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(54) Title: LAUNDRY COMPOSITION

(57) **Abstract:** A fabric conditioner composition comprising: 0.001 wt.% to 3 wt.% of a first organic acid or the salts thereof, selected from lactic acid, sodium benzoate and potassium sorbate; 0.001 wt.% to 3 wt.% further organic acid or salts thereof; 1 to 18 wt.% quaternary ammonium compound; and water.

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LAUNDRY COMPOSITION

Field of the Invention

The present invention is concerned with preservatives for fabric conditioner formulations.

Background of the Invention

Fabric conditioner compositions commonly comprise preservatives. Preservatives prevent the growth of mould or bacteria in the products. Traditionally isothiazolinone based preservatives have been used, such as Benzisothiazolinone, however there is a desire to move away from this class of preservatives. There is a need for effective replacements for isothiazone based preservatives.

Summary of the Invention

It has been found that the combination of two or more organic acids in a fabric conditioner composition provides improved preservation.

Accordingly in a first aspect of the present invention is provided a fabric conditioner composition comprising:

a 0.001 wt.% to 3 wt.% of a first organic acid or the salts thereof, selected from lactic acid, sodium benzoate and potassium sorbate;
b 0.001 wt.% to 3 wt.% further organic acid or salts thereof;
c 1 to 18 wt.% quaternary ammonium compound; and
d Water

Wherein the further organic acids or salts thereof comprise at least one acid/salt selected from: sodium benzoate, potassium sorbate, anisic acid, itaconic acid, sodium dehydroacetic acid; and
wherein the further organic acids and salts thereof are different to the first organic acid.

In a further aspect of the present invention is provided a method of preparing a fabric conditioner as described herein, wherein the organic acids and salts thereof are added to water prior to the addition of the quaternary ammonium compound.

Detailed Description of the Invention

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilised in any other aspect of the invention. The word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of.” In other words, the listed steps or options need not be exhaustive. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise indicated. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word “about”. Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y", it is understood that all ranges combining the different endpoints are also contemplated.

The compositions described herein comprise a first organic acid or the salts thereof, selected from lactic acid, sodium benzoate and potassium sorbate and further organic acids and salts thereof. The further organic acids and salts thereof are different to the first organic acid. In other words, if the first organic acid is lactic acid, the further organic acids and salts thereof do not comprise lactic acid.

Salts of the acids may be formed prior to addition to the composition of may form in the composition.

Organic acids are molecules comprising an acid group and at least one carbon atom. Preferably the acid group of the further organic acids is a carboxylic acid group. Preferably the further organic acids comprise only carbon, oxygen and hydrogen, when in the form of a salt the organic acids will additionally comprise a counter ion (which may be inorganic), such as sodium or potassium. The presence of lactic acid or salts thereof and further organic acids or salts thereof provides effective preservation.

The further organic acids or salts thereof maybe be a single species of acid or maybe a mixture of two or more organic acids or the salts thereof. Preferably the further organic acids or salts thereof comprise less than five species of acid. The further organic acids or salts thereof comprise at least one acid/salt selected from: sodium benzoate, potassium sorbate, anisic acid, itaconic acid, sodium dehydroacetic acid. More preferably the further organic acid or salt thereof comprises lactic acid, sodium benzoate, potassium sorbate or combinations thereof. Most preferably the first organic acid of salt thereof is lactic acid and the further organic acids or salts thereof comprise at least one acid/salt selected from: sodium benzoate, potassium sorbate or combinations thereof.

The fabric conditioner comprises 0.001 wt.% to 3 wt.% first organic acid or salt thereof, by weight of the fabric conditioner. More preferably the fabric conditioner comprises 0.002 wt.% to 2.5 wt.% first organic acid or salt thereof. Even more preferably 0.005 to 2 wt.% of the first organic acid or salt thereof, by weight of the fabric conditioner.

