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COMPOSITE TOILET SOAP BAR HAVING AN ACID pH IN USE

Peter J. Ferrara, 47 E. 87th St. 10028; Gaston Dalby, 51 5th Ave. 10003; Clarence A. Barnes, Jr., 829 Park Ave. 10017; and Roy Gordon, 110 East End Ave. 10028, all of New York, N.Y.

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ABSTRACT OF THE DISCLOSURE

A solid soap produced in the form of bars is disclosed, having a pH which ranges from slightly acidic to neutral. The bar of soap comprises two separate soap entities of different properties physically combined to form a unitary structure, the properties of which result from the interaction of the two soap entities in actual use.

This invention relates to soap compositions produced in the form of bars for use as toilet soap.

More particularly, this invention relates to two distinct soap compositions produced in the form of a single bar for use as toilet soap.

A cleansing soap derives its main usefulness through its detergent activity. The detergent activity not only accomplishes the removal of soil, which is a desirable objective, but at the same time results in the removal of valuable skin "oils." In an attempt to lessen or eliminate the loss of these desirable, natural skin oils, modern soap making technology has developed a great interest in how to make and use bath oil-containing soaps. The intent in using bath oil soaps is to substitute these oils contained in the soap for those incidentally removed from the skin in the cleansing process.

One method of achieving the substitution of a bath oil for the oils taken away from the skin is to add bath oil directly to the water in a bath tub. Unless the bath oil thus used also contains a surfactant, it is not capable of manifesting the reactivity characteristics necessary to replace the natural skin oils which are removed by the soap.

In the case of persons taking shower baths, this external or separate addition of bath oil is not readily obtained; hence, one must depend on the transfer or substitution process in the course of the lathering step.

While the desirable objectives of replacing natural skin oils are quite obvious, the attainment of these has not been achieved through the use of the soaps made available by today's commerce. One reason is the difficulty of matching up the bath oils with the natural skin oils taken away from the cleansed surface areas. The replacement is neither adequate in terms of quantity transfer, nor in composition. To strive for a more substantial degree of substitution means a longer exposure time to the soap containing the bath oil component. This poses a serious disadvantage in that the usual soaps, with or without bath oils, are highly alkaline, ranging in pH from between 9.5 and 10.2. The normal pH of skin is approximately 5.5, and published clinical data reveals that the use of a quality bath soap can cause a change in the skin pH of such a magnitude as to require 30 to 60 minutes, or even 90 minutes, before the skin pH returns to its normal state.

It is this drastic shift from the normal pH of skin which accounts for skin sensitivity, giving rise to a host of dermatological problems.

It would be desirable, therefore, to adjust the pH of a bath oil soap to the normal pH of skin, thus eliminating the drastic sensitizing effects caused by the use of the usual alkaline soaps.

Furthermore, the adjustment in the pH of a bath oil soap to the skin pH not only retards the removal of valuable skin oils because of the soap's decreased tendency to solubilize skin oils, but when applied over a more extended interval, provides for a more substantial exposure to the bath oil contained in the soap.

The production of a toilet soap having a pH which is either neutral or slightly acidic in nature presents considerable difficult. This is a matter well known to those experienced in the art. The physical state or structure of a soap depends on the presence of sodium salts of solid acids of C_{16} and C_{18}, chain length, for instance, stearic acid and palmitic acid. The corresponding potassium soaps are quite soft and are generally used where maximum water solubility is desired, such as in shaving creams and liquid soaps. As a very rough generalization, the usual soap-making processes are based on the saponification of natural fats and oils with caustic soda; i.e., the neutralization of fatty acids with alkali. The natural soap stocks include tallow (cattle or sheep fat) and nut oils like coconut, babassu and palm-kernel. The initial product is a kettle soap which contains 70% soap, 0.2–0.5% salt (used to precipitate the soap curd) and about 20 to 30% water. All percentages and proportions disclosed herein are by weight. The kettle soap retains excess alkali even after 3 and 4 water washes of the soap curd. If the excess alkali is neutralized with an acidic compound, the sodium stearate is converted to stearic acid, and the desired soap structure is no longer obtained.

