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(72) Inventeurs/Inventors:  
FARRELL, TERENCE JAMES, US;  
NICHOLSON, JOHN RICHARD, US;  
FRANCIS, KEITH, US

(73) Propriétaire/Owner:  
UNILEVER PLC, GB

(74) Agent: BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.

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(54) Title: MOLTEN MIX PROCESS FOR MAKING SYNTHETIC SOAP BAR COMPOSITION

(57) **Abrégé/Abstract:**

The invention provides a molten process for making compositions comprising anionic, surfactant soap and free fatty acid using a source of divalent cation sufficiently soluble to interact with soluble soaps. This allows greater amounts of soap to be used while retaining good finishing properties.



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(71) Applicant (for AE, AG, AU, BB, BZ, CA, CY, GB, GD, GH, GM, IE, IL, KE, LC, LK, LS, MN, MW, NZ, SD, SG, SL, SZ, TT, TZ, UG, ZA, ZW only): **UNILEVER PLC** [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB).

(71) Applicant (for AL, AM, AT, AZ, BA, BE, BF, BG, BJ, BR, BY, CF, CG, CH, CI, CM, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, FR, GA, GE, GN, GR, GW, HR, HU, ID, IS, IT, JP, KG, KP, KR, KZ, LR, LT, LU, LV, MA, MC, MD, MG, MK, ML, MR, MX, MZ, NE, NL, NO, PL, PT, RO, RU, SE, SI, SK, SN, TD, TG, TJ, TM, TR, UA, UZ, VN, YU only): **UNILEVER NV** [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).

(71) Applicant (for IN only): **HINDUSTAN LEVER LIMITED** [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Maharashtra, 400 020 Mumbai (IN).

(72) Inventors: **FARRELL, Terence, James**; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020

(US). **NICHOLSON, John, Richard**; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US). **FRANCIS, Keith**; Unilever Research U.S. Inc., 45 River Road, Edgewater, NJ 07020 (US).

(74) Agents: **ELLIOTT, Peter, William** et al.; Unilever PLC, Patent Department, Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB).

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(54) Title: MOLTEN MIX PROCESS FOR MAKING SYNTHETIC SOAP BAR COMPOSITION

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**WO 02/12430 A1**

## MOLTEN MIX PROCESS FOR MAKING SYNTHETIC SOAP BAR COMPOSITION

5 The present invention relates to a molten mix process for making bar compositions comprising synthetic anionic surfactant, fatty acid and a divalent cation. In particular, the process allows higher quantities of essentially water soluble soap (e.g., soap having solubility  
10 equal to or greater than 82/18 tallow coconut soap) to be used than previously thought possible while enhancing bar finishing properties.

Using a molten mix process, ingredients are mixed at  
15 temperatures above about 110°F before the molten composition is chilled, optionally refined and/or milled, plodded to extrudate (generally in form of extruded "logs") and cut and stamped into final bars. In these molten mix processes, higher soluble soap levels are associated with materials  
20 becoming soft and sticky and causing finishing problems, especially those related to bar stamping. The process of the invention comprises a modification of the process to avoid these finishing problems.

25 It is well known to make extruded bar compositions using synthetic anionics (e.g., acyl isethionates, alkyl glyceryl ether sulfates etc.) and fatty acid soap.

The soap in such compositions is generally known to serve a  
30 number of purposes. First, it serves to help structure the bars so it does not readily crumble both when the bar is

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being "finished" (e.g., extruded, stamped) and also as a final user bar. Fatty acid soap also provides some beneficial user properties such as good lather and a certain skin feel which may be desirable to some consumers. In addition, soap is generally cheaper than most anionics and provides some cost savings.

Despite the advantages noted above, however, the level of soap which can be used in the process for making these bars (e.g., molten process in which ingredients are mixed at a temperature above about 110°F) has generally been considered to have a cap because excessive levels lead to poor bar finishing properties (e.g. principally in that the bars are stickier and result in problems in bar extrusion and stamping when these stickier bars stick to the machinery). Thus, in a bar typically containing 30-75% anionic, preferably 35 to 60% anionic, levels of soap above 5% can lead to the above noted finishing problems.

Without wishing to be bound by theory, at least part of this problem is believed to be due to the fact that increasing soap levels generates soap solutions and/or isotropic liquid crystal phases with unbound water within the synthetic detergent (syndet) bar formulation. The presence of such phases have the potential to hinder the finishing stages of production, which includes extrusion and stamping, by rendering the material soft and sticky.

Unexpectedly, applicants have found that if a source of divalent cation is provided such that the divalent cation is made available to the mix solution (e.g., to be made

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available, the source component must have solubility equal to or greater than that of calcium carbonate); and sufficient divalent cation is made available to react with the soluble soap dissolved in the unbound water, the degree of softness and stickiness during final bar production can be lessened or alleviated.

U.S. Patent No. 5,981,451 to Farrell et al. relates to a process for making bars containing a mixture of anionic surfactant and soap, but there the process is a non-molten process and stickiness issues of finishing a bar are primarily encountered when using a molten mix process.

U.S. Patent No. 4,557,853 to Collins relates to bars containing alkaline earth metal carbonates as skin feel agents. Given the low water solubility of these carbonates, it is believed that the level used (2.4 to 5.9% earth metal carbonate as defined by the surfactant to earth metal carbonate ratio) is too low to provide a sufficient amount of divalent ion to control the level of soluble soap in solution. That is, the patent fails to recognize the link between providing available divalent cation which can insolubilize the soap at a certain point in the process and thereby reduce stickiness during the finishing stages of bar processing. It should also be noted that the finishing process is considerably less likely to suffer from soft, sticky material issues when soap is the predominant constituent of the formulation.

WO 95/13356 to Procter & Gamble relates to an acyl isethionate bar containing liquid polyols and magnesium

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soap. Bars made by the process of the subject invention do not require liquid polyols of this reference. . (However unnecessary the use of liquid polyols in subject invention, it should be noted that the inventors of the subject invention do not wish to exclude possibility of using liquid polyols in formulations). Moreover, the patent does not recognize the need for providing available/excess divalent cations (e.g., to aid as scavengers for otherwise soluble soap during molten mixing where, if not removed, they are believed to be the cause of down stream "finishing" problems) and, on the contrary, requires the initially used magnesium soap to stay bound and to act as a filler process aid.

