

FORM 1

SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

596187

APPLICATION FOR A STANDARD PATENT

APPLICATION ACCEPTED AND AMENDMENTS
ALLOWED 12-2-86

Helene Curtis, Inc., incorporated in Illinois, of 325 North Wells Street, Chicago, Illinois, 60610, UNITED STATES OF AMERICA, hereby apply for the grant of a standard patent for an invention entitled:

MILD DETERGENT COMPOSITIONS

which is described in the accompanying complete specification.

Details of basic application(s):-

Basic Applic. No: Country:

Application Date:

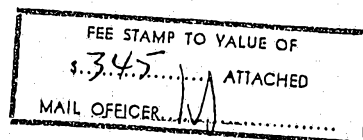
874554
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UNITED STATES OF AMERICA
UNITED STATES OF AMERICA

16 June 1986
12 May 1987

The address for service is:-

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DATED this THIRD day of JUNE 1987

Helene Curtis, Inc.

By:

H. J. Anderson

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 27009
S&F CODE: 58010



(CONVENTION—Company)

FORM 8—REGULATION 12 (2)

COMMONWEALTH OF AUSTRALIA

PATENTS ACT, 1952-1973

DECLARATION IN SUPPORT OF A CONVENTION
APPLICATION FOR A PATENT

In support of the Convention Application No. _____ made
by (a) HELENE CURTIS, INC.

(a) Here Insert (in full)
Name of Company.

(hereinafter referred to as "Applicant") for a patent for an invention entitled:

(b) Here Insert Title of
Invention.

(b) MILD DETERGENT COMPOSITIONS

(c) and (d) Here insert
Full Name and
Address of Company
Official authorised to
make declaration.

I, (c) ROY A. WENTZ

care of (d) Helene Curtis, Inc. 325 North Wells Street
Chicago, Illinois, 60610, United States of America

do solemnly and sincerely declare as follows:

1. I am authorised by Applicant to make this declaration on its behalf.

2. The basic Application(s) as defined by section 141 of the Act was/were
made in (e) U.S.A. on the 16th day of June 1986
and U.S.A. on the 12th day of May 1987
both by (f) Donna M. LaPetina and Chaitanya Patel

(e) Here Insert Basic
Country or Countries
followed by date or
dates of Basic
Application(s).

(f) Here insert Full
Name(s) of Applicant(s)
in Basic Country.

(g) Here insert (in full)
Name and Address of
actual inventor or
inventors.

3. (g) Donna M. LaPetina and Chaitanya Patel

of 2 S 030 Bristol Ln. Warrenville, IL 60555 U.S.A. and
1118-1A Prescott, Roselle, IL 60172 U.S.A., respectively is/are
the actual Inventor(s) of the invention and the facts upon which Applicant is entitled
to make the Application are as follows:

Applicant is the Assignee of the said Inventor(s).

4. The basic Application(s) referred to in paragraph 2 of this Declaration
was/were the first Application(s) made in a Convention country in respect of the
inventions the subject of the Application.

DECLARED at Chicago, Illinois, United States of America

this 5th day of June 1987

HELENE CURTIS, INC

(h) Personal Signature
of Declarant (c) (no
seal, witness or
legalisation).

(12) PATENT ABRIDGMENT (11) Document No. AU-B-73770/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 596187

(54) Title
MILD DETERGENT COMPOSITION CONTAINING ANIONIC AND AMPHOTERIC SURFACTANTS

International Patent Classification(s)
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C11D 001/92

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HELENE CURTIS, INC.

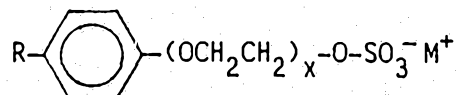
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(74) Attorney or Agent
SPRUSON & FERGUSON

(56) Prior Art Documents
AU 525729 45435/79 C11D
AU 290571 46098/64 C11D A61K

(57) Claim

1. A mild detergent composition comprising:
2% to 10% by weight, based on the total weight of the composition, of
a water soluble anionic surfactant of the formula



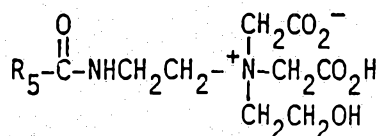
wherein R is an alkyl group containing 6 to 15 carbon atoms, x is an integer from 1 to 10, and M is a member of the groups consisting of alkali metals, ammonium, mono-, di- or tri-alkanolammonium, and an alkylammonium containing 1 to 3 alkyl groups, each having 1 or 2 carbon atoms;

3% to 10% by weight, based on the total weight of the composition of
an amphoteric, water soluble, carboxylated derivative of a fatty
imidazoline selected from amphoteric detergents of the formula:

(1)

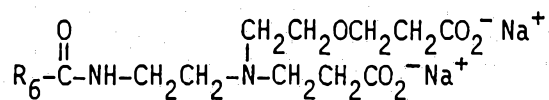
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wherein R_5 is an alkyl group containing 7 to 17 carbon atoms;

(ii)



wherein R_6 is an alkyl group containing 7 to 17 carbon atoms; or

(iii) a mixture of (i) and (ii); and

1% to 6% by weight, based on the total weight of the composition, of a water soluble betaine-type detergent selected from a betaine, an alkamidopropyl betaine, a sulfobetaine, an alkamidopropyl hydroxysultaine and combinations thereof in a suitable liquid carrier.

FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

59 6 18 7

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:

Accepted:

Published:

Priority:

Related Art:

This document contains the
amendments made under
Section 49 and is correct for
printing.

Name and Address
of Applicant:

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Complete Specification for the invention entitled:

MILD DETERGENT COMPOSITIONS

The following statement is a full description of this invention, including the
best method of performing it known to me/us

MILD DETERGENT COMPOSITIONS

Abstract of the Disclosure

10 A mild detergent composition, including a carboxylated derivative of a fatty imidazoline and a zwitterionic betaine or sultaine together with a sulfated alkylphenol ethoxylate, unexpectedly provides the unusually low skin and eye irritation levels associated with baby shampoos while exhibiting the cleansing, foaming and aesthetic properties associated with conventional shampoos.

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MILD DETERGENT COMPOSITIONS

CROSS REFERENCE TO A RELATED APPLICATION

This application is a continuation-in-part
of copending application Serial No. 874,554 filed June
16, 1986.

Field of the Invention

The present invention relates to very mild
and non-irritating detergent and shampoo compositions
having a minimal tendency to sting the eyes. More
particularly, the present invention is directed to
hair shampoo compositions possessing low ocular and
dermal irritation potential and yet exhibiting good
foam volume and stability, and improved product aes-
thetics. The composition of the present invention,
comprising a carboxylated derivative of a fatty
imidazoline, a zwitterionic betaine or sultaine and a
sulfated alkylphenol ethoxylate provides a hair shampoo
ideally suited for use on infants and babies by un-
expectedly exhibiting improved low levels of eye and
skin irritation, plus improved cleansing and aesthetic
characteristics.

Background of the Invention and Prior Art

Conventional hair shampoos generally contain
an effective amount of an anionic surface active agent,
usually an alkyl sulfate or an alkyl ether sulfate,
in conjunction with nonionic or amphoteric surfactants
and other common additives to provide a shampoo compo-
sition that effectively cleans the hair, generates
copious and stable foam, and possesses the aesthetic
qualities, such as viscosity, conditioning effects,



appearance and feel that make the composition acceptable to the consuming public. For baby shampoo compositions, the most important property is an extremely low level of dermal and ocular irritation and, particularly, lack of eye sting upon contact.

To achieve the low irritation levels and extreme mildness required of baby shampoo compositions, the baby shampoo is formulated from the least irritating surfactants available. The anionic surfactants commonly used in conventional hair shampoos exhibit superior foaming and cleaning properties, but they are somewhat irritating to the skin and particularly irritating to the eyes. This high irritation potential makes these anionic surfactants unsuitable for use in baby hair shampoo compositions, unless their high irritation potential can be modified and reduced.

