Oct. 7, 1952 D. E. MARSHALL 2,613,185

COMPOSITE DETERGENT BAR

Filed March 30, 1951

Fig. 1.

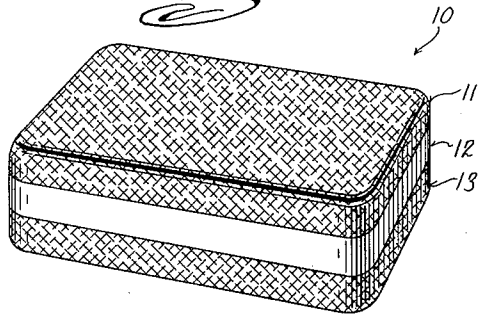


Fig. 2.

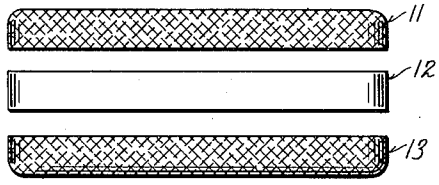


Fig. 3.

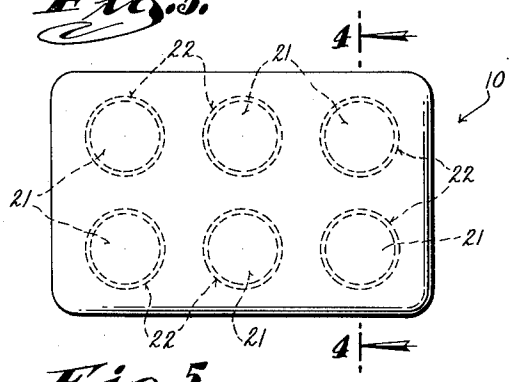


Fig. 4.

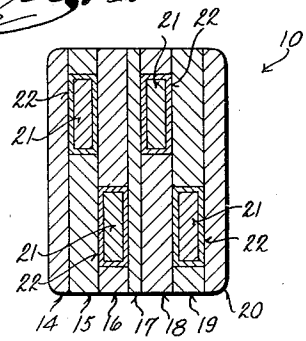


Fig. 5.

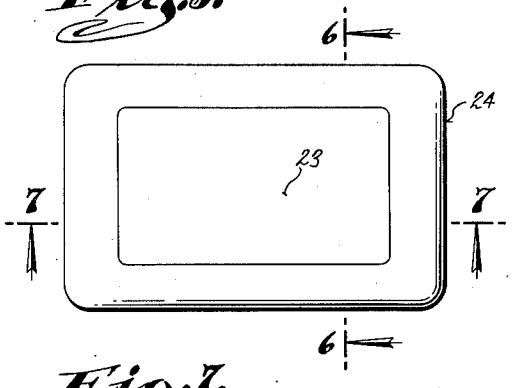


Fig. 6.

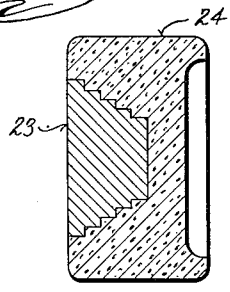


Fig. 7.

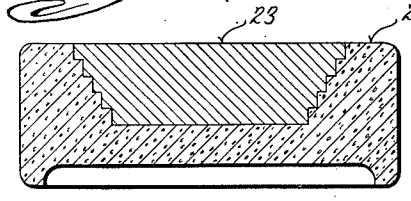
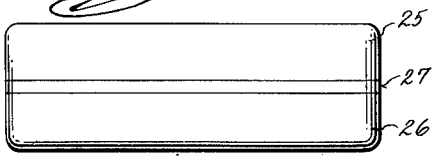


Fig. 8.



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COMPOSITE DETERGENT BAR

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Application March 30, 1951, Serial No. 218,371

8 Claims. (Cl. 252—92)

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This invention relates to a composite detergent bar in which the component parts are secured together solely by the cold welding properties possessed by soap which has been cold milled to an ultra-microcrystalline degree of sub-division, and to the method of making the same.

A wide field of use exists for a multi-part bar of soap or detergent in which the component parts are readily distinguishable from one another throughout the life of the bar or have different detergent actions to provide a bar of enhanced detergency, and in which the component parts will remain joined together despite the action of temperature, time and moisture encountered in storage and use. With such composite bars it is possible not only to take advantage of the tremendous sales appeal possessed by multi-colored bars or bars in which ornamentation or identifying indicia are embedded to remain visible and distinct from the rest of the bar throughout the life of the bar, but it is also possible by this technique to produce a commercially successful bar which is partially a fatty acid soap and partially a synthetic detergent to thereby take advantage of the improved detergency possessed by such a combination.