Further, the degree of physical firmness of the soap must be combined with a high degree of solubility. The selection and blending of the fats and oils and choice of alkali must therefore be regulated so as to obtain the desired degree of firmness in the resulting bar without detracting from its ease of solubility. The choice again results in a highly alkaline soap which is irritating to the skin, affecting some individuals more than others.

An object of this invention is to provide soap compositions in the form of bars, having an over-all pH value in the slightly acidic to neutral range.

A further object of the invention is to provide soap compositions which have the desirable detergent properties of alkali soaps and the skin oil replacement properties of bath oil soaps without displaying an unsatisfactory degree of solubility and physical firmness.

A still further object of the invention is to provide soap compositions which may be used effectively as toilet soaps and which will leave the skin both clean and softened without there being any disadvantages attendant its use.

Another object of the invention is to provide two distinct soap compositions in the form of a single bar for use as toilet soap.

Other aspects of the invention will, in part, be obvious and will, in part, appear hereinafter.

It has been discovered, in accordance with the present invention, that the objectives of cleansing and the exposure of the skin to valuable bath oils at pH values compatible to skin pH can be achieved by combining two separate soap compositions into a unitary structure; i.e., combining a conventional detergent soap composition with a bath oil soap composition to form a single bar, so that the special properties of the two soaps are realized, but their disadvantages avoided by the capacity of the two compositions to interact during use.

Thus, one of the two soap compositions may be an ordinary grade of milled soap, or so-called transparent soap, relatively inexpensive to produce and having the usual properties for cleansing and toilet use. Its alkalinity will fall in the range common to such soaps. The second of the two compositions, on the other hand, will contain the bath oil component substantive to the skin oils, and thus be capable of being substituted therefor.

The second soap composition, however, will be produced so as to incorporate therein an acidic material which will reduce the pH values of the aqueous solution of the combination of the two compositions below the range producing irritation; i.e., the acidic material present in the second composition (bath oil composition) will neutralize the alkali present in the first composition (detergent composition) in the aqueous solution of the two formed in the actual washing without adversely affecting the detergent and softening or oil-restoring properties of the combination.

The amounts of each of the two soap compositions may vary considerably according to the requirements of the user. The only limitation is that when the two are combined in use, the acid component of the bath oil soap composition must be present in an amount sufficient to interact with the alkaline component of detergent soap composition, producing on the skin a pH approximating the normal skin pH.

As a feature of the invention, it has been found that the advantages flowing from the combination of a detergent soap with a bath oil soap can be obtained with the use of a relatively small amount of the bath oil soap. This makes it possible to prepare compositions composed of a major proportion of an ordinary detergent soap which are nevertheless adapted for the purposes herein. Such combinations are readily available and inexpensive and possess to a degree equivalent to that of the bath oil soap alone the indicated desirable oil replacement or softening properties.

Among the compositions found particularly suitable for use as the detergent bar composition are the following:

(1) SOAPS OF TALLOW FATTY ACID

A soap was prepared by adding 60.3 parts of tallow fatty acids heated to 65° C. to a solution consisting of .3 part of sodium chloride and 8.7 parts of sodium hydroxide dissolved in 30.7 parts of water, also heated to 65° C., with agitation and continued mixing until uniform. The soap thus prepared was cast into a rectangular mold and allowed to cool.

A soap was also prepared in a similar manner from the same fatty acids, except that malonic acid was incorporated in the soap. In this case, 60.3 parts of tallow fatty acids and a solution consisting of .3 part of sodium chloride, 9.1 parts of sodium hydroxide, 30.3 parts of water and .6 part of malonic acid was used. The additional sodium hydroxide used in this formula was used for the purpose of forming the sodium salt of the malonic acid used.