Accordingly, baby shampoos usually contain substantial amounts of the milder and less irritating nonionic, amphoteric and zwitterionic surface active agents. However, the benefits of improved mildness and reduced irritation potential in baby shampoo compositions gained by using these surfactant-types is offset by inferior foaming and lathering, poor viscosity and oftentimes poorer cleaning compared to anionic surfactant-based shampoos. Therefore, members of the mild surfactant groups are often combined with the harsher anionic surfactants to produce a shampoo with good cleaning capabilities and good aesthetic qualities, but with eye irritation levels still too high for baby shampoos. These results have led to extensive research efforts to find baby shampoo compositions that are mild and non-irritating to the skin and eyes; are capable of satisfactory foaming, lathering and cleaning; and possess the requisite aesthetic qualities, such as viscosity, for consumer appeal.

It is particularly desirable that shampoo compositions have good foam volume and foam stability. The amount of foam generated by a shampoo composition has a direct bearing on the perceived efficiency of cleaning the hair, and the stability of the generated foam determines how long the shampoo will keep the hair lathered. Generally speaking, the greater the volume of foam produced and the more stable the foam, the more efficient the perceived cleansing action of the shampoo. In addition, a baby shampoo composition must be extremely mild and possess low ocular and dermal irritation levels.

Non-irritating shampoo and detergent compositions have been known and in use for some time. U.S. Patent Nos. 2,999,069 and 3,055,836 are representative of such prior art non-irritating compositions, and generally comprise an amphoteric surfactant combined with an anionic surfactant and a nonionic surfactant. These prior art compositions, although non-irritating, possess foaming characteristics that are perceptively inferior in foam volume and foam stability when compared to conventional shampoos. These prior art shampoos also have very low viscosities, a characteristic still prevalent in present day non-irritating shampoos. Increasing the viscosity of these compositions by employing viscosity building additives or thickeners is counterproductive since the foaming characteristics of the compositions are further reduced. Therefore, increased viscosity, without sacrificing foaming properties, is highly desirable in formulating non-irritating shampoo compositions intended for mass marketing.

Some mild shampoo compositions have been formulated from mixtures of anionic, zwitterionic, amphoteric, ampholytic and nonionic surfactants. In these compositions, the nonionic and amphoteric surfactants have been included to modify the harshness

of the anionic surfactants. All of the compositions include nonionic and anionic surfactants as essential components although the combination of both nonionic and anionic surfactants have disadvantages when incorporated into non-irritating shampoos. For examples of such compositions, see U.S. Patent Nos, 3,928,251; 3,950,417; 3,962,418; 4,177,171; 4,263,178; 4,426,310 and 4,435,300. Other disclosures considered relevant are British patent specification Nos. 1,508,929, 1,540,301 (like U.S. Patent No. 4,177,171) and 2,026,532, and French Patent No. 1,403,213.

As shown in the prior art, to produce a shampoo composition with low eye irritation, more is required than merely admixing any number of different surfactant types. Although numerous cleansing and shampoo compositions are available commercially, there remains a great demand for compositions with low irritation potential that have not sacrificed other valuable features such as cleansing, foaming and viscosity. As also known in the shampoo art, particular types of surfactants are employed to produce an acceptable irritation-free shampoo composition that will not sting an infant's eyes should accidental contact occur.

The present invention is directed to a mild detergent composition that possesses the non-irritating and non-sting properties of a baby shampoo, while retaining the cleaning and aesthetic properties of a conventional shampoo while maintaining unexpectedly better foaming properties for a baby shampoo. The detergent composition of the present invention includes components known individually in the shampoo art, but that heretofore have not been combined to produce a shampoo composition exhibiting such new and unexpected improvements in mildness and irritation, while unexpectedly maintaining cleaning and aesthetic characteristics at levels previously found only in harsher conventional shampoos.

In accordance with the present invention, the hair shampoo composition has the characteristics of improved mildness and reduced irritation potential over present day commercial baby shampoo compositions, while achieving new and unexpected lathering and shampoo properties. The shampoo composition of the present invention includes unique blend of anionic and amphoteric surfactants to provide the aesthetic and cleansing capabilities found in conventional shampoos while achieving improvements upon the dermal and ocular irritation levels of present day commercial baby shampoos.

SUMMARY OF THE INVENTION

In brief, it has been found that a mixture of a carboxylated derivative of a fatty imidazoline, a zwitterionic betaine or sultaine and a sulfated alkylphenol ethoxylate in a liquid carrier provides a hair shampoo composition with unexpectedly low dermal and ocular irritancy, while achieving the cleansing and aesthetic characteristics of harsher, conventional anionic surfactant-based shampoos.

Therefore, it is an object of the present invention to provide improved shampoo compositions.

Another object of the present invention is to provide improved shampoo compositions exhibiting low dermal and ocular irritation potential.

Another object of the present invention is to provide improved shampoo compositions exhibiting good foaming properties, including excellent foam stability, in addition to exhibiting low dermal and ocular irritation potential.

Another object of the present invention is to provide improved shampoo compositions exhibiting excellent aesthetic characteristics in addition to low dermal and ocular irritation potential and good foaming properties.

Another object of the present invention is to provide a liquid hair shampoo composition that effectively cleanses the hair, generates copious amounts of stable foam, and virtually will not irritate the skin or eyes.

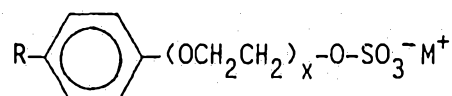
Another object of the present invention is to provide shampoo compositions that are sufficiently non-irritating and non-stinging for use in baby shampoos while possessing the cleansing and aesthetic characteristics associated with conventional shampoos.

Another object of the present invention is to provide a liquid hair shampoo composition containing a combination of two amphoteric surfactants and an anionic surfactant to achieve unexpectedly low ocular and dermal irritation potential, high viscosity and good foaming characteristics.

The above and other objects and advantages will become apparent from the following detailed description of the invention.

According to a broad form of the present invention there is provided a mild detergent composition comprising:

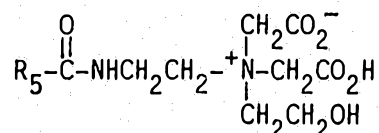
2% to 10% by weight, based on the total weight of the composition, of a water soluble anionic surfactant of the formula



wherein R is an alkyl group containing 6 to 15 carbon atoms, x is an integer from 1 to 10, and M is a member of the groups consisting of alkali metals, ammonium, mono-, di- or tri-alkanolammonium, and an alkylammonium containing 1 to 3 alkyl groups, each having 1 or 2 carbon atoms;

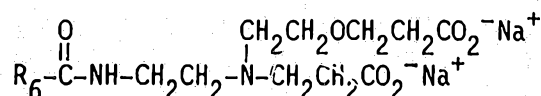
3% to 10% by weight, based on the total weight of the composition of an amphoteric, water soluble, carboxylated derivative of a fatty imidazoline selected from amphoteric detergents of the formula:

(i)



wherein R₅ is an alkyl group containing 7 to 17 carbon atoms;

(ii)



wherein R₆ is an alkyl group containing 7 to 17 carbon atoms; or

(iii) a mixture of (i) and (ii); and

1% to 6% by weight, based on the total weight of the composition, of



a water soluble betaine-type detergent selected from a betaine, an alkamidopropyl betaine, a sulfobetaine, an alkamidopropyl hydroxysultaine and combinations thereof; in a suitable liquid carrier.

5 DETAILED DESCRIPTIONS OF THE PREFERRED EMBODIMENTS

10 The hair shampoo composition of the present invention comprises a blend of amphoteric and anionic surfactants, exhibiting unexpected mildness and achieving the cleansing and aesthetic qualities not normally found in mild detergents. The unique blend of surfactants provides a novel hair shampoo composition possessing low ocular and dermal irritation potential, making the compositions of the present invention ideal as baby shampoos.