The composite bar of this invention also makes possible the production of a floating bar without necessitating aeration of the entire bar. For instance, where the bar consists of two parts, one a synthetic detergent and the other a fatty acid soap, only the fatty acid soap need be aerated and by proportioning the relative volume of the two parts the degree of buoyancy can be predetermined.

Another advantage of the composite bar of this invention is that it enables the incorporation of novel inserts in the bar as, for instance, slugs of highly perfumed soap in which the perfume is protected against loss during storage by being embedded in the bar to be released during use of the bar.

Broadly stated, the purpose and object of this invention thus is to provide a cake or bar of detergent composed of a plurality of separate and distinct preformed parts or bodies held together entirely without recourse to mechanical interlocks or other similar expedients heretofore resorted to where attempts have been made to produce composite or multi-part bars. The invention rests upon the discovery that if soap is cold milled to reduce its crystalline structure to submicroscopic size, i. e. to an ultra-micro-

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crystalline phase or state, it possesses remarkable cold welding properties. In other words, the invention rests upon the discovery that the cold milled soap of commerce, of which Palmolive, Lux and Camay are outstanding examples, upon being milled to the degree of ultra-microcrystalline subdivision will cold weld not only to itself but also to other soaps and synthetic detergents as well.

Various theories might be advanced in explanation of this phenomenon, but a discussion of why such ultra-microcrystalline cold milled soap possesses the needed cold welding properties is not necessary for those skilled in soap making to understand the invention.

The particular way in which the crystal size reduction is achieved forms no part of this invention but for purposes of illustration reference may be had to the copending application of Donald E. Marshall, Serial No. 129,942, filed November 29, 1949, which discloses one method of producing ultra-microcrystalline cold milled soap.

The said copending application also discloses aeration of this soap, pointing out that because of its extremely fine degree of subdivision it can be uniformly aerated during the process; and explains that ultra-microcrystalline cold milled soap surpasses known soaps in all important considerations, that it has an extremely fine texture, lathers well, and does not have the objectionable soap-dish jelly-forming disadvantage of ordinary milled soap. But one of the most important and advantageous qualities of ultra-microcrystalline soap is its ability to withstand cracking and disintegration during use and this attribute flows directly from the excellent cold welding properties which such ultra-microcrystalline soap possesses. It is, therefore, far stronger than solid synthetic detergents and where the composite bar is to include a part formed of a synthetic detergent, the present invention has as another of its objects to provide a bar so designed and constructed that the part thereof formed of synthetic detergent is protected throughout the life of the bar by the remainder of the bar which is formed of ultra-microcrystalline soap.

More specifically it is an object of this invention to provide a composite detergent bar in which a tapered insert of synthetic detergent is so positioned in a body of ultra-microcrystalline soap that not only is the insert protected throughout the life of the bar but in addition a desired proportion between synthetic and nat-

ural soap is maintained throughout the life of the bar.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel product and method of producing it substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein-disclosed invention may be made as come within the scope of the claims.

The accompanying drawing illustrates several complete examples of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view of a composite bar constructed in accordance with this invention;

Figure 2 is a side view of the bar shown in Figure 1 but with the component parts thereof separated preparatory to assembly;

Figure 3 is a plan view of a bar or cake of detergent embodying a modified form of this invention;

Figure 4 is a cross sectional view taken through Figure 3 on the plane of the line 4—4;

Figure 5 is a plan view of a bar showing another modified form of this invention, wherein an insert of synthetic detergent is so embedded in a body of ultra-microcrystalline soap as to be protected thereby throughout the life of the bar;

Figure 6 is a cross sectional view through Figure 5 on the plane of the line 6—6;

Figure 7 is a longitudinal sectional view through Figure 5 on the plane of the line 7—7; and

Figure 8 is a side elevational view of a detergent bar showing still another modification of this invention.

Referring now particularly to the accompanying drawing, the numeral 10 designates generally a composite bar or cake of detergent and which, in accordance with this invention, comprises a plurality of separate and distinct parts 11, 12 and 13. While these separate parts may be of any desired detergent it is essential that one of each pair of adjacent surfaces be of ultra-microcrystalline cold milled soap since, as explained hereinbefore, it is the excellent cold welding properties of this soap which are utilized to weld the several parts of the bar together. Thus, for instance, in the cake shown in Figures 1 and 2 the outer laminations or parts 11 and 13 might be of ultramicrocrystalline cold milled fatty acid soap while the middle lamination 12 is a piece of solid synthetic detergent.

