Patented Mar. 4, 1952

2,588,264

UNITED STATES PATENT OFFICE

2,588,264

DETERGENT COMPOSITION

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No Drawing. Application December 1, 1944, Serial No. 566,241

9 Claims. (Cl. 252—121)

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The present invention relates to a detergent composition or soap that will lather adequately and have high detergent effect regardless whether used in soft water, hard water, or in salt water.

As conductive to a clear understanding of the invention, it is noted that long-chain fatty acid soaps do not function satisfactorily in the presence of calcium or magnesium salts that are present in hard water; for such salts combine with the soap to form curds which by virtue of their insolubility in water detract materially both from the cleansing efficiency and rinsibility of such soaps. Long-chain fatty acid soaps also do not function satisfactorily in salt water or sea water, because they are insolubilized by the salting out action of electrolyte which is more readily soluble in water than is the soap. Accordingly, the soap fails to emuslify in such environment and thus the cleansing action is negligible and it is difficult to rinse the soap from the skin or other surface with sea water.

Where it is attempted to mitigate the above limitations of long chain fatty acid soap, by the incorporation therewith of synthetic detergent, inordinately large amounts of the latter are required for an efficient blend to function satisfactorily in hard and in sea water. Such large amounts of synthetic detergent greatly increase the cost of the soap, and in use tend to defat the skin and to cause excessive drying and chapping. While the incorporation of substances that will promote micelle formation permits reduction in the synthetic detergent, the use of inorganic salts for the purpose, such as sodium sulfate or chloride is effective only in large proportions up to 80 parts thereof to 20 parts of the synthetic detergents. Such inorganic salts, in such high concentrations, however, tend to precipitate the fatty acid soda soaps and thereby to prevent the same from exerting emulsifying or lathering action, aside from the fact that a high percentage of non-soap detergent dilutes the effectiveness of the detergent as a whole.

An object of the present invention is to provide an all purpose detergent composition or soap, equally useful in soft water, in hard water and in salt water, said detergent to be devoid of any ingredient that tends to precipitate or insolubilize the fatty acid soap constituent thereof, the latter to constitute the preponderating bulk, practically the entire bulk of the compound detergent to be of detergent ingredients, which despite their diverse rates of solubility nevertheless dissolve uniformly in the use of the compound detergent.

Another object is to provide a compound detergent of the above characteristics, the ingredients of which are relatively inexpensive and which may be easily prepared with standard soap makers' equipment.

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This application is a continuation in part of my earlier application, Serial No. 405,659 for Slow Dissolving Detergents, filed August 6, 1941, now abandoned.

The composition, according to the present invention, involves the use of three primary ingredients which are (1) fatty acid soap, (2) organic non-soap detergent and (3) a minor proportion of emulsified binder composition of type self-emulsifying in water.

The fatty acid soap ingredient (1) may be of the type commonly used in the ordinary soap used in soft water. It may consist of saponified tallow, desirably mixed with cocoanut oil, with or without other saponified fatty acids or saponified rosin.

The organic non-soap detergent (2) preferably includes two distinct types, (2*a*) a strong solvent and/or dispersing agent for calcium and magnesium soaps, and (2*b*) a composition capable of solubilizing soda soaps, even in the presence of electrolytes in the concentrations normally founded in sea water.

The emulsified binder composition (3) is a water insoluble cellulose ether emulsified in manner to perform the following functions: (*a*) To promote micelle formation of the two non-soap detergent constituents, (*b*) to equalize the rate of solution of the various ingredients in the finished soap bar, flake or powder and (*c*) to provide mechanical strength in the case of bar soap.

In the soap composition the element (2), the strong solvent and/or dispersing agent for calcium and magnesium soap, generically designated a "disperser" in the claims, is desirably of solubility of from 5 to 30 parts in 100 parts of water and has high cleansing efficiency, low tissue adsorption and excellent rinsibility. Among the compounds useful for the purpose are aryl alkyl polyether sulfates, sulfated fatty acid esters, long chain alkyl aryl sodium sulfonates, sodium salts of long chain alcohol sulfuric acid esters and sulfonated long chain collamids. It is preferred to use alkylated phenol sulfonate—polyether sulfate, one commercial form of which compound is marketed under the trade name Triton 770. Preferred sulfated fatty acid esters are succinyl di-octyl sodium sulfate and the sodium salt of a sulfated fatty acid ester having 15 carbons in the chain and a single alcohol group and which is marketed under the trade name Artic Syntex M. Among the sodium salts of long chain alcohol sulfuric acid esters that can be use are sodium lauryl sulfate and stearyl sodium sulfate. A useable sulfonated collamide is the sodium salt of sulfonated myristyl collamide. Satisfactory long chain alkyl aryl sodium sulfonates are phenol cetyl sodium sulfonate, phenyl cetyl sodium sulfonate and naphthalene cetyl sodium sulfonate.