15 Non-irritating detergent compositions are generally comprised of amphoteric surfactants combined with anionic and/or nonionic surfactants. The anionic surfactant is usually an ethoxylated alkyl sulfate such as ammonium lauryl ether sulfate, and the nonionic surfactant is an ethoxylated monoester of an aliphatic polyhydric alcohol. Recently, other surfactants have been included to improve the aesthetic properties of



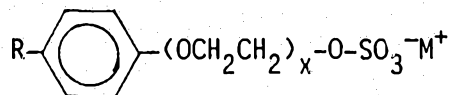
the detergent composition without increasing the irritation potential. Among these surfactants are zwitter-ionic betaine compounds, nonionic amine oxides, and carboxylated complexes. However, the prior art does
5 not disclose a detergent composition containing traditional amphoteric surfactants in combination with an anionic salt of a sulfated alkylphenol ethoxylate.

The blend of surfactants included in the detergent compositions of the present invention provides extremely and unexpectedly low ocular irritation
10 making the detergent compositions especially suitable for use as a baby shampoo composition. Additionally, the aesthetic properties of the detergent compositions are excellent. The detergent compositions or shampoos of the present invention can be formulated with
15 Brookfield viscosities well above 1000 cps, whereas the presently available commercial products do not possess viscosities over about 1500 cps level. The foaming properties of the blend of surfactants incorporated in the detergent compositions of the present
20 invention are excellent as well, as demonstrated by hair clinic results described in more detail herein-after.

In accordance with an important feature of the present invention, the non-irritating detergent
25 compositions comprise a blend of an anionic detergent and two amphoteric detergents to obtain a hair shampoo composition of very low irritation potential while retaining high foaming and suitable viscosity characteristics heretofore known only in harsher conven-
30 tional, highly anionic compositions. The total amount of the active surfactant compounds, including the nonionic surfactants added for feel or viscosity enhancement, should not be greater than about 35% by
35 weight of the total composition in order to prevent ocular irritation. Preferably, the total amount of the active surfactant compounds will range from about

8% to about 15% by weight of the total shampoo composition.

In accordance with an important feature of the present invention, the detergent compositions of the present invention includes an anionic surfactant comprising a salt of a sulfated alkylphenol ethoxylate, generally depicted by the structural formula I:



I

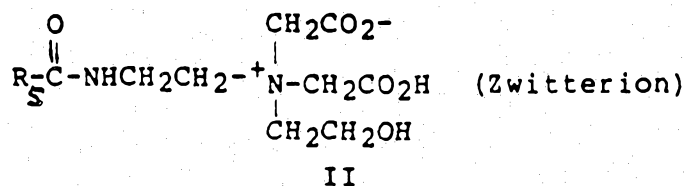
wherein R is an alkyl group of about 6 to about 15 carbon atoms, x is an integer from 1 to about 10, and M is an alkali metal (preferably sodium or potassium) or a mono- or di-, or tri-alkanolammonium (preferably triethanolammonium, diethanolammonium or monoethanolammonium) or an alkylammonium containing 1 to 3 alkyl groups, each having 1 or 2 carbon atoms. The compounds of structure I are also known as salts of alkylphenoxypoly(ethyleneoxy)ethanol sulfates. To achieve the full advantage of the present invention, the anionic surfactant of the detergent composition includes an alkyl group of about 7 to about 10 carbon atoms (R = 7 to 10) and x is an integer from 3 to 7, most preferably x is 4. To achieve the fullest advantage of the present invention the anionic surfactant of the present invention is the ammonium salt of nonylphenoxypoly(ethyleneoxy)-ethanol sulfate containing about 4 moles of ethylene oxide, having the CFTA adopted name of ammonium nonoxynol-4 sulfate.

The anionic surfactants of formula I provide several advantages over other anionic surfactants commonly used in hair shampoo compositions. Most notably, ammonium nonoxynol-4 sulfate has a lower primary skin irritation level than other high foaming anionics, mild surfactants or foam boosters such as alpha olefin sulfonates, lauryl sulfates, lauryl ether sulfates and cocamidopropyl betaines. Due to this inherent mildness, the ammonium nonoxynol-4 sulfate may be blended with amphoterics to provide a mild, non-stinging shampoo without the need to add large amounts of a nonionic surfactant.



The anionic surfactants of structural formula I should be present in the hair shampoo composition from about 2% to about 10% by weight, and preferably from about 2% to about 7% by weight. At this level, compositions formulated with anionics of structural formula I exhibit definite viscosity improvement, improved hard water foaming heights over sodium or ammonium lauryl sulfate detergents, very good lathering, and improved softness, luster, body and manageability of the hair. Hair shampoos formulated with anionics such as ammonium nonoxynol-4 sulfate also retain their excellent foaming levels in the presence of substantial levels of emollients.

In accordance with an important feature of the present invention, the hair shampoo compositions include two amphoteric surfactants of different chemical classes. One of the amphoterics is a carboxylated derivative of a fatty imidazoline generally depicted by structural formula II or by structural formula III:

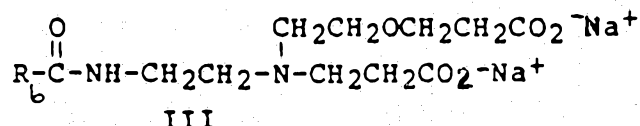


wherein R_5 is an alkyl radical containing predominantly 7 to 17 carbon atoms. The zwitterions of structure II are termed alkoamphocarboxyglycinates, and they exhibit low skin and eye irritation potential and also act to detoxify other composition ingredients, making them less irritating. Overall, these zwitterions demonstrate mildness, mild foaming and cleansing, and excellent performance in the presence of oily soils, making them particularly useful in baby shampoo compositions. To achieve the full advantage of the



present invention, a compound of structural formula II, wherein R is the alkyl group of coconut fatty acid, cocoamphocarboxyglycinate, is present in the shampoo compositions, in an amount of about 3% to about 10% by weight and particularly in an amount of about 4% to about 7% by weight of the total composition. Representative commercial products providing the alkoamphocarboxyglycinates of structural formula II include those sold under the trade names of MIRANOL C2M CONC. N.P., MIRANOL C2M CONC. O.P., MIRANOL CM SPECIAL (Miranol Inc.); ALKATERIC 2CIB (Alkaril Chemicals); AMPHOTERGE W-2 (Lonza Inc.); MONATERIC CDX-38, MONATERIC CSH-32 (Mona Industries); REWOTERIC AM-2C (Rewo Chemical Group); and SCHERCOTERIC MS-2 (Scher Chemicals).

Similarly the amphoteric generally depicted by structural formula III:



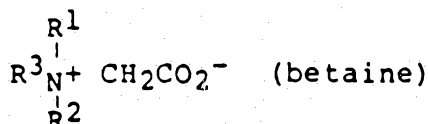
wherein R_b is an alkyl radical containing predominantly 7 to 17 carbon atoms can be used on the composition of the present invention as the carboxylated derivative of a fatty imidazoline. The zwitterions of structure III are termed alkoamphocarboxypropionates, and they likewise exhibit low skin and eye irritation potential and act to detoxify other composition ingredients, making them less irritating. The amphoteric depicted by structural formula III also demonstrate the mildness, mild foaming and cleansing and excellent performance in the presence of oily soils, making them particularly useful in baby shampoo compositions. To achieve the full advantage of the present invention, either the cocoamphocarboxyglycinate described above, or the compound having the structural formula III, wherein R is the alkyl group of coconut fatty acid, cocoamphocarboxypropionate, is present in the shampoo



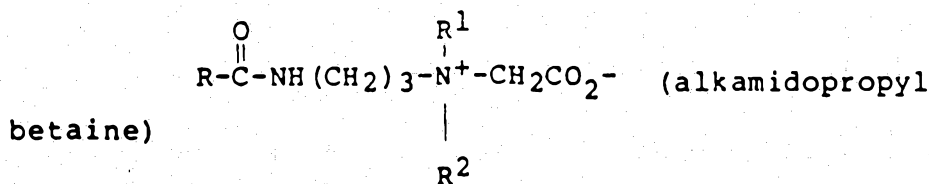
compositions, in an amount of about 3% to about 10% by weight and particularly in an amount of about 4% to about 7% by weight of the total composition.