The synthetic detergents contemplated by the present invention are usually sodium salts of long chain organic compounds containing sulfate or sulfonate groups and ordinarily referred to as organic sulfated and sulfonated anionic detergents. As is well known in the art, such synthetic detergents may also contain an aryl group. Also, instead of being sodium salts of the compounds mentioned above, they may be amonium salts or salts of other alkali metals such as potassium. As is also well known in the art, groups other than sulfates or sulfonates may be employed to produce water soluble synthetic detergents, for example, a series of hydroxyl or other groups.

The nonionic solid synthetic detergents derived from a hydrophobic unit such as a fatty acid, fatty alcohol, alkylphenol or long chain mercaptan combined with a hydrophilic group such as a polyethylene glycol chain are also suitable for use with this invention. These nonionic detergents are sold by the Wyandotte Chemical corporation under the trade name Pluronic Detergents and were recently described on page 40 of the October, 1950 issue of "Soap and Sanitary Chemicals." The exact chemical formulation of these new solid nonionic synthetic detergents is not disclosed, but their washing characteristics and melting points are thoroughly delineated.

The term "synthetic detergent" is a well understood term in the art and refers to any water-soluble surface active agent having a long chain organic radical which, unlike soap, has the property of dispersing or dissolving calcium or magnesium soaps instead of forming such insoluble alkaline earth soaps as is the case with ordinary fatty acid soaps in hard water washing. In general, such synthetic detergents are much more effective for breaking the interface between oil and water than soap, and thus more effectively wet greasy surfaces and more effectively disperse oil and grease to enable its removal from surfaces being washed. The synthetic detergent contemplated in this invention is only the solid organic non-soap synthetic detergent, that is, such synthetic detergents as will form a solid body capable of being attached to a body of ultra-microcrystalline cold milled fatty acid soap.

Examples of synthetic detergents usable in the present invention are as follows:

Chemical Name	Typical Formula
Sodium Lauryl Sulfate	$C_{11}H_{23}CH_2OSO_3Na$
Sodium Lauric Monoglyceride Sulfate	$C_{11}H_{23}COOCH_2CHCH_2OSO_3Na$ (with CH_2OH)
Sodium Hydroxyethane Sulfonate	$C_{17}H_{33}COOCH_2CH_2SO_3Na$
Sodium Alkyl Benzene Sulfonate	$C_{12}H_{23}C_6H_4SO_3Na$
Sodium Alkyl Benzene Sulfonate	$C_9H_{19}C_6H_4SO_3Na$
Sodium Alkyl Sulfonate	$C_{20}H_{41}SO_3Na$
Sodium Dihexyl Sulfosuccinate	$C_6H_{13}OCO-CH_2$ / $C_6H_{13}OCO-CH-SO_3Na$
Sodium Secondary Tridecyl Sulfate	$C_5H_{11}-C(OSO_3Na)-C_7H_{15}$

Where as in Figures 1 and 2, the bar is composed of three parts the outer two of which are of ultra-microcrystalline cold milled soap and the middle part of solid synthetic detergent, it is, of course, the cold welding properties of the two outer layers or laminations which hold the bar together; and by virtue of this excellent cold welding property of ultra-microcrystalline soap, it is only necessary to wet the surfaces to be joined or one of them and then press the three pieces together. Relatively light pressure is sufficient to produce the bond desired, but sufficient pressure may be employed in a suitable soap mold to round the corners or otherwise modify the shape of the composite bar, if desired.

As will be readily apparent to those skilled in soap making the facility with which composite bars may be produced in accordance with this invention makes it possible to incorporate vari-

ous solid inserts into the bar. Thus as shown in Figures 3 and 4, for instance, where the bar is composed of seven laminations 14 to 20, inclusive, certain of the intermediate laminations 15, 16, 18 and 19, may be provided with solid inserts or wafers of perfumed soap 21 protected by a lacquer coating 22 so that the perfume does not permeate and seep through the bar during storage and use.

As also indicated in Figures 3 and 4, the wafers 21 in adjacent laminations may be staggered so that each wafer is also surrounded and protected by a layer of soap. During use of the bar the wafers of the perfumed soap are successively uncovered so that the bar retains its perfume substantially throughout its full life. The wafers 21 may be readily manufactured by producing pellets of perfumed soap of the desired shape and then dipping them in lacquer and allowing them to dry. During assembly of the bar the coated pellets are inserted in suitable perforations in the laminations 18 and 19 after which the several laminations are assembled by moistening the contacting surfaces and pressing the assembly in a soap mold, it being understood that one of each pair of contacting surfaces is of ultra-microcrystalline cold milled soap.