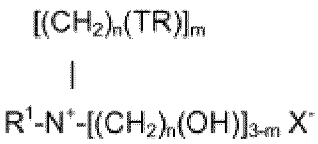
The fabric conditioner comprises 0.001 wt.% to 3 wt.% further organic acids or salt thereof, by weight of the fabric conditioner. More preferably the fabric conditioner comprises 0.002 wt.% to 2.5 wt.% further organic acids or salt thereof. Even more preferably 0.005 to 2 wt.% of the further organic acids or salt thereof, by weight of the fabric conditioner.

The compositions described herein further comprise a quaternary ammonium compound.

The quaternary ammonium compound (QAC) preferably comprises at least one chain derived from fatty acids, more preferably at least two chains derived from a fatty acid. Preferably the fatty acids are defined as aliphatic monocarboxylic acids having a chain of 4 to 28 carbons. Fatty acids may be derived from various sources such as tallow or plant sources. Preferably the fatty acid chains are derived from plants. Preferably the fatty acid chains of the QAC comprise from 10 to 50 wt. % of saturated C18 chains and from 5 to 40 wt. % of monounsaturated C18 chains by weight of total fatty acid chains. In a further preferred embodiment, the fatty acid chains of the QAC comprise from 20 to 40 wt. %, preferably from 25 to 35 wt. % of saturated C18 chains and from 10 to 35 wt. %, preferably from 15 to 30 wt. % of monounsaturated C18 chains, by weight of total fatty acid chains.

The preferred quaternary ammonium fabric softening actives for use in the method described herein are so called "ester quats" or ester-linked quaternary ammonium compounds. Particularly preferred materials are ester-linked triethanolamine (TEA) quaternary ammonium compounds comprising a mixture of mono-, di- and tri-ester linked components. Typically, TEA-based fabric softening compounds comprise a mixture of mono, di- and tri ester forms of the compound. Preferably the di-ester linked component comprises no more than 70 wt.% of the fabric softening compound, more preferably no more than 60 wt.% e.g., even more preferably no more than 55%, and most preferably no more that 45% of the fabric softening compound. Preferably the monoester component comprises at least 10 wt.% of the fabric softening compound.

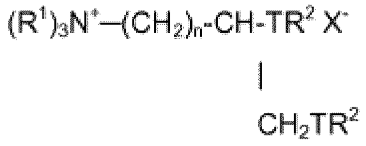
A first group of quaternary ammonium compounds (QACs) suitable for use in compositions described herein are represented by formula (I):



$$\begin{array}{l} \quad[(CH_2)_n(TR)]_m \\ \qquad | \\ R^1\text{-}N^+\text{-}[(CH_2)_n(OH)]_{3-m}\ X^- \end{array} \qquad (I)$$

wherein each R is independently selected from a C5 to C35 alkyl or alkenyl group; R^1 represents a C1 to C4 alkyl, C2 to C4 alkenyl or a C1 to C4 hydroxyalkyl group; T may be either O-CO. (i.e. an ester group bound to R via its carbon atom), or may alternatively be CO-O (i.e. an ester group bound to R via its oxygen atom); n is a number selected from 1 to 4; m is a number selected from 1, 2, or 3; and X- is an anionic counter-ion, such as a halide or alkyl sulphate, e.g. chloride or methylsulfate. Di-esters variants of formula I (i.e., m = 2) are preferred and typically have mono- and tri-ester analogues associated with them. Such materials are particularly suitable for use in the present invention.

A second group of QACs suitable for use in the compositions described herein are represented by formula (II):



$$\begin{array}{l} (R^1)_3N^+\text{—}(CH_2)_n\text{-}CH\text{-}TR^2\ X^- \\ \qquad\qquad\qquad\quad | \\ \qquad\qquad\qquad\quad CH_2TR^2 \end{array} \qquad (II)$$

wherein each R^1 group is independently selected from C1 to C4 alkyl, hydroxyalkyl or C2 to C4 alkenyl groups; and wherein each R^2 group is independently selected from C8 to C28 alkyl or alkenyl groups; and wherein n, T, and X- are as defined above.