Representative commercial products providing the cocoamphocarboxypionate of structural formula III include those sold under the trade names of MIRANOL C2M-SF 70%; MIRANOL C2M-SF 75%; MIRANOL C2M-SF CONC., MIRANOL C2M-SFE CONC., MIRANOL C2M-SFP (Miranol Inc.); AMPHOTERGE K-2 (Lonza Inc.); CYCLOTERIC DC-SF (Cyclo Corp.); MONATERIC 805-P2 (Mona Industries); REWOTERIC AM-2CSF (Rewo Chemical Group); and SCHERCOTERIC MS-SF-2 (Scher Chemicals).

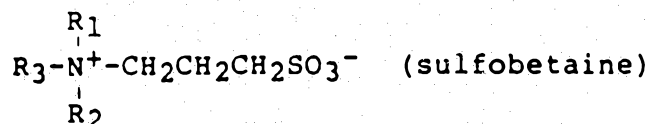
In accordance with another important feature of the present invention, the hair shampoo composition contains a second amphoteric surfactant classified as a betaine or betaine-type surfactant falling within structural formulae IV through VII:



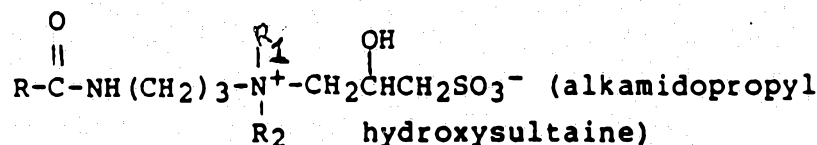
IV



V



VI



VII

wherein R is an alkyl radical containing predominantly 7 to 17 carbon atoms, R_1 and R_2 are the same or different alkyl radicals having 1 to 4 carbon atoms, and R_3



is an alkyl radical containing predominantly 8 to 18 carbon atoms.

5 Zwitterionic surfactants of this class have properties advantageous to shampoos, including mildness; compatibility with a variety of different components; efficacy over a broad pH range; good foam generation, foam boosting and foam stabilizing; good detergency and viscosity enhancement. In hair shampoo compositions, particularly at an acid pH, the betaine class of surfactants also impart conditioning and
10 anti-static properties to the hair. Each of the four types of betaine or sulfobetaine surfactants defined by structural formulae IV through VII may be used in the present invention. To achieve the full advantage
15 of the present invention, the alkamidopropyl betaines (V) and alkamidopropyl hydroxysultaines (VII) are preferred in that they are milder, impart better conditioning properties and generate greater foam volume than the other betaine-type surfactants.

20 The betaines have demonstrated excellent compatibility with the mucous membranes, therefore, by themselves, they are non-irritating to the eyes. Betaines also are effective in significantly reducing the eye irritation potential of alkyl sulfates and
25 alkyl ether sulfates. Shampoos or detergents containing only anionic surfactants will defat the skin and hair after prolonged use resulting in the formation of dandruff; however, combining an anionic surfactant with a betaine-type surfactant inhibits the defatting tendency and resultant dandruff formation. Blending
30 a betaine-type surfactant and an anionic surfactant reduces the harshness of the anionic surfactant. In accordance with the principles of the present invention, the combination of a amphoteric surfactant together with the anionic-betaine blend heretofore defined, results in a surfactant mixture that is non-
35 irritating and free of sting. To achieve the full

advantage of the present invention, a cocamidopropyl betaine or a cocamidopropyl hydroxysultaine is incorporated into the hair shampoo composition of the present invention from levels of about 1% to about 6% by weight based on the total weight of the composition. More preferably, the cocamidopropyl betaine or cocamidopropyl hydroxy sultaine is present in an amount of about 2% to about 4% by weight based on the total weight of the composition.

In accordance with another important feature of the present invention, the hair shampoo compositions contain a blend of an anionic surfactant and two amphoteric surfactants to produce a non-irritating, no-sting shampoo; however, unlike other non-irritating, no-sting shampoos, the hair shampoo compositions of the present invention do not require relatively large amounts of a nonionic surfactant to eliminate the stinging characteristics of the anionic/amphoteric blend. Since nonionic surfactants are low to moderate foamers, they often detract from the excellent foaming characteristics of the anionic/amphoteric surfactant blend. By obtaining a "no-sting" quality without large percentages of a nonionic surfactant, the foaming and lather capabilities of the compositions of the present invention are superior to baby shampoo compositions requiring large amounts of nonionic surfactants to reduce sting. This will become more apparent from the performance evaluation studies discussed in more detail hereinafter.

The mild liquid detergent compositions of the present invention are essentially unbuilt liquids, i.e., do not contain amounts of organic or inorganic salts in detergent building proportions, and are therefore suitable for use as shampoos or liquid bubble bath or liquid soap products. In accordance with the present invention, traditional amphoteric, well known in the hair shampoo art, are included in the hair

shampoo compositions, together with an alkylphenoxypoly(ethyleneoxy)ethanol sulfate instead of the traditional anionic surfactant, an ethoxylated alkyl sulfate to provide hair shampoo compositions of unexpectedly improved mildness over present day commercial baby shampoos, while retaining the superior aesthetic, cleansing and conditioning characteristics normally found only in the harsher, strongly anionic traditional shampoos.

In preparing the detergent compositions of the present invention, various other surfactants, such as anionics, nonionics and the like, can be utilized, if desired, as long as the basic properties of the hair shampoo are not adversely affected. The compositions of the present invention may contain the following types of components for enhanced aesthetic properties such as foaming, feel of lathering, thickening or conditioning: amine oxides, a nonionic surfactant for feel, foaming and conditioning; sulfosuccinates, an anionic surfactant for foam boosting; alkyl (C_8-C_{10}) glucosides, a very mild nonionic surfactant for foam boosting and foam stability, for detergency, and for feel; polyethylene glycol esters for viscosity enhancement; and/or glucose esters for conditioning and viscosity enhancement.

Advantageously the detergent composition has 0.1% to 3% by weight, based on the total weight of the compositions, of a water soluble polyethoxylated mono-fatty acid ester or di-fatty acid ester of methyl glucose containing 80 to 160 ethyleneoxy moieties per molecule, preferably a di-fatty acid ester of methyl glucose. The fatty acid usually contains 8 to 18 carbon atoms and typically is an ethylenically unsaturated fatty acid, for example oleic acid. Preferably the di-fatty ester of methyl glucose is methyl glucose dioleate containing 120 ethoxy moieties per molecule.

The pH of the hair shampoo compositions of the present invention should be in the range of about 5.5 to about 7.5, and to achieve the full advantage of the present invention the pH of the composition should be between about 6.0 and about 7.0.

Other common additives may be incorporated into the compositions of the present invention, as long as the basic properties of the hair shampoo, especially with respect to eye and skin irritation potential, are not substantially adversely affected. These additives include, but are not limited to, commonly used and non-irritating dyes, fragrances, opaci-



ficiers, pearlescing agents, buffering agents, pH adjusters, preservatives, emollients, sequestering agents, and the like, and will usually be present in weight percentages of less than 1% each, and 2% to 5% in total. The cosmetic carrier is generally water, since the addition of most organic solvents to the compositions will increase the irritation potential of the compositions, making them unsuitable for use on babies and infants. The compositions of the present invention have sufficient inherent viscosity making it unnecessary to add organic thickeners, such as gums, or inorganic salts, such as sodium chloride or ammonium chloride.