More particularly, the subject invention comprises a process for making a bar comprising:

- (1) 20% to 75%, preferably 35% to 60% by wt. of an anionic surfactant, preferably an alkali metal salt such as alkyl isethionate;
- (2) 4% to 20%, more preferably 6% to 12% of a fatty acid soap or soap fraction having a solubility equal to or greater than 82/18 tallow/coconut soap (i.e., a solubility of 1.1 g/l in water at 40°C);
- (3) 4% to 30%, preferably 10% to 25% free fatty acid; and
- (4) a compound or compounds which is a source of divalent cation;

wherein the process comprises mixing components (1), (2) and (3) and a compound or compounds which is a source of

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divalent cation (4) used in an amount sufficient that, when the divalent source compound is solubilized, it provides sufficient available cation to interact with soluble soap and thereby increase throughput 10% to 200% (assuming other  
5 variables are exactly the same or substantially similar), said throughput being defined by a greater extrusion rate and or greater number of bars stamped per minute.

The solubility of the divalent cation source may affect the  
10 amount of the compound used in the process. Thus, it should be understood, for example, that more calcium carbonate may be needed because the solubility of calcium carbonate is low while, for a more soluble salt such as magnesium or calcium chloride, much greater amounts may be required.

15

Figure 1 is a graph of differential scanning calorimetry coding curves. The critical point of this graph is the peak represented at about 0°C in the cooling cycle for Formulations 1 (solid line formulation without calcium  
20 carbonate) and 2 (dashed formulation with calcium carbonate).

Specifically, when calcium carbonate was added (dashed line), there is no transition, presumably because ions bind  
25 to soluble soap. Since there is less soluble soap, this leads to enhanced properties downstream.

The present invention is directed to a process for making bars comprising synthetic anionic surfactant in combination  
30 with greater amounts of fatty acid soap (e.g., soluble fatty acid soap) than previously believed possible without

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affecting the stickiness of bars and the bar finishing properties (e.g., extrudability, stampability). More specifically, the invention is directed to the unexpected discovery that addition of a sufficient amount of a compound(s) providing a source of divalent cation to insolubilize the greater amounts of soluble soap found when such greater amounts of soap are used in a molten mix process will, in turn, permit the use of bars having these greater amounts of soaps while avoiding problems associated with the higher level of soap. Since soap is generally cheaper than most anionics, use of greater amounts of soap also provides for more economic bars.

In particular, the invention is concerned with a process for making bars made by a molten mixing extrusion process. Specifically, components are mixed at molten temperature (>110°F), cooled (for example, on a chip cooler), optionally refined and/or milled, cut and stamped. By providing a source of divalent cations, it is believed the cations are able to precipitate soluble soaps (thereby reducing the total amount of soluble soap as a percent of the total soap such that there is less soluble soap which results in higher stampability). This in turn is believed to eliminate/decrease phases created by the soluble soaps which otherwise would lead to the formation of a sticky composition. As a result of reduced stickiness, the bar will extrude and stamp better (improved "finishing" properties) and have superior final bar user properties.

Each of the components of the bars are set forth in greater detail below.

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Anionic

A first required component of the bar compositions of the invention is that they must have at least one anionic surfactant.

Suitable anionic surfactants include aliphatic sulfonates, such as a primary alkane (e.g., C<sub>8</sub>-C<sub>22</sub>) sulfonates, primary alkane (e.g., C<sub>8</sub>-C<sub>22</sub>) disulfonates, C<sub>8</sub>-C<sub>22</sub> alkene sulfonates, C<sub>8</sub>-C<sub>22</sub> hydroxyalkane sulfonates or alkyl glyceryl ether sulfonates (AGS); or aromatic sulfonates such as alkyl benzene sulfonate.

The anionic may also be an alkyl sulfate (e.g., C<sub>12</sub>-C<sub>18</sub> alkyl sulfate) or alkyl ether sulfate (including alkyl glyceryl ether sulfates). Among the alkyl ether sulfates are those having the formula:

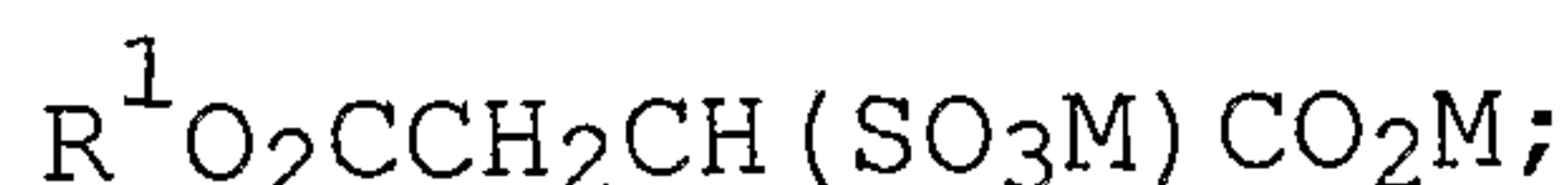


wherein R is an alkyl or alkenyl having 8 to 18 carbons, preferably 12 to 18 carbons, n has an average value of greater than 1.0, preferably greater than 3; and M is a solubilizing cation such as sodium, potassium, ammonium or substituted ammonium. Ammonium and sodium lauryl ether sulfates are preferred.

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The anionic may also be alkyl sulfosuccinates (including mono and dialkyl, e.g., C<sub>6</sub>-C<sub>22</sub> sulfosuccinates); alkyl and acyl taurates, alkyl and acyl sarcosinates, sulfoacetates, C<sub>8</sub>-C<sub>22</sub> alkyl phosphates and phosphates, alkyl phosphate  
5 esters and alkoxyl alkyl phosphate esters, acyl lactates, C<sub>8</sub>-C<sub>22</sub> monoalkyl succinates and maleates, sulphoacetates, alkyl glucosides and acyl isethionates.