The relative hardness of these soaps was determined by the use of a modified Mullen paper tester in which the conventional open ring of the Mullen tester was replaced by a flat metal surface. The readings represented the pressure in pounds per square inch as read on the Mullen gauge required to fracture the bars. With this device, a pressure of 15 to 20 pounds indicates a soft jelly-like consistency. A reasonably firm bar of soap is represented by a reading of 30 to 50 pounds. Freshly-prepared commercial soaps may show readings ranging from 50 to 100.

When tested with the equipment, the soap prepared without the addition of malonic acid fractured at 38 pounds, while the composition containing .6 part, or 1.0%, based on the weight of tallow acids, of malonic acid fractured at 73 pounds' pressure.

(2) SOAPS OF COTTONSEED FATTY ACIDS

Soaps of cottonseed fatty acid were prepared as described just above. Their compositions consisted of:

	Formula A	Formula B
Cottonseed fatty acids	60.3	60.3
Sodium chloride	.3	.3
Sodium hydroxide	8.3	8.9
Water	31.1	29.3
Adipic acid	None	1.2

The soap containing 1.2 parts of adipic acid (Formula B—2% of weight of the fatty acid) was substantially harder than the soap without the addition of adipic acid (Formula A). The Mullen tests were 61 and 24 respectively. The soap without adipic acid was too soft to be considered a satisfactory bar; the soap with adipic acid was well within the range of commercial bar soap.

(3) OLEIC ACID SOAPS

Using the same procedure as described above under 1, soaps were prepared from commercial oleic acid in accordance with the following formulae:

	Formula A	Formula B
Oleic acid	60.2	60.3
Sodium hydroxide	8.6	11.1
Water	31.1	22.6
Azelaic acid	None	6.0

Formula A soap showed a Mullen test of 19 pounds and Formula B of 84 pounds.

Bar soaps suitable for hand and body washing were prepared by mixing:

(A) 78 parts commercial oleic acid, 20 parts commercial pelargonic acid, 2 parts adipic acid, 17.6 parts sodium hydroxide, and 35.4 parts water;

(B) 48 parts commercial oleic acid, 50 parts coconut fatty acids, 2 parts adipic acid, 17.6 parts sodium hydroxide, and 35.4 parts water.

The foregoing bars represented by Formulas A and B were immersed in water for 16 hours at 70° F. At the end of this period, the bar soap represented by Formulas A and B had increased in size only approximately 10–20%. After immersion in water, bar soaps A and B had softened to some extent, but still retain suitability as bar soaps.

A preferred detergent soap which is substantially anhydrous containing 1% water or less may also be prepared by melting together and molding the following mixture:

	Parts
Sodium stearate	45.0
Lauric acid	15.0
Glycerine	12.0

The invention may be employed with detergent soaps derived from all typse of fatty monocarboxylic acids ranging in chain length from C_{12} to C_{22}. It may be employed with soaps of saturated fatty acids; but since such fatty acids yield soap of sufficient hardness for most purposes, it is particularly adapted for use with the soaps of unsaturated fatty acids, such as oleic acid or linoleic acid, with soaps produced from fatty oils containing a large percentage of these acids such as corn oil, soya bean oil, olive oil and the like.

As the bath oil bar composition containing an acid material, or one yielding an acidulating result during use in the presence of water, the following, among others, have been found suitable:

(1)

	Parts
Sodium stearate	22.5
Lauric acid	7.5
Glycerine, 99.5%	6.0
Isopropylmyristate	6.0
Fumaric acid	6.0

(2)

	Parts
Sodium stearate	22.5
Lauric acid	7.5
Glycerine, 99.5%	6.0
Isopropylmyristate	6.0
Gluconodeltalactone	6.0

(3)

	Parts
Sodium stearate	22.5
Lauric acid	7.5
Glycerine, 99.5%	3.0
Isopropylmyristate	3.0

(4)

	Parts
Sodium laurate	15.0
Glycerine, 99.5%	3.0
Fumaric acid	4.0
Arlacel 60 (Surfactant [Atlas Chemical Co.])	1.0
Isopropylmyristate (excellent suds producing soap)	7.0