In accordance with the present invention, a mild, non-stinging hair shampoo composition, suitable for use on infants and babies, is prepared by admixing a sulfated alkylphenol ethoxylate and a cocoamphocarboxyglycinate or a cocoamphocarboxypropionate with an alkamidopropyl betaine or an alkamidopropyl hydroxysultaine to yield a composition of unexpectedly low irritation potential, yet having the aesthetic and cleansing properties normally associated only with harsher, traditional anionic surfactant-based shampoos.

In accordance with the present invention, test solutions were prepared to determine the eye irritation levels and the lathering and performance levels of shampoos of the present invention and present day commercial shampoos. The detergent compositions can be tested for ocular irritation by the following modified Draize Test (J.H. et al., Toilet Goods Assn. No. 17, May 1952, No. 1, Proc. Sci. Sect.).

An 0.1 ml. sample of a neutral composition under test is dropped into one eye of an albino rabbit, the other eye serving as a control. Six rabbits are employed for each composition. Observations are made after 1, 24, 48, and 72 hours and 7 and 14 days after initial instillation. Results may vary from substan-

tially no change or only a slight irritation in the appearance of the rabbit's eye after 7 days to severe irritation and/or complete corneal opacity. Ocular lesions are scored for the cornea, iris and conjunctiva with a higher number indicating greater ocular irritation and the scores are added to give a total numerical value for each reading averaged from six rabbits. The averaged score is an indication of the irritation potential of the composition under test. Based on the averaged score, descriptive irritation evaluation may be given, e.g., none, slight, moderate or severe, as the case may be.

Test solutions were prepared and tested for eye irritation potential and for hair shampooing performance to determine the preferred combination for properties of mildness, "no sting", cleansing ability and aesthetics. Table I lists the weight percentage of the components present in Examples 1 through 7, followed by a summary of the Draize Test results of rabbit eye irritation for Examples 1 through 7. Examples 1 through 7, and all examples to follow, were prepared using mixing techniques well known in the shampoo art. The complete eye irritation data for Examples 1 through 7 can be found in Tables 1 through 7, respectively.

		<u>EX. 1</u>	<u>EX. 2</u>	<u>EX. 3</u>	<u>EX. 4</u>	<u>EX. 5</u>	<u>EX. 6</u>	<u>EX. 7</u>
	<u>Ingred.</u>	<u>% by weight</u>						
	Soft Water-----	q.s. to 100%-----						
	Ammonium							
5	Nonoxynol-4							
	Sulfate	4.05	4.05	4.05		4.05		
	PEG-120							
	Methyl							
	Glucose							
10	Dioleate	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	Cocamido-							
	propyl							
	Betaine		2.10		2.10	2.10	2.10	2.10
	Cocoampho-							
15	carboxy-							
	glycinate			6.00	6.00	6.00	6.00	6.00
	Ammonium							
	Lauryl							
	Sulfate					4.20		
20	Sodium Trideceth							
	Sulfate							4.05
	Citric Acid-----	q.s. to pH 6.0 to 6.5-----						

DRAIZE TEST - RABBIT EYE IRRITATION

25	1 hr.	7.7	7.7	19.2	9.0	14.6	30.0	22.5
	24 hr.	2.3	3.7	19.5	4.0	11.7	19.7	17.9
	48 hr.	1.0	1.0	10.0	2.3	5.0	15.6	11.0
	72 hr.	0.0	0.0	3.8	0.7	2.1	10.5	7.7
	7 days	0.0	0.0	0.0	0.0	0.0	3.2	0.7
30	14 days	0.0	0.0	0.0	0.0	0.0	4.2	0.0

TABLE I
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 1

MAXIMUM MEAN IRRITATION SCORE: 7.7/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No Wash

10

20

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		6 (1-1-1)	4 (1-1-0)	2 (1-0-0)	0	0	0
Total		6	4	2	0	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		6 (1-1-1)	0	0	0	0	0
Total		6	0	0	0	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	2 (1-0-0)	0	0	0	0
Total		8	2	0	0	0	0
Averages:							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		7.7	2.3	1.0	0	0	0
Total		7.7	2.3	1.0	0	0	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 20

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

30

TABLE II
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 2

MAXIMUM MEAN IRRITATION SCORE: 7.7/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	8 (2-1-1)	2 (1-0-0)	0	0	0
Total		8	8	2	0	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	2 (1-0-0)	0	0	0	0
Total		8	2	0	0	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	6 (1-1-1)	2 (1-0-0)	0	0	0
Total		12	6	2	0	0	0
<u>Averages:</u>							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		7.7	3.7	1.0	0	0	0
Total		7.7	3.7	1.0	0	0	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

MAXIMUM MEAN IRRITATION SCORE: 14.6/110.0

SPECIAL INSTRUCTIONS: No wash

20

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

30

TABLE IV
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 4

MAXIMUM MEAN IRRITATION SCORE: 30.0/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	15 (1-3)	15 (1-3)	10 (1-2)	10 (1-2)	10 (1-2)	10 (2-1)
Iris		0	0	5	5	0	5
Conjunctiva (R-S-D)		10 (2-2-1)	10 (2-2-1)	8 (2-1-1)	8 (2-1-1)	6 (1-1-1)	10 (2-1-2)
Total		25	25	23	23	16	25
Cornea (D-A)	5	20 (1-4)	20 (1-4)	15 (1-3)	10 (1-2)	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		16 (2-3-3)	12 (2-2-2)	12 (2-2-2)	10 (2-1-2)	2 (1-0-0)	0
Total		36	32	27	20	2	0
Cornea (D-A)	6	10 (1-2)	15 (1-3)	10 (1-2)	5 (1-1)	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	10 (2-2-1)	8 (2-1-1)	4 (1-0-1)	0	0
Total		22	25	18	9	0	0
Averages:							
Cornea		18.3	11.7	7.5	5.0	1.7	1.7
Iris		0.0	0.0	0.8	0.8	0.0	0.8
Conjunctiva		11.7	8.0	7.3	4.7	1.3	1.7
Total		30.0	19.7	15.6	10.5	3.0	4.2

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

TABLE V
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 5

MAXIMUM MEAN IRRITATION SCORE: 22.5/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	5 (1-1)	10 (1-2)	5 (1-1)	5 (1-1)	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	6 (1-1-1)	4 (1-0-1)	2 (1-0-0)	0	0
Total		17	16	9	7	0	0
Cornea (D-A)	5	20 (1-4)	15 (1-3)	10 (1-2)	10 (1-2)	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	12 (2-2-2)	8 (2-1-1)	6 (2-0-1)	2 (1-0-0)	0
Total		32	27	18	16	2	0
Cornea (D-A)	6	10 (1-2)	5 (1-1)	5 (1-1)	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	10 (2-2-1)	8 (2-1-1)	4 (1-0-1)	0	0
Total		22	15	13	4	0	0
<u>Averages:</u>							
Cornea		10.8	9.2	5.0	4.2	0	0
Iris		0.0	0.0	0.0	0.0	0	0
Conjunctiva		11.7	8.7	6.0	3.7	0.7	0
Total		22.5	17.9	11.0	7.7	0.7	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

TABLE VI
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 6

MAXIMUM MEAN IRRITATION SCORE: 9.0/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

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Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	4 (1-1-0)	2 (1-0-0)	2 (1-0-0)	0	0
Total		8	4	2	2	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	2 (1-0-0)	2 (1-0-0)	0	0	0
Total		8	2	2	0	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	2 (1-0-0)	2 (1-0-0)	0	0	0
Total		8	2	2	0	0	0
Averages:							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		9.0	4.0	2.3	0.7	0	0
Total		9.0	4.0	2.3	0.7	0	0