Preferred materials of this second group include 1,2 bis[tallowoyloxy]-3- trimethylammonium propane chloride, 1,2 bis[hardened tallowoyloxy]-3- trimethylammonium propane chloride, 1,2-

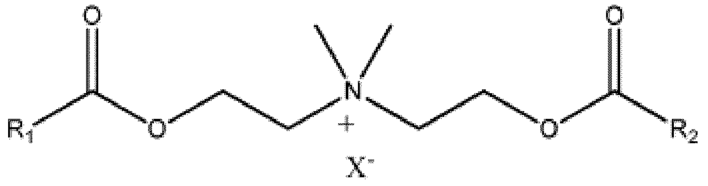
bis[oleoyloxy]-3-trimethylammonium propane chloride, and 1,2 bis[stearoyloxy]-3-trimethylammonium propane chloride. Such materials are described in US 4, 137,180 (Lever Brothers). Preferably, these materials also comprise an amount of the corresponding mono-ester.

A third group of QACs suitable for use in the compositions described herein are represented by formula (III):

$$(R^1)_2\text{-}N^+\text{-}[(CH_2)_n\text{-}T\text{-}R^2]_2\ X^- \quad \text{(III)}$$

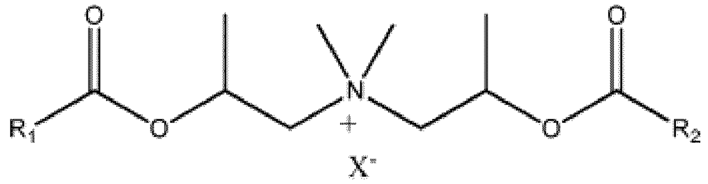
wherein each R^1 group is independently selected from C1 to C4 alkyl, or C2 to C4 alkenyl groups; and wherein each R^2 group is independently selected from C8 to C28 alkyl or alkenyl groups; and n, T, and X- are as defined above. Preferred materials of this third group include bis(2-tallowoyloxyethyl)dimethyl ammonium chloride, partially hardened and hardened versions thereof.

A fourth group of QACs are represented the by the formula (IV):



(IV)

A fifth group of QACs suitable for use in the invention are represented by formula (V)



(V)

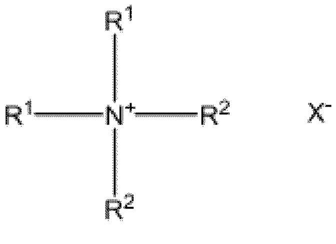
R_1 and R_2 are independently selected from C10 to C22 alkyl or alkenyl groups, preferably C14 to C20 alkyl or alkenyl groups. X- is as defined above.

The iodine value of the quaternary ammonium fabric conditioning material is preferably from 0 to 80, more preferably from 0 to 60, and most preferably from 0 to 45. The iodine value may be chosen as appropriate. Essentially saturated material having an iodine value of from 0 to 5, preferably from 0 to 1 may be used in the compositions described herein. Such materials are known as "hardened" quaternary ammonium compounds.

A further preferred range of iodine values is from 20 to 60, preferably 25 to 50, more preferably from 30 to 45. A material of this type is a "soft" triethanolamine quaternary ammonium compound, preferably triethanolamine di-alkylester methylsulfate. Such ester-linked triethanolamine quaternary ammonium compounds comprise unsaturated fatty chains.
If there is a mixture of quaternary ammonium materials present in the composition, the iodine value, referred to above, represents the mean iodine value of the parent fatty acyl compounds or fatty acids of all the quaternary ammonium materials present. Likewise, if there are any saturated quaternary ammonium materials present in the composition, the iodine value represents the mean iodine value of the parent acyl compounds of fatty acids of all of the quaternary ammonium materials present.

Iodine value as used in the context of the present invention refers to, the fatty acid used to produce the QAC, the measurement of the degree of unsaturation present in a material by a method of nmr spectroscopy as described in Anal. Chem., 34, 1136 (1962) Johnson and Shoolery.