Sulfosuccinates may be monoalkyl sulfosuccinates having the  
10 formula:



and amide-MEA sulfosuccinates of the formula:

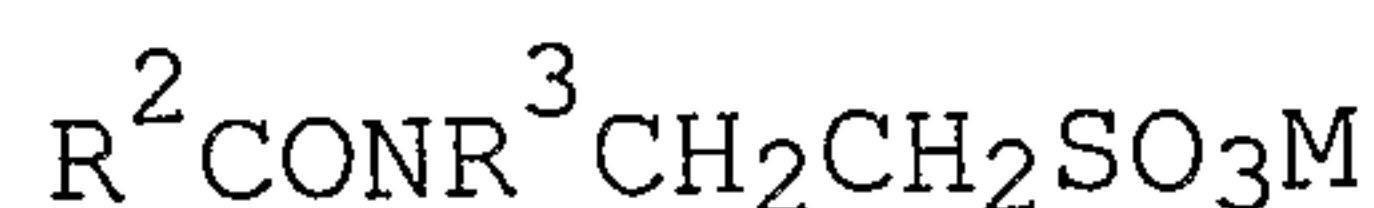
15



wherein R<sup>1</sup> ranges from C<sub>8</sub>-C<sub>22</sub> alkyl and M is a solubilizing cation.

20

Taurates are generally identified by the formula:



25 wherein R<sup>2</sup> ranges from C<sub>8</sub>-C<sub>20</sub> alkyl, R<sup>3</sup> ranges from C<sub>1</sub>-C<sub>4</sub> alkyl and M is a solubilizing cation.

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A preferred anionic is acyl isethionate, e.g., C<sub>8</sub> to C<sub>18</sub> acyl isethionate. These esters are generally prepared by reaction between alkali metal isethionate with mixed aliphatic fatty acids having from 6 to 18 carbon atoms and an iodine value of less than 20. Generally at least 75% of the mixed fatty acids have 12 to 18 carbons and up to 25% have from 6 to 10 carbons. The isethionate may also be an alkoxyated isethionate as described in U.S. Patent No. 5,393,466 to Ilardi et al.

10

Of course, mixtures of one or more anionics may be used.

Generally, the anionic(s) will comprise 20-75%, preferably 35-60% by wt. of the bar composition.

15

#### Fatty Acid Soap

A second required component of the invention is the use of certain soluble "soap". As previously noted, the use of levels of soap above 5% by wt., particularly levels beyond 10% has been previously discouraged, particularly in systems comprising, for example, acyl isethionate, free fatty acid and alkali metal isethionate (see for example, U.S. Patent No. 4,954,282 to Rys et al. and particularly, column 4, lines 10-13). This is not only because soap is generally harsher than other anionics, but also because syndets, such as those based on acyl isethionates, can become soft and sticky in the presence, for example, of >4% by wt. soluble soap thereby causing process problems at later steps when bars are extruded and stamped (e.g., sticking to dies).

25

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- 10 -

In the subject invention, soaps may comprise 4% to 20%, preferably 6% to 12% by wt. of the final bar composition.

- 5 By soluble soap is meant a soap or soap fraction having a solubility equal to or greater than 82/18 tallow/coconut soap. The solubility of 82/18 tallow/coconut may be defined in turn as a solubility of 1.1 g/l in water at 40°C.
- 10 82/18 soap generally refers to a mixture of about 15% to about 20% coconut oil and about 80% to about 85% tallow. These mixtures contain about 95% fatty acids having from about 12 to about 18 carbon atoms. The soap may be prepared from coconut oil, in which case the fatty acid content
- 15 comprises about 85% fatty acid of C<sub>12</sub>-C<sub>18</sub> chain length.

In addition to specific "soluble" soaps, additional soaps which may not be as soluble may be used.

- 20 The term "soap" is used in its popular sense, i.e., the alkali metal or alkanol ammonium salts of aliphatic alkane- or alkene monocarboxylic acids. Sodium, potassium, mono-, di- and tri-ethanol ammonium cations, or combinations thereof, are suitable for the purposes of the present
- 25 invention. In general, sodium soaps are used in the compositions of the invention. However, from about 1% to about 25% of the soap may be potassium soaps. The soaps useful herein are the well known alkali metal salts of natural or synthetic aliphatic (alkanoic or alkenoic) acids
- 30 having from about 12 to 22 carbon atoms, preferably from about 12 to about 18 carbon atoms. They may be described as

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alkali metal carboxylates of acrylic hydrocarbons having about from 12 to about 22 carbon atoms.

The soaps may contain unsaturation in accordance with  
5 commercially acceptable standards. Excessive saturation is normally avoided.

Soaps may be made by the classic kettle boiling process or modern continuous soap manufacturing processes wherein  
10 natural fats and oils such as tallow or coconut oil, or their equivalents, are saponified with an alkali metal hydroxide using procedures well known to those skilled in the art. Alternatively, the soaps may be made by neutralizing fatty acids, such as lauric (C<sub>12</sub>), myristic  
15 (C<sub>14</sub>), palmitic (C<sub>16</sub>), or stearic (C<sub>18</sub>) acids with an alkali metal hydroxide or carbonate.

#### Free Fatty Acid

20 Another required component of the invention are C<sub>8</sub> to C<sub>22</sub> carbon free fatty acids. These may function in part as superfatting agents and/or as skin feel and creaminess enhancers. Superfatting agents may be C<sub>10</sub>-C<sub>18</sub>, preferably C<sub>10</sub>-C<sub>16</sub> fatty acids. A preferred skin feel and creaminess  
25 enhancer is stearic acid. These fatty acids may comprise 4-30%, preferably 10-25% by wt. of the bar composition.

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Divalent Cation Source Compounds

Another required component of the subject invention is a compound or compounds which act as a source of divalent cation. While the compound may be any compound which is a salt having such a divalent counterion (e.g., calcium<sup>2+</sup> or magnesium<sup>2+</sup>), the solubility of the salt is also critical since a sufficient amount of the divalent cation must be made available (i.e., the compound must be sufficiently soluble) and it must be available in sufficient quantity so that there is enhanced throughput or extrusion (e.g., measured at pounds extruded per minute) and/or enhanced stamping (e.g., in bars stamped per minute).