Cornea

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

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TABLE VII
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 7

MAXIMUM MEAN IRRITATION SCORE: 19.5/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	10 (1-2)	5 (1-1)	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	10 (2-2-1)	8 (2-1-1)	4 (1-0-1)	0	0
Total		22	15	8	4	0	0
Cornea (D-A)	5	5 (1-1)	5 (1-1)	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (2-1-1)	8 (2-1-1)	4 (1-0-1)	2 (1-0-0)	0	0
Total		13	13	4	2	0	0
Cornea (D-A)	6	10 (1-2)	10 (1-2)	5 (1-1)	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		10 (2-2-1)	12 (2-2-2)	8 (2-1-1)	4 (1-0-1)	0	0
Total		20	22	13	4	0	0
Averages:							
Cornea		9.2	9.2	3.3	0.8	0	0
Iris		0.0	0.0	0.0	0.0	0	0
Conjunctiva		10.0	10.3	6.7	3.0	0	0
Total		19.2	19.5	10.0	3.8	0	0

Cornea

D = Density

A = Area

Corneal Score = $D \times A \times 5$

Maximum Score = 80

Iris:

Iris Score = Value $\times$ 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = $(R+S+D) \times 2$

Maximum Score = 20

Example 1 is a pH-adjusted aqueous solution of ammonium nonoxynol-4 sulfate and a glucose ester, namely PEG-120 methyl glucose dioleate, as a viscosity enhancer and conditioner. In Example 2, the addition of cocamidopropyl betaine did not increase the eye irritation level, although the total surfactant concentration has increased. Example 3 shows increased eye irritation when cocoamphocarboxyglycinate replaces the betaine, however, reintroduction of the betaine in Example 5 shows a definite improvement in eye irritancy over Example 3. Example 4 shows the extent of eye irritation in shampoos lacking an anionic surfactant, and although the eye irritation levels are good, absence of an anionic surfactant severely retards the cleaning and foaming ability of the shampoo. The increased irritation levels of Examples 3 and 5 over Examples 1, 2 and 4 also is due in part to greater surfactant levels in Examples 3 and 5. For comparison, in Example 6 ammonium lauryl sulfate replaced the ammonium nonoxynol-4 sulfate of Example 5 on a weight basis and exhibited a much higher eye irritation level of 30.0, or a 105.5% increase over the eye irritancy level of 14.6 for the composition of Example 5.

A composition of the present invention (Example 5) is compared to a composition containing an anionic surfactant, sodium trideceth sulfate, used in a leading commercial baby shampoo (Example 7). The resultant eye irritation tests showed a 54% increase for the composition of Example 7 containing sodium trideceth sulfate over the eye irritation levels of Example 5, containing ammonium nonoxynol-4 sulfate.

The compositions of examples 8 through 12 were prepared to demonstrate the low irritancy and improved viscosities of several compositions of the present invention. As will be more fully described hereinafter, the viscosities of the compositions of Examples 8 through 12 are all substantially improved

over the leading commercial baby shampoos; and eye
irritancy levels of the compositions of Examples 8
through 12 are less than or equal to the commercial
shampoos. The compositions of Examples 8 through 12
also exhibit improved cleansing and aesthetic proper-
ties.

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<u>Ingred.</u>		<u>EX. 8</u>	<u>EX. 9</u>	<u>EX. 10</u>	<u>EX. 11</u>	<u>EX 12</u>
(present by wt. %)						
	Water	-----q.s. to 100%-----				
5	Cocoampho- carboxygly- cinate	5.00	5.00	5.00	5.95	5.95
	Ammonium non- oxynol-4 sulfate	2.70	2.70	2.70	5.40	4.05
10	Cocamidopropyl hydroxy- sultaine	1.50	---	2.45	---	---
	Cocamidopropyl betaine	---	1.35	---	---	2.10
15	Alkyl glucoside	1.40	1.40	1.40	---	---
	PEG-120 Methyl glucose dioleate	1.50	1.50	1.00	1.00	0.50
20	PEG-80 Sorbitan laurate	---	---	---	1.50	2.50
	Citric acid	-----q.s. to pH 6.0 to 6.5-----				
	Color, fragrance preservative	-----q.s.-----				
25	Viscosity	3100	2500	2000	5400	2540
	Draize Results					
	1 hr.	7.7	8.0	7.3	12.7	14.0
	24 hr.	3.0	4.3	5.7	7.3	10.7
30	48 hr.	1.3	1.0	2.7	4.7	5.4
	72 hr.	0.0	0.0	0.7	1.3	1.3

35 In comparing the compositions of Example 8 and Example 9 it is apparent that substituting cocamidopropyl betaine for a cocamidopropyl hydroxysultaine does not appreciably alter the eye irritation level, but it does lead to a decrease in viscosity. In the composition of Example 10, increased cocamidopropyl

hydroxysultaine levels results in very slightly improved eye irritation potential, and a decreased PEG-120 methyl glucose dioleate level leads to a viscosity decrease. In the composition of Example 11, omitting the betaine-type of surfactant and increasing the amount of cocoamphocarboxyglycinate and ammonium non-oxynol-4 sulfate leads to increased eye irritation potential, as expected from doubling the anionic surfactant level and omitting the mild betaine-type surfactants. The effects of incorporating the PEG-120 methyl glucose dioleate into compositions of the present invention are shown in Example 12. Lower viscosities and increased eye irritation levels resulted from reducing the glucose dioleate concentration and increasing the amount of PEG-80 sorbitan laurate even though a betaine was reintroduced into the composition and the anionic surfactant level was decreased. The substantially different nature of the decreased eye irritation mechanism for the compositions of the present invention is further emphasized by the fact that increased quantities of the nonionic PEG-80 sorbitan laurate does not decrease eye irritation levels, as it does in commercial baby shampoos. To achieve the full advantage of the present invention, PEG-120 methyl glucose dioleate is included at low levels of about 1% to about 2% by weight of the total composition as a nonionic viscosity enhancer. At this level, the glucose oleate effectively thickens the shampoo composition without adversely affecting foam properties, and minimizes the irritation levels of the anionic/amphoteric blend. Tables VIII through XII contain the complete eye irritation data for Examples 8 through 12.

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TABLE VIII

RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 8

MAXIMUM MEAN IRRITATION SCORE: 7.7/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No Wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		6 (1-1-1)	2 (1-0-0)	0	0	0	0
Total		6	2	0	0	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	4 (1-1-0)	2 (1-0-0)	0	0	0
Total		8	4	2	0	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	4 (1-0-1)	2 (1-0-0)	0	0	0
Total		8	4	2	0	0	0
<u>Averages:</u>							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		7.7	3.0	1.3	0	0	0
Total		7.7	3.0	1.3	0	0	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

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TABLE IX
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 9

MAXIMUM MEAN IRRITATION SCORE: 8.0/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No Wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		6 (1-i-1)	2 (1-0-0)	0	0	0	0
Total		6	2	0	0	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	2 (1-0-0)	0	0	0	0
Total		8	2	0	0	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	6 (1-1-1)	2 (1-0-0)	0	0	0
Total		8	6	2	0	0	0
<u>Averages:</u>							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		8.0	4.3	1.0	0	0	0
Total		8.0	4.3	1.0	0	0	0

Cornea:
D = Density
A = Area
Corneal Score = D x A x 5
Maximum Score = 80

Iris:
Iris Score = Value x 5
Maximum Score = 10

Conjunctiva:
Redness = R Swelling = S Discharge = D
Conjunctival Score = (R+S+D) x 2
Maximum Score = 20