The invention also contemplates and makes commercially feasible a composite bar of the type shown in Figures 5, 6 and 7 wherein an insert 23 of solid synthetic detergent is embedded in and protected by a body 24 of ultra-microcrystalline cold milled fatty acid soap. The shape of the insert 23 and the recess in the body 24 which receives the insert is generally that of a frustrum of a rectangular pyramid, and the side and end walls of the insert and of the recess in which its fits are formed with a series of rectangular steps. By reason of this generally tapered formation of the insert the insert is at all times surrounded on all sides but one by the body of the soap even after the major portion of the bar has been used. It will also be apparent that the exposed surfaces of the soap body and the synthetic insert decrease substantially proportionately to each other so that the ratio of synthetic detergent to soap remains substantially constant for the useful life of the bar.

An important feature of this modification is that it affords good protection for the more soluble and weaker synthetic insert by the less soluble and stronger fatty acid body of the bar and in this respect the stepped formation of the side walls of the insert is particularly important since it assures against the formation of thin feather edges of synthetic detergent as the bar is used up.

In producing the composite bar of Figures 5, 6 and 7 the body portion 24 of ultra-microcrystalline cold milled fatty acid soap is first formed. The insert 23 of solid synthetic detergent is then formed and pressed into the recess in the body 24, during which operation the stepped side and end walls of the insert and recess interengage and become solidly welded together due to the cold welding properties of the ultra-microcrystalline fatty acid soap comprising the body 24.

Though the bar of Figures 5, 6 and 7 is no doubt the best way to combine synthetic detergent with fatty acid soap, it is, of course, also possible with this invention to combine a slab or layer of the synthetic detergent with a slab or layer of ordinary fatty acid soap. Thus, as shown in

Figure 8, the bar may consist of a slab of synthetic detergent 25 and a slab or layer 26 of ordinary fatty acid soap held together by a bonding layer or sheet of ultra-microcrystalline soap 27.

In all forms of the invention illustrated and hereinbefore described the method of producing the composite bar involves mechanically reducing fatty acid soap to an ultra-refined state, i. e. to an ultra-microcrystalline degree of subdivision. This may be done in the manner described in the aforesaid copending application of Donald E. Marshall, Serial No. 129,942. The ultra-microcrystalline soap mass thus produced provides the material of which is produced those parts of the bar relied upon to provide the cold welding characteristics by which the several parts of the bar are held together. The remaining laminations or parts of the bar are formed of a detergent selected from the group consisting of fatty acid soap and a synthetic detergent which may be an organic sulfated or sulfonated anionic detergent, or a nonionic solid synthetic detergent.

If a floating bar is to be made the material from which certain of the laminations are formed is aerated. Thus, for instance, the ultra-microcrystalline soap body 24 of the composite bar shown in Figures 5, 6 and 7 may be aerated as explained in the said copending application.

It is also possible to add color or some other distinguishing characteristic to the material from which certain of the laminations or parts are formed, so that the various parts will be readily distinguishable from one another when joined together as well as prior thereto. Thus, for instance, the outer laminations of the bar shown in Figures 1 and 2 may be of one color while the synthetic inner layer is of another color.

With the material of which the various parts of the bar are to be made properly prepared, the individual laminations or parts of the bar are preformed therefrom using the conventional soap molding practice. The adjacent surfaces of the component parts are then moistened, correctly assembled and pressed together preferably in a soap mold. A permanent bond is thus formed between the adjacent surfaces solely by the cold welding properties of the mechanically reduced ultra-microcrystalline soap.

From the foregoing description taken in connection with the accompanying drawing and appended claims, it will be readily apparent to those skilled in this art that this invention makes possible a commercially practical composite bar wherein the component parts of the bar are permanently secured together despite the action of temperature, time and moisture encountered in storage and use and that it makes possible for the first time the utilization of the tremendous advantage possessed by a multi-part bar of soap or detergent in which the component parts are readily distinguishable from one another throughout the life of the bar or have different detergent actions, the sum total of which affords enhanced detergency.

This application is a continuation in part of the copending applications Serial Nos. 3,719 filed January 22, 1948, and 779,473 filed October 13, 1947, both now abandoned.

What I claim as my invention is:

1. A composite or multi-part bar of detergent comprising: a homogeneous solid body consisting essentially of unadulterated mechanically cold milled soap having an ultra-microcrystalline

structure and exceptional cold welding properties, said body being preshaped and having substantial mass; another preshaped homogeneous solid body of a detergent selected from a group consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents separate and at all times distinguishable from the first named body and also having substantial mass; said bodies having contiguous surfaces in intimate contact with one another and permanently bonded together by the cold welding properties of said ultra-microcrystalline cold milled soap, whereby said bodies will remain joined together despite the action of temperature, time and moisture encountered in storage and use.