(5)

	Parts
Sodium laurate	10.0
Sodium stearate	5.0
Glycerine, 99.5%	3.0
Gluconodeltalactone	4.0
Arlacel 60	1.0
Isopropylmyristate	9.0

The acid material which is present in the bath oil-soap composition can in certain instances be present in a form in which it is not active per se, but rather where it is activated with said water present in the aqueous medium and in the latter form is capable of reacting with the alkali present in the detergent soap to produce a pH value in the slightly acidic to neutral range. The reaction with water is not necessarily instantaneous so that the activation takes at least several seconds, the neutralization being thereby delayed a corresponding amount of time.

The two separate compositions, i.e., detergent and bath oil, are formed into separate units of bar soap and the two units then physically joined to form a single integral structure. Thus, the two different bars of soap may be superimposed one over the other; a frame may be formed from one and the other inserted therein. A side-by-side arrangement may be utilized, as well as two layers of alternating side-by-side arrangements, or a ribbon or striped arrangement. It is only necessary that an arrangement be selected whereby both compositions are simultaneously available at the site for efficient interaction in the presence of water. The joining of the two different compositions can be effected in various manners. For example, an inert water-insoluble adhesive can be used, the joining can be effected by mechanical means, i.e., plastic pins; by careful pouring of both compositions into an appropriate frame and allowing solidification to bar form to then take place, placing a formed bar of the detergent composition into an appropriate frame and thereafter pouring bath oil soap in and allowing the same to solidify in contact with the detergent soap bar.

The invention is more fully illustrated, but not limited by the following:

EXAMPLE I

(1) A firm, bath oil soap was prepared by heating together a mixture consisting of 22.5 parts of sodium stearate, 7.5 parts of lauric acid, 6.0 parts of glycerine and 12.0 parts of isopropylmyristate. After the mixture was liquified, at about 50° C., 2.2 parts of sodium bicarbonate were added, and the temperature increased slowly until carbon dioxide ebullution was no longer evidenced. Then the liquid mass was cooled, 6.0 parts of powdered fumaric acid were added and the mixture cast into form of bars.

(2) Another soap was prepared to obtain both transparency and high detergency. This was made using the usual soap production methods, with 35 parts of tallow, 30 parts of coconut oil, 25 parts of castor oil, 10 parts glycerine, 13.9 parts sodium hydroxide and 3 parts of potassium hydroxide. The caustic soda and caustic potash were first dissolved in 30 parts of water. After saponification was complete the mixture was cooled to 80° C. and 37 parts of 190 proof specially denatured ethyl alcohol (Formula 3-A) were added. The mixture was maintained at 80° C. in a closed kettle, for 8 hours with occasional stirring, then heated to 85° C. for an additional period of 4 hours. Thereafter sufficient coconut oil fatty acid was added to reduce the free alkalinity of the mixture to a level not to exceed 0.10%, and the soap cast into molds.

The bath oil soap produced in step 1, and the detergent grade of transparent soap made in step 2, were joined together by first applying a film of water to surfaces of the soap to be faced together, and, the two wet surfaces were pressed together, while being exposed to flowing air to dry off excess moisture.

The tap water solutions of the combined soaps, showed a pH in the range of 6.8 to 7.6, a very satisfactory range for persons sensitive to the effects of highly alkaline soaps on the skin.

EXAMPLE II

(1) A detergent bar soap was prepared from 78 parts of commercial oleic acid, 20 parts pelargonic acid, 2 parts adipic acid, and, 17.6 parts of sodium hydroxide dissolved in 35.4 parts of water. This detergent bar was cast into special molds and allowed to solidify.