A further type of quaternary ammonium compound may be a non-ester quaternary ammonium material represented by formula (VI):



$$R^1-\overset{\displaystyle R^1}{\underset{\displaystyle R^2}{N^+}}-R^2 \qquad X^-$$

(VI)

wherein each R^1 group is independently selected from C1 to C4 alkyl, hydroxyalkyl or C2 to C4 alkenyl groups; R^2 group is independently selected from C8 to C28 alkyl or alkenyl groups, and X- is as defined above.

The fabric conditioners comprise 1 to 18 wt. % quaternary ammonium compound, preferably 2 to 17 wt.% quaternary ammonium compound and more preferably 3 to 16 wt. % quaternary ammonium compound by weight of the composition.

The fabric conditioner compositions described herein comprise water. Preferably the fabric conditioner composition comprises at least 75 wt.% water, i.e. 75 to 98 wt.% water by weight of the composition.

The fabric conditioners may preferably comprise further ingredients suitable for use in a fabric conditioner. Among such materials there may be mentioned: non-ionic surfactants (such as the addition products of ethylene oxide and/or propylene oxide with fatty alcohols, fatty acids and fatty amines), fatty alcohols, fatty acids, antifoams, insect repellents, shading or hueing dyes, preservatives (e.g. bactericides), pH buffering agents, perfume carriers, hydrotropes, anti-redeposition agents, soil-release agents, polyelectrolytes, anti-shrinking agents, anti-wrinkle agents, anti-oxidants, dyes, colorants, sunscreens, anti-corrosion agents, drape imparting agents, anti-static agents, sequestrants and ironing aids. The products of the invention may contain pearlisers and/or opacifiers. A preferred sequestrant is HEDP, an abbreviation for Etidronic acid or 1-hydroxyethane 1,1-diphosphonic acid

Preferably the fabric conditioner composition comprises of perfume ingredients. Perfume ingredients may be free perfumes and/or encapsulated perfumes (perfume microcapsules). The encapsulating materials, preferably comprise, but are not limited to; aminoplasts, proteins, polyurethanes, polyacrylates, polymethacrylates, polysaccharides, polyamides, polyolefins, gums, silicones, lipids, modified cellulose, polyphosphate, polystyrene, polyesters or combinations thereof. More preferably the encapsulating materials comprise aminoplast, such as melamine formaldehyde or urea formaldehyde microcapsules, proteins and/or polysaccharides. The fabric conditioners preferably comprise 0.5 to 20 wt.% perfume ingredients by weight of the composition, more preferably 1 to 15 wt.% perfume materials, most preferably 2 to 10 wt. % perfume materials.

The present invention further relates to a method of producing a fabric conditioner as described herein. The method involves the steps of adding the first organic acid or salts thereof and further organic acids and salts thereof to water prior to the addition of the quaternary ammonium compound. This method provides improved stability of the composition. Preferably the quaternary ammonium compound is pre-melted prior to addition to the water, more preferably the quaternary ammonium compound is pre-melted at 55-70°C prior to addition to the water. The method described herein maybe carried out in batch processing (for example all mixing taking place in one vessel) or continuous processing (for example ingredients being added sequentially along a feed pipe). Mixing is preferably employed in the method. Mixing may be by any suitable means, for example a paddle stirrer in a tank or a static mixer in a feed pipe. Preferably the formulation is stirred after the addition of the quaternary ammonium compound, mixing may additionally take place at other stages of the method. The water used in the method is preferably at a temperature of 20°C to 55°C, more preferably 30°C to 50°C.

Further ingredients, when present may be added at any stage of the preparation method i.e. before the organic acids, or between the addition of the organic acids and the quaternary ammonium compound, or after the addition of the quaternary ammonium compound.