Thus, for example, if the compound is calcium carbonate, since this is far less soluble than calcium chloride, the composition may require 10 or 12%, or more calcium carbonate to provide sufficient available cation to ensure that the soluble soap component is precipitated. On the other hand, less calcium or magnesium chloride would be required to ensure the same result.

The critical point therefore, as noted above, is that sufficient cation is made available to ensure that most of the soluble soap is bound to the cations so it becomes insoluble.

Looking at Figure 1, it can be seen that addition of sufficient cation eliminates/decreases the phase transition at about 0°C so that it becomes essentially flat (see left

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side of Figure 1, where the absence of a transition is shown by a dashed line).

Although this may not appear significant, what this  
5 accomplishes is to substantially reduce the stickiness of the bar downstream so that, when the compositions are cooled, extruded, cut and stamped, at the extrusion and stamping phase far less residue gets stuck to the machinery. This in turn leads to an enhanced extrusion rate (as  
10 measured for example by pounds extruded per minute and/or bars stamped per minute).

Examples of compounds which may be used as a source of divalent cation include slightly less soluble salts such as  
15 calcium or magnesium carbonate, or more soluble salts such as calcium or magnesium chloride. Preferably, the compound should have a solubility at least equal to that of calcium carbonate (at 18°C, solubility of 0.0013 g/100 grams water as defined by Kirk-Othmer Chemical Engineering Encyclopedia).  
20 Other divalent cations which may be used include group IIA metals (besides calcium or magnesium) such as beryllium, strontium or barium.

As noted, the amount of compounds used will vary depending  
25 on the solubility of the compound, but, ultimately must be used in an amount sufficient so that enhanced stamping (relative to total starting soap) is obtained after the cations have had a chance to bind. This in turn may be measured by an improvement in the extrusion (measured for  
30 example in pounds extruded per minute or number of bars stamped per minute). Ideally, an increase in extrusion or

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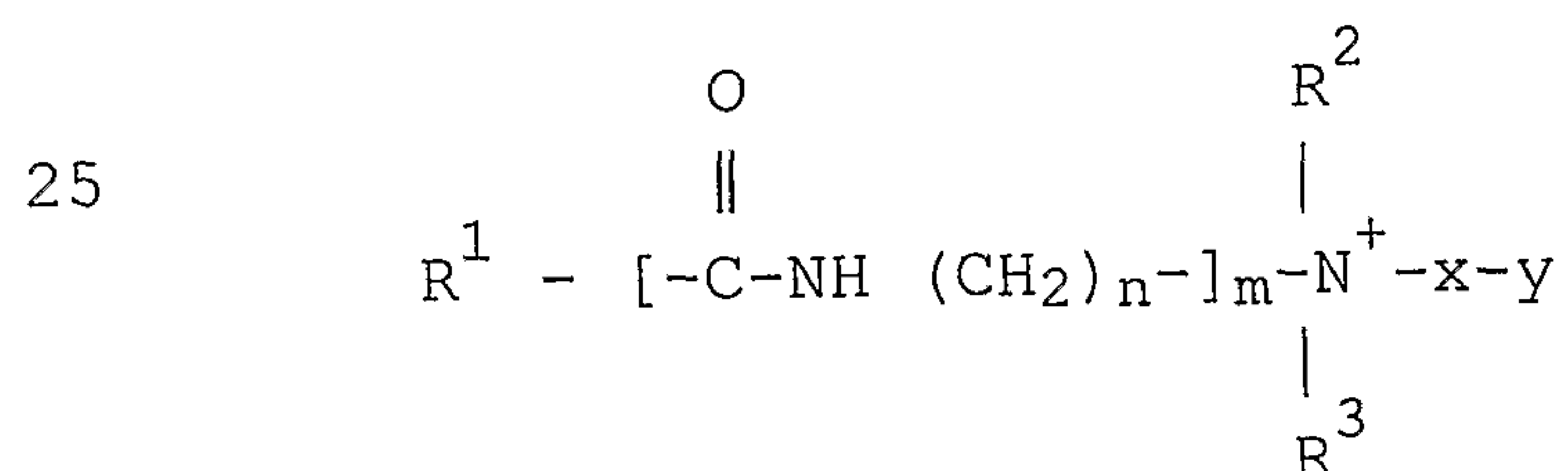
bar rate should be 10% or greater (e.g., 10-200%, preferably 10. to 100%), preferably 15% to 150%, more preferably 20% to 125%. It should be understood that percent improvement is intended to be based on otherwise exact or similar process conditions (e.g., screw speeds, barrel temperatures and other parameters that would be understood by those skilled in the art as being same or substantially the same) so that improvement is based on addition of cation alone.

## 10 Optionals

In addition to the ingredients noted above the bar compositions may include other surfactants selected from nonionic, amphoteric, cationic etc.

15

Amphoteric detergents which may be used in this invention include at least one acid group. This may be a carboxylic or a sulphonic acid group. They include quaternary nitrogen and therefore are quaternary amido acids. They should generally include an alkyl or alkenyl group having about 7 to 18 carbon atoms usually comply with an overall structural formula:



30

wherein  $\text{R}^1$  is an alkyl or alkenyl group with 7 to 18 carbon atoms;

- 15 -

$R^2$  and  $R^3$  are each independently alkyl, hydroxyalkyl or carboxyalkyl groups with 1 to 3 carbon atoms;