The second non-soap detergent ingredient (2b), the solubilizer for soda soaps even in the presence of electrolytes, is one that must be water miscible even at low temperatures, such as 15 degrees C. Among the compositions useful for this purpose are aryl alkyl poylether alcohols and polyoxyalkylene ether fatty acid ester, including such compounds of any of the fatty acids from lauric to stearic and desirably of the partial ester of oleic acid. One commercial example of polyether alcohol useful for the purpose is known by the trade name Igepal CA. A preferred aryl alkyl polyether alcohol for the purpose is sold under the trademark Triton NE. The commercial name for a suitable polyoxyalkylene ether stearic acid ester is "Tween 60," and for a suitable polyoxyalkylene ether lauric acid ester is "Tween 20."

The third ingredient (3) of the soap, a minor proportion of emulsified binder composition, is composed of water insoluble cellulose ether, preferably ethyl cellulose ether plasticized and colloided and of character such as to be self-emulsifying in water. The colloiding and emulsifying agents used are desirably fatty acid monoesters of polyhydric alcohol. Among the compounds useful for the purpose are diglycol laurate, diglycol oleate, diglycol stearate, glycerol monostearate and mannitan mono-oleate, but mannide mono-oleate has been found particularly advantageous for the purpose. The emulsifying binder constituent preferably also includes a minor proportion of water soluble methyl cellulose ether to stabilize the emulsion.

In the preparation of the plasticized binder composition, the ethyl cellulose ether is dissolved in a mixture of appropriate solvent and emulsifier, the solution is diluted with a water solution or dipsersion of a part or all of the colloding material, with rapid stirring together with the stabilizer, and the batch is treated in a colloid mill or homogenizer.

In one preferred embodiment 25 parts of ethyl cellulose ether are dissolved in 15 parts of toluene and 10 parts of ethanol. The solution is then diluted with 50 parts of water at 40 degrees C., containing 1 to 5 parts by weight of mannide mono-oleate, with rapid stirring. Emulsification takes place immediately. The final treatment in a colloid mill or homogenizer is conducted for from 10 to 30 minutes, resulting in a stable emulsion which may be incorporated into the compound detergent without further treatment.

In a preferred soap composition of the above type, although the total synthetic non-soap detergent may be as high or higher than 50 percent by weight, it is preferred to keep it below 15 per cent. The 2a ingredient of non-soap detergent may be of weight from two to four times, but preferably approximately the same weight as the 2b ingredient. Even with a synthetic detergent content as low as 7 per cent, an efficient salt water detergent in bar form may thus be produced.

The ethyl cellulose ether content of the finished composition may vary from .25 to 1.5 per cent but ordinarily .5 per cent of that ingredient is preferred. The methyl cellulose ether which functions to stabilize the ethyl cellulose ether emulsion may be used in amounts from .05 per cent to 1 per cent, but ordinarily, .1 per cent thereof is sufficient in the finished product.

The plasticizer for the cellulose ether is used in amounts of between .1 per cent and 2 per cent of the finished product, depending upon the emulsifying efficiency of the compound used. Where mannide mono-oleate is used for the purpose .1 per cent of the total compound detergent is sufficent.

The soap is prepared by admixture of the various ingredients in a crutcher or soap remelter, a conventional soap stabilizer such as sodium silicate being also preferably added.

One desirable formula is the following:

	Parts
Toilet mill base:	
Tallow soda soap — 450 parts; Coconut oil soda soap (approx. 35% moisture) — 45 parts	450
Triton 770 (15% Triton, 85% water)	120
Triton NE (35% Triton NE, 65% water)	40
Ethyl cellulose emulsion (25% ethyl cellulose, 4% mannide mono-oleate, 71% inert solvent)	8
Methyl cellulose ether solution (.5 lb. methyl cellulose, 2 lbs. water)	2½
Sodium silicate (Na_2O—$4SiO_2$) 40° Bé., all parts being by weight	4

To prepare the soap of the foregoing or of other formulas within the scope of the present invention, the toilet mill base is pumped into a crutcher together with the disperser for calcium and magnesia soaps, at 140 degrees to 160 degrees F. and the mixture is allowed to agitate as a first batch.

The other non-soap detergent ingredient i. e. the solubilizer for soda soaps, is separately blended with the plasticized emulsion that had been previously prepared as above set forth and is agitated while heated to 100 degrees F. as a second batch.

Thereupon the latter batch is pumped into the crutcher for mixture with the first batch, and the entire mixture is crutched for from 15 to 30 minutes.

The stock is then rolled out into ribbons of approximately 2 to 20 mil thickness and is conveyed from the roller to a dryer. A drying cycle which will reduce the moisture content to between 15 per cent and 3 per cent is employed, though it is preferred to reduce the moisture content to from 5 per cent to 10 per cent.

Alternatively all of the ingredients of soap may be mixed in a soap remelter and pumped to a flash dryer and dried to form suitable for milling and plotting.

It is understood that after the ribbons have been dried to the required moisture content, perfume, color and other agents may be added if desired in an amalgamator and the product may be milled, plotted and pressed into soap tablets or divided into milled flake or powdered soap in the customary manner, employing conventional soap processing machinery for the purpose.