When perfume ingredients are present, free perfume and/or perfume microcapsules may be added at any stage of the preparation method. When both free perfume and perfume microcapsules are present, they may be added at the same stage of the method or at different stages of the method. Preferably free perfume is added after the quaternary ammonium compound. Preferably the free perfume is added after the mixture is cooled below 40°C.

Examples

Table 1: 2.35 % Fabric conditioner formulations

Ingredient	wt.% active									
	A	B	1	2	3	4	5	6	7	8
Fabric softening active[1]	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
Lactic acid	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0	0.1
Anisic acid	0	0	0.1	0	0	0	0	0	0	0
Itaconic acid	0	0	0	0.1	0	0	0	0	0	0
Sodium Benzoate	0	0	0	0	0.1	0.2	0	0	0.1	0
Potassium Sorbate	0	0	0	0	0	0	0.1	0.2	0.2	0
Sodium Dyhydroacetic Acid	0	0	0	0	0	0	0	0	0	0.11
Fatty alcohol[2]	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Alcohol ethoxylate[3]	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Thickening polymer[4]	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Perfume microcapsule	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Minors	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Water	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100

Fabric softening active[1] – TEA quaternary ammonium compound sourced from palm oil

Fatty alcohol[2] - Ceto - Stearyl Alcohol

Alcohol ethoxylate[3] - C16C18-Fatty alcohol + 25 EO

Thickening polymer[4] – Flosoft polymer ex. SNF

Table 2: 10.5 % Fabric conditioner formulation

Ingredient	wt.% active									
	C	D	9	10	11	12	13	14	15	16
Fabric softening active[5]	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
Lactic acid	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0
Anisic acid	0	0	0	0.1	0	0	0	0	0	0
Itaconic acid	0	0	0	0	0.1	0	0	0	0	0
Sodium Benzoate	0	0	0	0	0	0.1	0.2	0	0	0.1
Potassium Sorbate	0	0	0	0	0	0	0	0.1	0.2	0.2
Sodium Dyhydroacetic Acid	0	0	0.11	0	0	0	0	0	0	0
Thickening polymer[3]	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Perfume microcapsule	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Minors	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Water	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100	To 100

Fabric softening active[5] – TEA quaternary ammonium compound sourced from tallow

The 2.35% active fabric conditioners were prepared as follows: the fabric softening active and fatty alcohol were combined to form a premix at ~ 65°C. Water heated to a temperature of ~45°C, the alcohol ethoxylate was added followed by the minors, then the premix and the thickening polymer. The mixture was cooled to ~35°C and the perfume microcapsules added. The mixture was then cooled to room temperature.

The 10.5% active fabric conditioners were prepared as follows: the fabric softening active was melted at ~ 65°C. Water was heated to a temperature of ~45°C, the microcapsules were added, followed by the minors, then the premix and finally the thickening polymer. The mixture was then cooled to room temperature.

Test method:

A mould only challenge test method was performed on samples as defined in Tables 1 and 2. An *Aspergillus brasiliensis* (ATCC 16404) suspension was made at a concentration of 10^7 cfu/g. This inoculum was then added to each fabric conditioner prototype at a ratio of 1:100 (by weight), to achieve final suspension of 10^5 cfu/g of product. The inoculated fabric conditioners were stored in 25°C incubators for 28 days. The remaining level of *Aspergillus brasiliensis* (ATCC 16404) was quantified for each sample, and the log reduction calculated from the initial inoculum level after 28 days.

Table 3: 2.75 % active fabric conditioner log reduction results

Preservation system		**28 days – log reduction in total viable count**
A	0.1% lactic acid	2.18
B	0.5% lactic acid	2.02
1	0.1% lactic + 0.1% anisic acid	2.74
2	0.1% lactic acid + 0.1% itaconic acid	2.79
3	0.1% lactic acid + 0.1% sodium benzoate	>4.38
4	0.1% lactic acid + 0.2% sodium benzoate	>4.38
5	0.1% lactic acid + 0.1% potassium sorbate	>4.38
6	0.1% lactic acid + 0.2% potassium sorbate	>4.38
7	0.1% sodium benzoate + 0.2% potassium sorbate	>4.38
8	0.1 % lactic acid + 0.113% NaDHA	>4.38