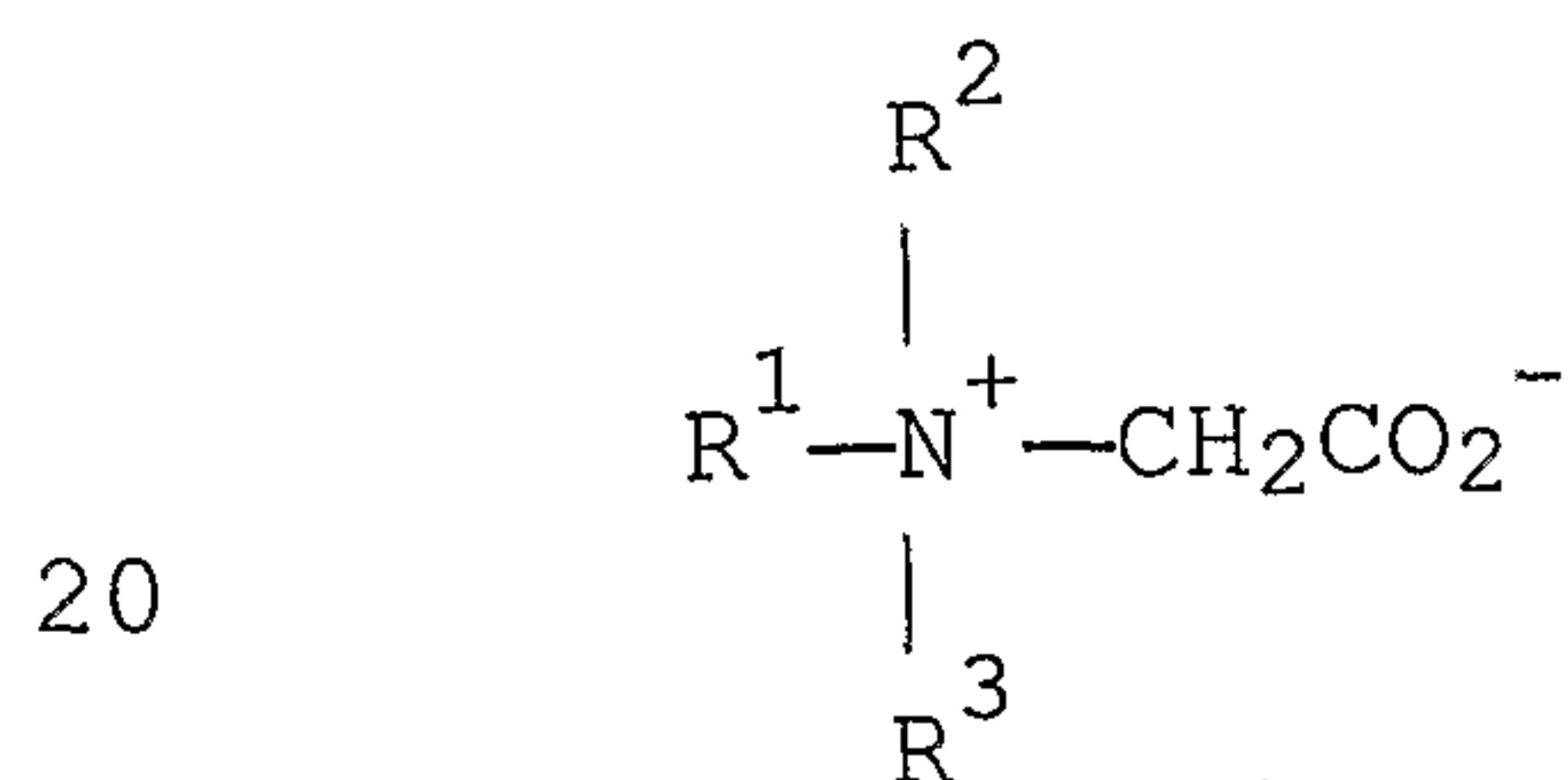
5 n is 2 to 4;

m is 0 to 1;

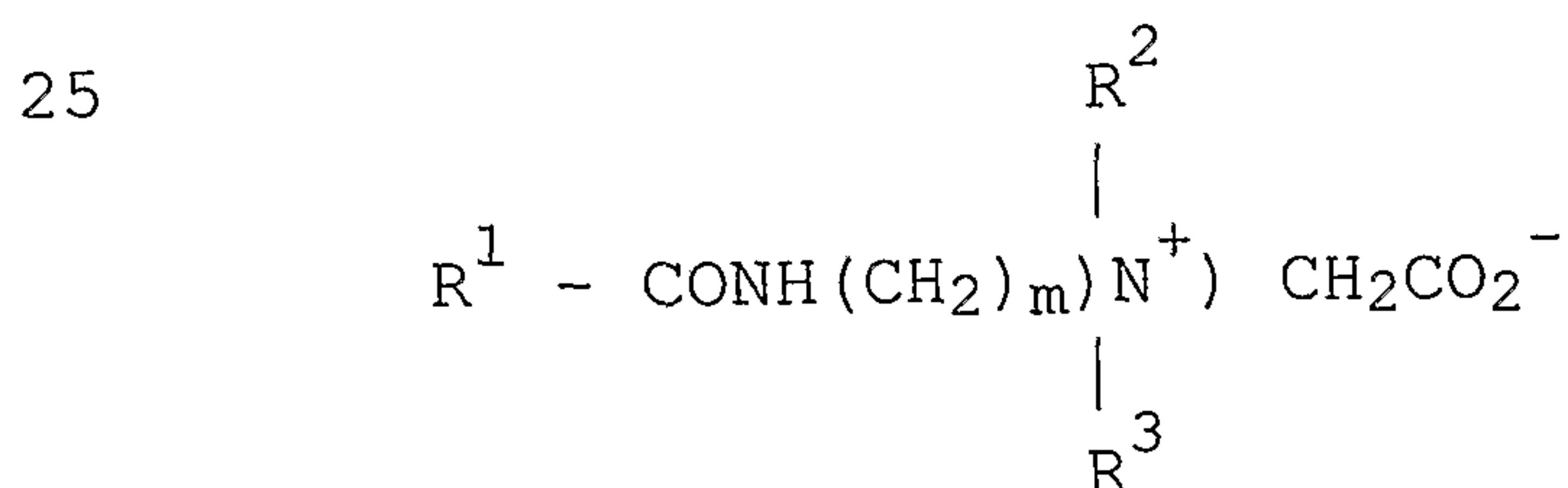
x is an alkylene group with 1 to 3 carbon atoms optionally  
10 substituted with hydroxyl, and

y is  $-\text{CO}_2-$  or  $-\text{SO}_3-$

Suitable amphoteric detergents within the above general  
15 formula include simple betaines of formula:



and amido betaines of formula:



