous solutions of the composition to approximately 12.0 in order that the sodium metasilicate can function satisfactorily as a corrosion inhibitor, and a liquid nonionic (100 percent active content) surfactant of the alkyl aryl polyethylene glycol ether type.

I have found that caking of detergent mixtures on storage results when the dry salts are blended and the liquid surfactant is then added to the blended mixture. It is well known that acidic and basic salts interact, especially in warm, damp atmospheres. Caking can be eliminated by utilizing the liquid alkyl aryl polyethylene glycol surfactant as a positive barrier between the alkaline and acidic salts. According to this invention the interaction and subsequent caking is prevented by mixing the ingredients in the following order: blend the liquid alkyl aryl polyethylene glycol ether thoroughly with the sodium primary phosphate, the acidic salt of the composition; then add the sodium tripolyphosphate, the relatively acid salt, and again mix thoroughly; at this stage, all acidic and relatively acidic salts have become coated with and absorbed layer of the liquid surfactant; finally the sodium metasilicate is added and mixed into the composition. I have also found that the same prevention of interaction and caking can be accomplished by mixing as follows: blend 0.5 to 5% by weight of the total composition of the liquid alkyl aryl polyethylene glycol ether thoroughly with the sodium metasilicate; then add the sodium tripolyphosphate and again mix thoroughly, then add the sodium primary phosphate, and again mix thoroughly; in this process, the alkaline salt is first positively coated with the liquid nonionic surfactant, and then the acidic ingredients are mixed in. In general, the proportions of the ingredients are immaterial and may vary over a wide range. The only proportion critical to the instant invention is the 0.5 to 5 percent by weight of the liquid, water soluble, alkyl aryl polyethylene glycol ethers enumerated above.

The following examples will further illustrate the nature of this invention, but no restrictions, limitations, or conditions are to be imputed to this invention by these examples. The percentages are by weight in the following examples. It will be evident to those skilled in the

art that changes can be made in the types and/or amounts of the alkaline and acid salts and water softener.

Example 1

Two percent of octyl phenyl poly-(9,10)-ethylene glycol ether, $C_8H_{17} \cdot C_6H_4 \cdot (OC_2H_4)_{9-10} \cdot OH$, are mixed in a blender with 10.5 percent of sodium primary phosphate monohydrate. 52.5 percent of sodium tripolyphosphate are added to the mixture in the blender, and the product mixed again. 35 percent of sodium metasilicate pentahydrate is then added to the mixture in the blender, and the product mixed again. The resulting composition retains its free flowing and granular characteristics and does not exhibit caking tendencies in storage.

Example 2

Two percent of nonyl phenyl pentadecaethylene glycol ether, $C_9H_{19} \cdot C_6H_4 \cdot (OC_2H_4)_{15} \cdot OH$, are mixed in a blender with 35 percent of sodium metasilicate pentahydrate. 52.5 percent of sodium tripolyphosphate is added to the mixture in the blender, and the product mixed again. 10.5 percent of sodium primary phosphate monohydrate is then added to the mixture in the blender, and the product mixed again. The resulting composition retains its free flowing and granular characteristics and does not exhibit caking tendencies on storage.

I claim:

1. A non-caking storage stable alkaline detergent composition comprising by weight 52.5 percent sodium tripolyphosphate, 35 percent sodium metasilicate pentahydrate, and 10.5 percent sodium primary phosphate monohydrate coated with 2 percent octyl phenyl poly-(9,10)-ethylene glycol ether.
2. A method of preparing a non-caking storage stable alkaline detergent composition which comprises mixing 2% of nonyl phenyl petadecalene glycol ether in a blender with 35% of sodium metasilicate pentahydrate after which 52.5% of sodium tripolyphosphate is added and the product mixed again, followed by the addition of 10.5% of sodium primary phosphate monohydrate and final mixing.

References Cited in the file of this patent

UNITED STATES PATENTS

1,813,701	Howe	July 7, 1931
2,213,477	Steindorff et al.	Sept. 3, 1940
2,550,691	Harris	May 1, 1951
2,614,992	Mankowich	Oct. 21, 1952
2,878,188	Callahan	Mar. 17, 1959

FOREIGN PATENTS

490,285	Great Britain	Aug. 11, 1938
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