Table 4: 10.5 % active fabric conditioner log reduction results

Preservation system		**28 days – log reduction in total viable count**
C	0.1% lactic acid	0.97
D	0.5% lactic acid	0.94
9	0.1% lactic acid + 0.113% NaDHA	3.94
10	0.1% lactic + 0.1% anisic acid	2.77
11	0.1% lactic acid + 0.1% itaconic acid	1.4
12	0.1% lactic acid + 0.1% sodium benzoate	4.41
13	0.1% lactic acid + 0.2% sodium benzoate	>4.41
14	0.1% lactic acid + 0.1% potassium sorbate	2.8
15	0.1% lactic acid + 0.2% potassium sorbate	>4.41
16	0.1% sodium benzoate + 0.2% potassium sorbate	>4.41

Combinations of first organic acid or the salts thereof, selected from lactic acid, sodium benzoate and potassium sorbate and a further organic acid provides an increase in log kill of the Aspergillus brasiliensis (ATCC 16404) compared to lactic acid alone. The combinations of lactic acid with sodium benzoate, lactic acid with potassium sorbate, and sodium benzoate with potassium sorbate provides the greatest increase in log kill of the Aspergillus brasiliensis (ATCC 16404).

CLAIMS

1. A fabric conditioner composition comprising:

   a 0.001 wt.% to 3 wt.% of a first organic acid or the salts thereof, selected from lactic acid, sodium benzoate and potassium sorbate;
   b 0.001 wt.% to 3 wt.% further organic acid or salts thereof;
   c 1 to 18 wt.% quaternary ammonium compound; and
   d Water

   Wherein the further organic acids or salts thereof comprise at least one acid/salt selected from: sodium benzoate, potassium sorbate, anisic acid, itaconic acid, sodium dehydroacetic acid; and
   wherein the further organic acids and salts thereof are different to the first organic acid.

2. A fabric conditioner composition according to claim 1, wherein the further organic acid or salts thereof comprise carboxylic acids.

3. A fabric conditioner composition according to any preceding claim, wherein the further organic acid or the salts thereof comprise acid/salt selected from: lactic acid, sodium benzoate, potassium sorbate or combinations thereof.

4. A fabric conditioner composition according to any preceding claim, wherein the first organic acid is lactic acid or the salts thereof and the further organic acid or salts thereof comprise acid/salt selected from: sodium benzoate, potassium sorbate or combinations thereof.

5. A fabric conditioner composition according to any preceding claim, wherein the quaternary ammonium compound is an ester-linked quaternary ammonium compound.

6. A method of preparing a fabric conditioner according to any preceding claim, wherein the organic acids and salts thereof are added to water prior to the addition of the quaternary ammonium compound.

7. A method according to claim 6, wherein the quaternary ammonium compound is pre-melted prior to addition to the water.

8. A method according to claim 6 or 7, wherein the water is at a temperature of 20°C to 55°C.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/050731

A. CLASSIFICATION OF SUBJECT MATTER
INV. C11D1/62 C11D3/00 C11D3/20 C11D11/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C11D D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2022/115442 A1 (COLGATE PALMOLIVE CO [US]) 2 June 2022 (2022-06-02) claims examples -----	1-8
A	US 2014/189962 A1 (TOVAR PESCADOR JOSE JAVIER [MX] ET AL) 10 July 2014 (2014-07-10) example -----	1-8
A	GB 1 599 171 A (PROCTER & GAMBLE) 30 September 1981 (1981-09-30) example 10 claims ----- -/--	1-3

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
12 March 2024	23/04/2024

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Neys, Patricia

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International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2019/142194 A1 (SHARON LABORATORIES LTD [IL]) 25 July 2019 (2019-07-25) table 12 claims 1-19,28 page 15, paragraph 134 - paragraph 135 -----	1-8

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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