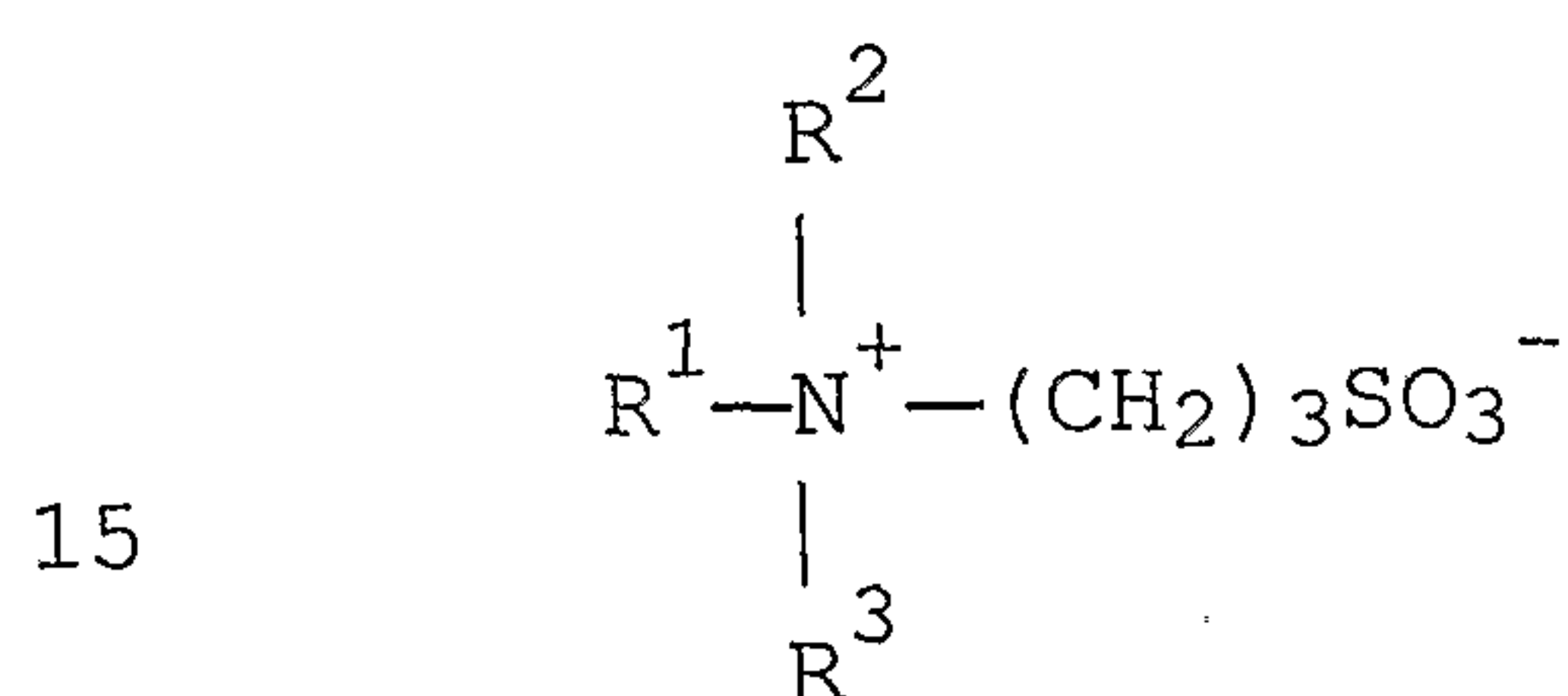
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where m is 2 or 3.

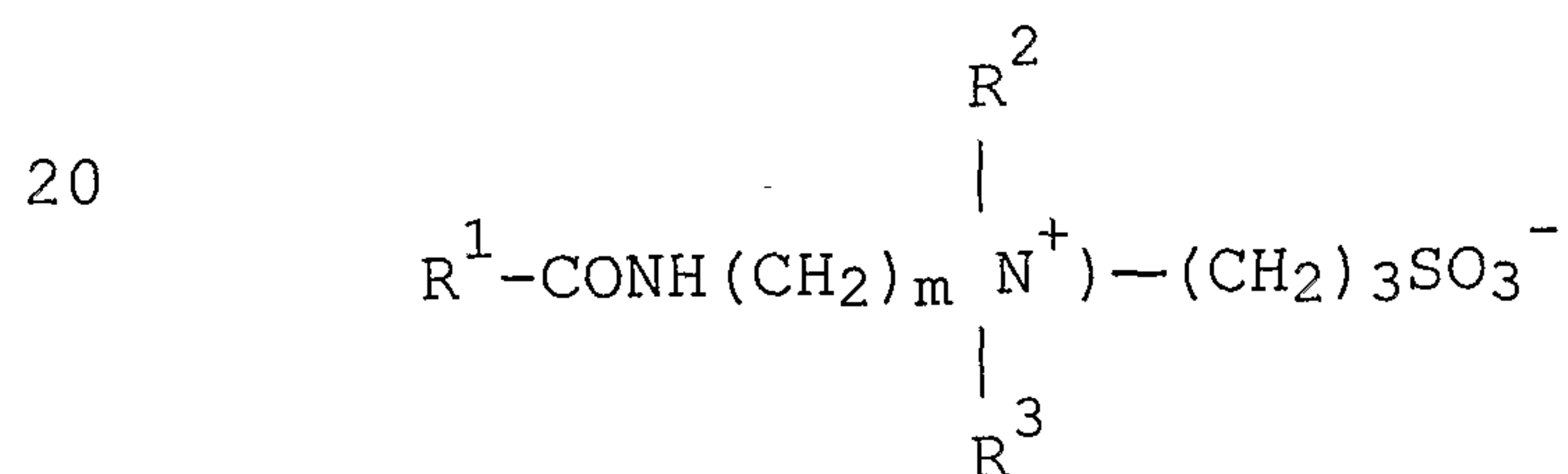
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In both formulae  $R^1$  is an alkyl or alkenyl group with 7 to 18 carbons; and  $R^2$  and  $R^3$  are independently alkyl, hydroxyalkyl or carboxy alkyl groups with 1 to 3 carbons.  $R^1$  may, in particular, be a mixture of  $C_{12}$  and  $C_{14}$  alkyl groups derived from coconut so that at least half, preferably at least three quarters of the groups  $R^1$  have 10 to 14 carbon atoms.  $R^2$  and  $R^3$  are preferably methyl.