2. A bar of detergent comprising separate and distinct solid bodies of more than one kind of detergent material selected from the group consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents bonded into normally inseparable adhesion to one another, each of said bodies being preshaped and having substantial mass, said bar being characterized by the fact that one of said detergent bodies consists essentially of ultrarefined unadulterated mechanically cold milled fatty acid soap having an ultra-microcrystalline structure and exceptional cold welding properties; and further characterized by the fact that each of the bodies of other kind of detergent material has a face in intimate contact with a face of said ultrarefined cold milled soap body and permanently bonded thereto by the cold welding properties of the ultrarefined soap whereby the surface adhesion between the detergent bodies resists the normal separating and cracking action of temperature, time and moisture encountered in storage and use.

3. A composite detergent bar comprising a plurality of distinct and separate laminations, one of said laminations comprising a body of solid material of the class consisting of fatty acid soap and organic sulfated and sulfonated water soluble anionic detergents, and the material defining at least one of the contacting faces at each junction of the laminae consisting essentially of unadulterated cold milled fatty acid soap which is characterized by an ultra-microcrystalline structure and exceptional cold welding properties, in intimate contact with the material of the adjacent lamina and permanently bonded thereto by the cold welding properties of said ultra-microcrystalline soap whereby the surface adhesion between the laminations resists the normal separating and cracking action of temperature, time and moisture encountered in storage and use.

4. A composite or multi-part bar of detergent comprising: a homogeneous solid body consisting essentially of aerated mechanically cold milled unadulterated soap having an ultra-microcrystalline structure and exceptional cold welding properties, said body being preshaped and having substantial size; another preshaped homogeneous solid body of a detergent selected from a group consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents separate and distinct from the first named body and also having substantial size; said bodies having contiguous surfaces in intimate contact with one another and permanently bonded together by the cold welding properties of said ultra-microcrystalline aerated cold milled soap, whereby said bodies will remain joined together despite the action of temperature, time and moisture encountered in storage and use.

5. In a composite detergent bar: a pair of adjacent laminations one of which consists essentially of a body of solid material selected from the class consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents; the other of said laminations consisting essentially of a body of solid material selected from the group consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents; and a bonding layer between the adjacent faces of said two laminations consisting essentially of cold milled unadulterated ultra-microcrystalline soap which is characterized by exceptional cold welding properties, permanently joining said two laminations solely by the cold welding properties of said ultra-microcrystalline soap.

6. A composite or multi-part bar of detergent, comprising: a homogeneous solid body consisting essentially of mechanically cold milled unadulterated ultra-microcrystalline soap having exceptional cold welding properties, said body being preshaped and having a cavity opening to one face thereof; a preshaped homogeneous solid body of synthetic detergent of the class consisting of fatty acid soap and organic sulfated and sulfonated anionic water soluble detergents, of a size and shape to fit the cavity in the first named body, the continguous surfaces of said bodies being in intimate contact with one another and permanently bonded together by the cold welding properties of said ultra-microcrystalline mechanically cold milled soap comprising the first named body, whereby said bodies will remain joined together despite the action of temperature, time and moisture encountered in storage and use and whereby the side walls of the cavity in the first named body afford protection for the second designated body which is received in the cavity.

7. A composite detergent bar, comprising: a body of mechanically cold milled unadulterated ultra-microcrystalline soap characterized by exceptional cold welding properties, said body having a recess in one face thereof extending a major portion of the distance through said body; a body of synthetic detergent of the class consisting of organic sulfated and sulfonated anionic water soluble detergents filling said recess and having an exposed surface substantially in the plane of said face of the first named body, said recess and said body of synthetic detergent having smaller cross sectional areas adjacent to their inner portions than adjacent to the exposed surface of said body of synthetic detergent so that the inner portions of said synthetic detergent are spaced farther from the edges of the bar than the portions of said synthetic detergent adjacent to its exposed surface, whereby all but the exposed surface of the synthetic detergent portion of the bar are protected by the ultra-microcrystalline soap portion of the bar as the bar is used up, said bodies having their contiguous surfaces in intimate contact with one another and permanently bonded together by the cold welding properties of the ultra-microcrystalline mechanically cold milled soap.

8. The composite detergent bar of claim 7 further characterized by the fact that the recess in the body of soap and the body of synthetic detergent filling the same have stepped side walls.

DONALD E. MARSHALL.

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