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TABLE X

RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 10

MAXIMUM MEAN IRRITATION SCORE: 7.3/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No Wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	6 (1-1-1)	4 (1-0-1)	0	0	0
Total		8	6	4	0	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		6 (1-1-1)	6 (1-1-1)	4 (1-0-1)	2 (1-0-0)	0	0
Total		6	6	4	2	0	0
Cornea (D-A)	6	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	6 (1-1-1)	2 (1-0-0)	2 (1-0-0)	0	0
Total		8	6	2	2	0	0
<u>Averages:</u>							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		7.3	5.7	2.7	0.7	0	0
Total		7.3	5.7	2.7	0.7	0	0

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Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

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TABLE XI
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 11

MAXIMUM MEAN IRRITATION SCORE: 12.7/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No wash

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Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	1	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	8 (2-1-1)	6 (1-1-1)	2 (1-0-0)	0	0
Total		12	8	6	2	0	0
Cornea (D-A)	2	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		14 (2-2-3)	6 (1-1-1)	4 (1-0-1)	2 (1-0-0)	0	0
Total		14	6	4	2	0	0
Cornea (D-A)	3	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (1-2-3)	8 (1-1-2)	4 (1-0-1)	0	0	0
Total		12	8	4	0	0	0
<u>Averages:</u>							
Cornea		0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva		12.7	7.3	4.7	1.3	0	0
Total		12.7	7.3	4.7	1.3	0	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 80

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

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TABLE XII
RABBIT EYE IRRITATION RESULTS

CLIENT: HELENE CURTIS INDUSTRIES

Example: 12

MAXIMUM MEAN IRRITATION SCORE: 14.0/110.0

FORM ADMINISTERED: 0.1 ml instilled into the eye

SPECIAL INSTRUCTIONS: No Wash

Tissue	Rabbit Number	1 Hour	24 Hours	48 Hours	72 Hours	7 Days	14 Days
Cornea (D-A)	4	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	10 (2-1-2)	4 (1-0-1)	2 (1-0-0)	0	0
Total		12	10	4	2	0	0
Cornea (D-A)	5	0	0	0	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		8 (1-1-2)	4 (1-0-1)	2 (1-0-0)	0	0	0
Total		8	4	2	0	0	0
Cornea (D-A)	6	10 (1-2)	10 (1-2)	5 (1-1)	0	0	0
Iris		0	0	0	0	0	0
Conjunctiva (R-S-D)		12 (2-2-2)	12 (2-2-2)	6 (1-1-1)	2 (1-0-0)	0	0
Total		22	22	11	2	0	0
<u>Averages:</u>							
Cornea		3.3	3.3	1.7	0	0	0
Iris		0.0	0.0	0.0	0	0	0
Conjunctiva		10.7	7.0	3.7	1.3	0	0
Total		14.0	10.7	5.4	1.3	0	0

Cornea:

D = Density

A = Area

Corneal Score = D x A x 5

Maximum Score = 60

Iris:

Iris Score = Value x 5

Maximum Score = 10

Conjunctiva:

Redness = R Swelling = S Discharge = D

Conjunctival Score = (R+S+D) x 2

Maximum Score = 20

TABLE XIII

COMMERCIAL PRODUCT ANALYSIS AND COMPARISON

	<u>COMMERCIAL PRODUCT</u>	<u>1 HR.</u>	<u>24 HRS.</u>	<u>48 HRS.</u>	<u>72 HRS.</u>
	A	8.0	4.0	1.3	0.0
5	B	9.3	4.7	2.0	0.0
	C	7.3	2.7	0.7	0.0
	D	11.3	3.3	0.7	0.0
	E	6.0	2.7	1.3	0.0
	F	26.7	21.3	9.0	1.3
10	EXAMPLE 8	7.7	3.0	1.3	0.0
	EXAMPLE 9	8.0	4.3	1.0	0.0
	EXAMPLE 10	7.3	5.7	2.7	0.7

As is apparent from the data in Table XIII, Examples 8 through 10 favorably compare with, or improve upon, the eye irritation levels of present commercial baby hair shampoos. However, in addition to comparable or improved irritation potential, the shampoos of the present invention unexpectedly retain the aesthetic and cleaning properties of the harsher, conventional alkyl sulfate-based hair shampoos.

The viscosity of a liquid detergent composition is extremely important for consumer appeal. The composition must be thin enough for dispensing, yet thick enough so that it does not immediately run through the user's fingers. A thick product is also perceived by the consumer to be concentrated and, therefore, an effective and economical product. Ideally, hair shampoos, except for the gelled tube-type compositions, have a viscosity in the range of about 2000 cps to about 8000 cps for easy dispensing, minimal runniness and good consumer appeal. From Table IV, it is obvious that the viscosity of present day baby shampoos is usually below 1500 cps, or well below the minimum viscosity targeted for good consumer acceptance. The viscosity of most shampoos and detergents may be increased by adding inorganic thickeners, such as ammonium or sodium chloride, or organic thicken-

ers, such as gums or nonionic surfactants; however, these additives generally increase the irritation and stinging properties of the shampoo. Hair shampoo compositions of the present invention are readily prepared in the 2000 cps to 8000 cps, and particularly in the 2000 cps to 5000 cps viscosity range, without the addition of inorganic thickeners, gums, or large amounts of nonionic surfactants, as shown in Table XIV.

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TABLE XIV
PHYSICAL PROPERTIES OF BABY SHAMPOOS

	<u>COMMERCIAL PRODUCT</u>	<u>pH</u>	<u>VISCOSITY (CPS)</u>
	J & J NO MORE TEARS	6.15	1000
	MENNEN BABY MAGIC	7.09	540
15	VASELINE INTENSIVE CARE	6.56	340
	WALGREENS	6.43	1130
	OSCO	6.16	480
	SUAVE	7.50	650
	EXAMPLE 8	6.35	3100
20	EXAMPLE 9	6.11	2500
	EXAMPLE 10	6.49	2000

Compositions of the present invention were clinically tested against the leading commercial baby shampoos by washing one-half of a subject's hair with a shampoo composition of the present invention and the other half of the subject's hair with the commercial shampoo. In this blind test, the operator rates each shampoo in several categories and issues comments as to why one shampoo is preferred over the other.

25 In one clinical test, the shampoo composition of Example 8 was rated as performing better on the first lather, by being easier to lather up and with a better lathering ability and amount of foam when compared to the leading commercial baby shampoos. For the other testing parameters, such as combing, feel, static, effect on color, and the like, the two shampoos of this test were rated essentially equal. The shampoo

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composition of Example 10 provided the same benefits as Example 8, when compared to the same commercial baby shampoo, plus imparting improved latherability and amount of foam on the second lathering. In another test, the composition of Example 9 demonstrated a pronounced improvement in ease of application, probably due to its greater viscosity and increased anionic level; Example 9 also demonstrated improved lathering and foam generation ability. The composition of Example 13 was similarly tested against the same commercial shampoo, and showed improved lathering, foam generation and combing ability.

Example 13

	Water	q.s. to 100%
15	Cocoamphocarboxyglycinate	5.95%
	Ammonium nonoxynol-4 sulfate	2.70%
	Cocamidopropyl hydroxysultaine	1.50%
20	Alkyl glucoside	1.40%
	PEG-120 methyl glucose dioleate	0.50%
	Citric acid	0.35%
	Dye/fragrance/preservative	q.s.
25	pH - 6.32	
	viscosity - 1040 cps	

From the Draize Test data, the comparative performance data and the physical properties of the compositions of the present invention, new and unexpected improvements in baby hair shampoo compositions are realized by combining a sulfated alkylphenol ethoxylate, a carboxylated derivative of a fatty imidazoline and a zwitterionic betaine. The compositions of the present invention unexpectedly demonstrate a lower eye and skin irritation potential, better foaming characteristics and improved viscosities at a generally

lower total surfactant level, without the addition of thickeners.