A further possibility is that the amphoteric detergent is a sulphobetaine of formula

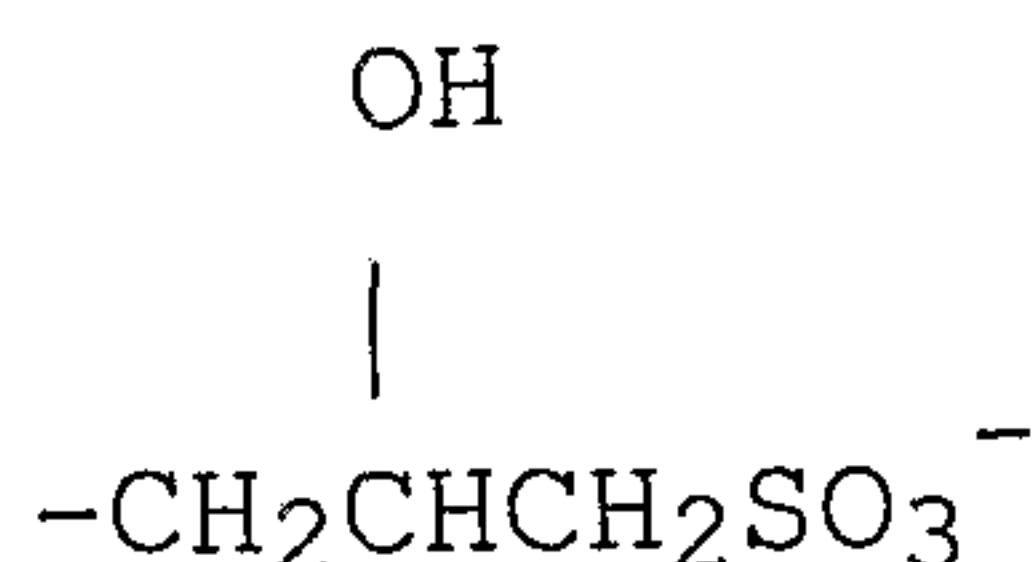


or



where  $m$  is 2 or 3, or variants of these in which  $-(CH_2)_3 SO_3^-$  is replaced by

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5 In these formulae  $R^1$ ,  $R^2$  and  $R^3$  are as discussed for the amido betaine.

The amphoteric surfactant generally comprises 1% to 10% by wt. of the bar composition.

10

Other surfactants (i.e., nonionics, cationics) may also be optionally used although these generally would not comprise more than 0.01 to 10% by wt. of the bar composition.

15 Nonionic surfactants include, in particular, the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example, aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide, either alone or with propylene  
 20 oxide. Specific nonionic detergent compounds are alkyl ( $C_6$ - $C_{22}$ ) phenols-ethylene oxide condensates, the condensation products of aliphatic ( $C_8$ - $C_{18}$ ) primary or secondary, linear or branched alcohols with ethylene oxide, and products prepared by condensation of ethylene oxide with the reaction  
 25 products of propylene oxide and ethylenediamine. Other so-called nonionic detergent compounds include long chain tertiary amine oxides, long chain tertiary phosphine oxides and dialkyl sulphoxides.

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The nonionic may also be a sugar amide, such as a polysaccharide amide. Specifically, the surfactant may be one of the lactobionamides described in U.S. Patent No. 5,389,279 to Au et al. and polyhydroxyamides such as those described in U.S. Patent No. 5,312,954 to Letton et al.

Examples of cationic detergents are the quaternary ammonium compounds, such as alkyldimethylammonium halogenides.

Other surfactants which may be used are described in U.S. Patent No. 3,723,325 to Parran Jr. and "Surface Active Agents and Detergents" (Volume I & II) by Schwartz, Perry & Berch.

Skin mildness improvers also preferably used in the compositions of the present invention include isethionate salts. Effective salts cations may be selected from alkali metal, alkaline earth metal, ammonium, alkyl ammonium and mono-, di- or tri-alkanol ammonium ions. Specifically preferred cations include sodium, potassium, lithium, calcium, magnesium, ammonium, triethyl ammonium, monoethanolammonium, diethanolammonium or triethanolammonium ions.

Particularly preferred as a mildness improver is simple, unsubstituted sodium isethionate.

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The skin mildness improver will be present in amounts from about 0.5% to about 50% by wt. of the composition. Preferably, the mildness improver is present in amounts from about 1% to about 25%, more preferably from about 2% to about 15%, optimally from 3% to 10% by weight of the total composition.

Other performance chemicals and adjuncts may also be incorporated into the compositions of the present invention. The amount of these chemicals and adjuncts may range from about 1% to about 40% by weight of the total composition. For instance, from 2 to 10% of a suds-boosting detergent salt may be incorporated. Illustrative of this type of additive are salts selected from alkali metal and organic amine higher aliphatic fatty alcohol sulfates, alkyl aryl sulfonates, and the higher aliphatic fatty acid taurinates.

Adjunct materials including germicides, perfumes, colorants, pigments such as titanium dioxide and water may also be present.

The bars may also comprise oil soluble benefit agents (e.g., silicone, petrolatum etc.) or water soluble benefit agents (e.g., alpha hydroxy acids) as are well known to those skilled in the art (see for example, the broad list of benefit agents disclosed at column 8, lines 14-17 of U.S. Patent No. 6,066,613 to Tsaur et al.