In use of the compound detergent or soap in soft, hard or salt water the emulsified binder promotes the micelle formation of the two non-soap detergent ingredients and thereby increases their detergent effect. In such use, the emulsified binder prevents the rapid leaching out of the more easily soluble constituents, such as the highly soluble aryl alkyl polyether alcohol. The binder acts to retard the solution of such more soluble constituents so that the various constituents of the compound detergent or soap dissolve at practically uniform rate under all conditions of use.

In contact with water, whether soft, hard or salt, the mannide mono-oleate or other emulsifier re-emulsifies the cellulosic material. The emulsion thus formed controls the absorption by the skin of the various detergent ingredients. It

tends to reduce the absorption of such materials and thus facilitates rinsibility and precludes skin drying or chafing, which would result in the absence of such control, from the absorption by the skin of fatty acids, alkalis or detergents.

As many changes could be made in the above product and process and many apparently widely different embodiments of this invention could be made without departing from the scope of the claims, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A detergent composition, comprising a fatty acid soap and two aliphatic non-cationic type high molecular weight organic non-soap detergent constituents including a strong disperser for calcium and magnesium soaps, said disperser having high cleansing efficiency and low tissue absorption, a second organic non-soap detergent serving as a solubilizer for soda soap in the presence of electrolytes and a minor proportion of ethyl cellulose serving to promote micelle formation of the two non-soap constituents and to equalize the rate of solution of various ingredients of the finished compound detergent, said ethyl cellulose being colloided with mono-fatty acid ester of polyhydric alcohol.

2. A detergent composition, comprising a fatty acid soap, an aliphatic non-cationic type high molecular weight organic non-soap detergent which is a strong disperser for calcium and magnesium soaps and has high cleansing efficiency and low tissue adsorption, a second organic non-soap detergent which is a solubilizer for soda soap in the presence of electrolytes and a minor proportion of ethyl cellulose serving to promote micelle formation of the two non-soap detergent ingredients and to equalize the rate of solution of various ingredients of the finished compound detergent, said ethyl cellulose being colloided with fatty acid monoester of a polyhydric alcohol, said ethyl cellulose containing a minor proportion of methyl cellulose.

3. A detergent composition, comprising a fatty acid soap, an aliphatic non-cationic type high molecular weight organic non-soap detergent which is a strong disperser for calcium and magnesium soaps and has high cleansing efficiency and low tissue absorption, a second organic non-soap detergent which is a solubilizer for soda soap in the presence of electrolytes and a minor proportion of emulsified ethyl cellulose binder composition serving to promote micelle formation of the two non-soap detergent ingredients and to equalize the rate of solution of various ingredients of the finished compound detergent, said binder composition comprising an emulsion of ethyl cellulose colloided with emulsifier therefor, selected from the group consisting of mannide mono-oleate, mannitan mono-oleate, glycerol monostearate diglycol stearate, diglycol laurate and diglycol oleate.

4. A detergent composition, including a fatty acid soap and two aliphatic non-cationic type high molecular weight organic non-soap detergent constituents, one of which is a strong disperser for calcium and magnesium soap and the other a solubilizer for soda soaps in electrolytes, said compound detergent including a minor proportion of emulsified ethyl cellulose binder composition, said latter composition comprising an ethyl cellulose emulsion, emulsified with a fatty acid monoester of a polyhydric alcohol, stabilized with a water diluted solution of methyl cellulose, said binder composition being present in proportion between .25 and 1.5 per cent by weight of the compound detergent.

5. The combination recited in claim 4 in which the emulsified binder emulsion consists of a solution of 25 parts of ethyl cellulose in 15 parts of toluene and 10 parts of ethanol, emulsified with one to five parts of mannide mono-oleate diluted with 50 parts of water.

6. A compound soap, which will lather adequately and have high detergent effect in soft, hard and salt water, consisting in major proportion of an alkali metal salt of a high molecular weight fatty acid, the components of which soap will dissolve uniformly despite the adverse rates of solubility of the components thereof, the components thereof in addition to said alkali metal salt consisting of a dispersing agent selected from the group consisting of high molecular weight aryl alkyl polyether sulfates, sulfated fatty acid esters, long chain alkyl aryl sodium sulfonates, sodium salts of long chain alcohol sulfuric acid esters and sulfonated long chain collamids, and a minor proportion of a cellulose ether plasticized with a high molecular weight fatty acid monoester of a polyhydric aliphatic alcohol.

7. The soap of claim 6 in which the major proportion comprises saponified tallow and in which said dispersing agent also includes a compound selected from the group consisting of high molecular weight aryl alkyl polyether alcohols and polyoxyalkylene ether fatty acid ester.

8. A process of incorporating a water insoluble alkyl cellulose ether in soap which comprises dissolving the alkyl cellulose ether in an organic solvent, mixing with water containing a high molecular weight fatty acid partial ester of a polyhydric alcohol and then combining with soap.

9. A process of incorporating water insoluble ethyl cellulose in sodium soap to promote micelle formation, to equalize rate of solution of various ingredients in soap and to provide mechanical strength which comprises dissolving ethyl cellulose in a toluol-ethanol mixture, mixing with water containing mannide mono-oleate and then incorporating into the soap.

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