5 The compositions of the present invention are primarily useful in shampoo formulations where high foaming characterictis as well as low ocular and skin irritation potential are desired. They may also be used as liquid soaps and cleansers such as baby bath compositions, skin cleansers, mild shampoos for delicate skin, bubble bath compositions, as well as
10 in compositions suitable for cleansing animals and inanimate objects.

The compositions of the present invention possess the exceptionally desirable qualities of mildness and "no sting", plus the ability to thoroughly
15 cleanse the hair and scalp with the generation of copious amounts of stable foam. The compositions of the present invention also possess aesthetic qualities unmatched by present day non-irritating commercial shampoos.

20 It should be understood that the present disclosure has been made only by way of preferred embodiment and that numerous changes in details of construction, combination and arrangement of parts may be resorted to without departing from the spirit
25 and scope of the invention as hereunder claimed.

What is claimed and sought to be secured by Letters Patent of the United States is:

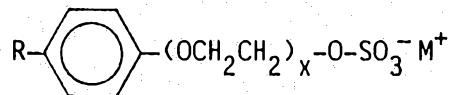
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The claims defining the invention are as follows:

1. A mild detergent composition comprising:

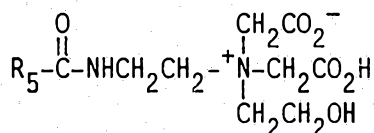
2% to 10% by weight, based on the total weight of the composition, of a water soluble anionic surfactant of the formula



wherein R is an alkyl group containing 6 to 15 carbon atoms, x is an integer from 1 to 10, and M is a member of the groups consisting of alkali metals, ammonium, mono-, di- or tri-alkanolammonium, and an alkylammonium containing 1 to 3 alkyl groups, each having 1 or 2 carbon atoms;

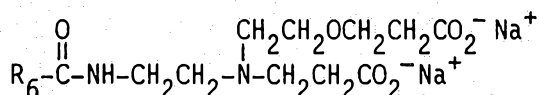
3% to 10% by weight, based on the total weight of the composition of an amphoteric, water soluble, carboxylated derivative of a fatty imidazoline selected from amphoteric detergents of the formula:

(i)



wherein R₅ is an alkyl group containing 7 to 17 carbon atoms;

(ii)



wherein R₆ is an alkyl group containing 7 to 17 carbon atoms; or

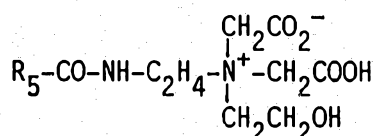
(iii) a mixture of (i) and (ii); and

1% to 6% by weight, based on the total weight of the composition, of a water soluble betaine-type detergent selected from a betaine, an alkamidopropyl betaine, a sulfobetaine, an alkamidopropyl hydroxysultaine and combinations thereof in a suitable liquid carrier.

2. The composition of claim 1, wherein M is an alkali metal selected from sodium or potassium.

3. The composition of claim 1, wherein M is a mono-, di- or tri-alkanolammonium selected from triethanolammonium, monoethanolammonium and diethanolammonium.

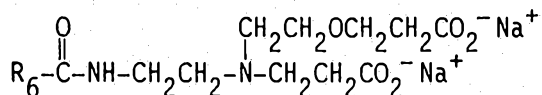
4. The composition of any one of claims 1 to 3, wherein the carboxylated derivative of a fatty imidazoline is an amphoteric detergent of the formula



wherein R_5 is an alkyl group containing 7 to 17 carbon atoms.

5. The composition of claim 4, wherein the amphoteric detergent is cocoamphocarboxyglycinate.

6. The composition of any one of claims 1 to 3, wherein the carboxylated derivative of a fatty imidazoline is an amphoteric detergent of the formula



wherein R_6 is an alkyl group containing 7 to 17 carbon atoms.

7. The composition of claim 6, wherein the amphoteric detergent is cocoamphocarboxypropionate.

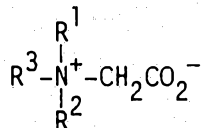
8. The composition of any one of claims 1 to 7, wherein R is an alkyl group containing from 7 to 10 carbon atoms and x is a number from 3 to 7.

9. The composition of any one of claims 1 to 8, wherein the anionic detergent is the ammonium salt of nonylphenoxypoly(ethyleneoxy)ethanol sulfate containing about 4 ethyleneoxy moieties per molecule, and said composition has a pH of 5.5 to 7.5.

10. The composition of any one of claims 1 to 9, wherein the anionic surfactant is present in an amount of 2% to 7% by weight, based on the total weight of the composition.

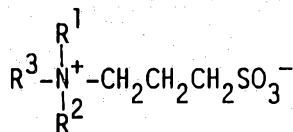
11. The composition of any one of claims 1 to 9, wherein the amphoteric detergent is present in an amount of 4% to 7% by weight, based on the total weight of the composition.

12. The composition of any one of claims 1 to 11, wherein the betaine has the structural formula



wherein R^1 and R^2 are the same or different alkyl radicals having 1 to 4 carbon atoms and R_3 is an alkyl radical having 8 to 18 carbon atoms.

13. The composition of any one of claims 1 to 11, wherein the sulfobetaine has the structural formula

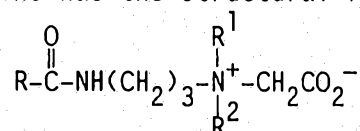


wherein R^1 and R^2 are the same or different alkyl radicals having 1 to 4 carbon atoms and R^3 is an alkyl radical having 8 to 18 carbon atoms.



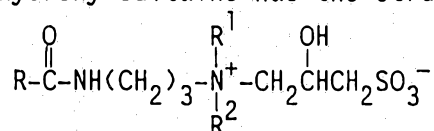
14. The composition of any one of claims 1 to 11, wherein the betaine-type surfactant is an alkamidopropyl betaine or an alkamidopropyl hydroxysultaine or a combination thereof.

15. The composition of any one of claims 1 to 11 or 14, wherein the alkamidopropyl betaine has the structural formulae



wherein R is an alkyl radical having 7 to 17 carbon atoms, R¹ and R² are the same or different alkyl radicals having 1 to 4 carbon atoms.

16. The composition of any one of claims 1 to 11 or 14, wherein the alkamidopropyl hydroxy sultaine has the structural formula



wherein R is an alkyl radical having 7 to 17 carbon atoms, R¹ and R² are the same or different alkyl radicals having 1 to 4 carbon atoms.

17. The composition of claim 14, wherein the betaine-type surfactant is cocamidopropyl betaine or cocamidopropyl hydroxysultaine or a combination thereof.

18. The composition of any one of claims 1 to 17, wherein the betaine-type surfactant is present in an amount of 1% to 4% by weight, based on the total weight of the composition.

19. The composition of any one of claims 1 to 18, wherein the composition has a pH of 6.0 to 7.0.

20. The composition of any one of claims 1 to 19, wherein the carrier comprises water.

21. The composition of any one of claims 1 to 20, further comprising from 0.1% to 3% by weight, based on the entire weight of the composition, of a water soluble polyethoxylated mono-fatty acid ester or di-fatty acid ester of methyl glucose, wherein said fatty acid contains from 8 to 18 carbon atoms and said polyethoxylated mono-fatty acid ester or di-fatty acid ester of methyl glucose contains from 80 to 160 ethyleneoxy moieties per molecule.

22. The composition of claim 21, wherein the fatty acids are ethylenically unsaturated fatty acids.

23. The composition of claim 21 or 22, wherein the fatty acid is oleic acid.



24. The composition of claim 21 or claim 22, wherein the methyl glucose ester is a di-fatty acid ester of methyl glucose.

25. The composition of claim 24, wherein the methyl glucose ester is methyl glucose dioleate containing 120 ethoxy moieties per molecule.

26. A mild detergent composition, substantially as herein described with reference to any one of Examples 5, 8-10, 12 or 13.

DATED this SECOND day of FEBRUARY 1990

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JLH/654y