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Processing

Through several processes all the ingredients, except the  
perfume, are combined in a mixer suitable for mixing viscous  
5 materials. The process is run at a temperature which insures  
homogeneity of the batch, typically between 180° - 240°  
Fahrenheit. When the target moisture has been achieved, the  
product is removed from the mixer and cooled, forming either  
chips or noodles. The cooled material is then combined with  
10 perfume and tumbled to ensure an even distribution of perfume  
throughout the product. The perfumed material is then  
transported to a hopper which feeds a refiner, which in turn  
feeds a plodder. The billet which exits the plodder is then  
cut, stamped into a bar and packaged.

15

The only criticality within the process is that the divalent  
ion be present during the molten mixing stage in order to  
react with the soluble soap.

20 Except in the operating and comparative examples, or where  
otherwise explicitly indicated, all numbers in this  
description indicating amounts or ratios of materials or  
conditions or reaction, physical properties of materials  
and/or use are to be understood as modified by the word  
25 "about".

Where used in the specification, the term "comprising" is  
intended to include the presence of stated features,  
integers, steps, components, but not to preclude the  
30 presence or addition of one or more features, integers,  
steps, components or groups thereof.

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The following examples are intended to further illustrate the invention and are not intended to limit the invention in any way.

- 5 Unless indicated otherwise, all percentages are intended to be percentages by weight.

### EXAMPLES

- 10 Applicants prepared the following 4 formulations by the process described above.

Table 1

| <u>Formulation</u>      |  |               |             |             |             |
|-------------------------|--|---------------|-------------|-------------|-------------|
|                         |  | #1            | #2          | #3          | #4          |
|                         |  | (Comparative) |             |             |             |
| Sodium Cocoyl           |  | 40.00         | 40.00       | 40.00       | 40.00       |
| Isethionate             |  |               |             |             |             |
| Stearic/Palmitic Acid   |  | 23.00         | 23.00       | 23.00       | 23.00       |
| Sodium Isethionate      |  | 3.00          | 3.00        | 3.00        | 3.00        |
| Zwitterionic Surfactant |  | 1.50          | 1.50        | 1.50        | 1.50        |
| Na Stearate             |  | 4.00          | 4.00        | 4.00        | 4.00        |
| 82/18 Tallow/Coconut    |  | 8.00          | 8.00        | 8.00        | 8.00        |
| Soap                    |  |               |             |             |             |
| Talc                    |  | 8.00          | 0.00        | 8.00        | 8.00        |
| Ca Carbonate            |  | 0.00          | 8.00        | 0.00        | 0.00        |
| TiO <sub>2</sub>        |  | 0.35          | 0.35        | 0.35        | 0.35        |
| Calcium Chloride        |  | 0.00          | 0.00        | 0.80        | 0.00        |
| Magnesium Chloride      |  | 0.00          | 0.00        | 0.00        | 0.80        |
| Sodium Chloride         |  | 0.80          | 0.80        | 0.00        | 0.00        |
| Coconut fatty acid      |  | 3.50          | 3.50        | 3.50        | 3.50        |
| Water                   |  | 6.00          | 6.00        | 6.00        | 6.00        |
| Misc.                   |  | qs. to 100%   | qs. to 100% | qs. to 100% | qs. to 100% |

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Example 1

In order to demonstrate the advantages of the invention, applicants first compared Formulation 1, Table 1 (Comparative) to Formulation 2, Table 1. Each formulation  
5 was extruded and the rate of extrusion was measured by weighing the billets exiting the plodder over a given period of time. Several measurements were taken and the averages were as follows:

|    |                                                        |                    |
|----|--------------------------------------------------------|--------------------|
| 10 | Formulation with talc, rate of extrusion:              | 4.7 lb. per minute |
|    | Formulation with calcium carbonate, rate of extrusion: | 5.7 lb. per minute |

15 Thus, by incorporating calcium carbonate into the formulation the rate of extrusion increased by 20%.

Example 2

Applicants also compared Formulation 1, Table 1 (Comparative)  
20 to Formulation 2, Table 1, under a different set of conditions to those described in Example 1. The formulations were compared based on the maximum, sustainable rate of bars which could be stamped per minute, under a given set of conditions, on a Binacchi commercial stamper. Formulation 1  
25 could be sustained at 350 bpm (bars per minute). Formulation 2 could be sustained at 420 bpm. Thus, by incorporating calcium carbonate into the formulation the stamping rate has increased by over 20%.

30 The examples clearly show the advantages of using divalent compounds during molten mixing.

**CLAIMS**

1. A molten mix process for making bars comprising:
- (1) 20% to 75% by wt. of an anionic surfactant;
  - 5 (2) 4% to 20% by wt. of a fatty acid soap or soap fraction having solubility equal to or greater than 82/18 tallow/coconut soap;
  - (3) 4% to 30% by wt. of free fatty acid; and
  - 10 (4) compound or compounds which is a source of divalent cation

wherein the process comprises mixing (1), (2) and (3) and the compound or compounds which is the source of divalent cation (4) used in an amount sufficient that, when the divalent source compound is solubilized, it provides sufficient available cation to interact with soluble soap and thereby increase throughput 10-200% compared with a process in which the compound or compounds which is a source of divalent cation (4) is not used, said throughput being defined by extrusion rate and/or number of bars stamped per minute.

2. A process according to claim 1, wherein the anionic surfactant comprises 35-60% by wt. of the composition.

3. A process according to claim 1 or claim 2, wherein the anionic surfactant is acyl isethionate.

4. A process according to any one of claims 1 to 3, wherein the fatty acid soap comprises 6 to 12% by wt. of the composition.

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5. A process according to any one of claims 1 to 4, wherein the solubility of tallow/coconut is 1.1 grams/liter in water at 40°C.

5 6. A process according to any one of claims 1 to 5, wherein the divalent cation is a group IIA metal selected from magnesium, calcium, beryllium, strontium, barium and mixtures thereof.

10

Figure 1  
Differential Scanning Calorimetry Cooling Curves