(2) A bath oil soap was prepared by heating together a mixture consisting of 30 parts of sodium laurate, 5.0 parts of glycerine, 2 parts of Arlacel-60 (Atlas Chemical Co.—surfactant) and 14 parts of isopropylmyristate. Arlacel 60 is a trade name for sorbitan monostearate as shown by the 1963 Annual of McCutcheon's Detergents and Emulsifiers. As soon as the mixture had melted and become uniform, 6.0 parts of gluconodeltalactone were added. While the bath oil soap was still a warm fluid, it was cast into molds, half filled with the soap composition of step 1. As the bath oil containing soap hardened, it became fused at the interface with the soap composition of step 1.

Water solutions of the combined soaps in this example showed a pH range similar to that of Example I.

EXAMPLE III

This example was exactly the same as Example II except that the detergent bar soap composition of step 1 was not formed as a bar until it had been disintegrated into chips which were dried using a heated air tunnel drier to a maximum level of 5% moisture. At this stage, the moisture level reduction permits the inclusion of the gluconodeltalactone, so all 6.0 parts used in step 2 (in Example II) can be "plodded" in step 1.

The net effect of the additional drying of the soap composition of step 1 was to make a firmer bar, longer lasting, with the same excellent capacity to generate the conversion of gluconodeltalactone into gluconic acid, thus neutralizing the alkalinity of the bath oil composition of step 2.

What is claimed is:

1. A composite toilet bar consisting essentially of:

(a) an alkaline detergent soap composition, in bar form, consisting essentially of a sodium soap of C_{12} to C_{22} fatty monocarboxylic acids and having an alkaline pH in an aqueous solution; and

(b) a bath oil soap composition, in separate bar form, consisting essentially of a sodium soap of C_{12} to C_{22} fatty monocarboxylic acids and a cosmetically acceptable acid selected from the group consisting of acetic acid, phosphoric acid, adipic acid, tartaric acid, malic acid, nitritoacetic acid, ethylenediaminetetra acetic acid, citric acid, glycollic acid, lactic acid, fumaric acid, disodium acid pyrophosphate, glucono-deltalactone and mixtures thereof, and having an acid pH in an aqueous solution;

wherein the two separate bar forms are physically joined to form a single integral structure and wherein said acid and alkaline components are present in sufficient quantity and are sufficiently water soluble such that when said composite bar is used as a cleaner

in combination with water, the overall aqueous medium has a pH of from 4 to 7.

2. A toilet soap according to claim 1 wherein said detergent soap composition is a transparent soap.

3. A toilet soap according to claim 1, wherein said detergent soap composition and said bath oil soap composition, each in separate bar form, are physically combined to form a composite unitary structure by means of plastic pins.

4. A toilet soap according to claim 1, wherein said detergent soap composition and said bath oil soap composition are physically combined to form a composite unitary structure by providing a film of water on the contacting surface of at least one of said bars and then pressing the contacting surfaces of the two bars together under drying conditions whereby the two bars are secured together.

5. A toilet soap according to claim 1 wherein said bath oil soap has the following composition:

	Parts
Sodium stearate	22.5
Lauric acid	7.5
Glycerine, 99.5%	6.0
Isopropylmyristate	6.0
Fumaric acid	6.0

6. A toilet soap according to claim 1 wherein said bath oil soap has the following composition:

	Parts
Sodium stearate	22.5
Lauric acid	7.5
Glycerine, 99.5%	6.0
Isopropylmyristate	6.0
Gluconodeltalactone	6.0

7. A toilet soap according to claim 1 wherein said bath oil soap has the following composition:

	Parts
Sodium stearate	22.5
Lauric acid	7.5

	Parts
Glycerine, 99.5%	3.0
Isopropylmyristate	3.0

8. A toilet soap according to claim 1 wherein said bath oil soap has the following composition:

	Parts
Sodium laurate	10
Sodium stearate	5
Glycerine, 99.5%	3
Gluconodeltalactone	4
Sorbitan monostearate	1
Isopropylmyristate	9

and said detergene soap has the following composition:

	Parts
Sodium stearate	45.9
Lauric acid	15.0
Glycerine	12.0

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LEON D. ROSDOL, Primary Examiner

D. L. ALBRECHT, Assistant Examiner

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