



(51) International Patent Classification:

A61K 8/365 (2006.01) *A61Q 5/06* (2006.01)
A61Q 5/04 (2006.01)

(21) International Application Number:

PCT/EP2016/066949

(22) International Filing Date:

15 July 2016 (15.07.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

15177612.7 21 July 2015 (21.07.2015) EP

(71) **Applicant** (for AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only): **UNILEVER PLC** [GB/GB]; a company registered in England and Wales under company no. 41424 of Unilever House, 100 Victoria Embankment, London Greater London EC4Y 0DY (GB).

(71) **Applicant** (for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, KE, KN, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, US, VC, ZA, ZM, ZW): **UNILEVER N.V.** [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) **Applicant** (for US only): **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 800 Sylvan Avenue AG West, S. Wing, Englewood Cliffs, New Jersey 07632 (US).

(72) **Inventors**: **PAUL, Prem, Kumar, Cheyalazhagan**; Unilever R&D Port Sunlight Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB). **ROGERS, Charlotte, Breony, Tandy**; Unilever R & D Port Sunlight

Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB).

(74) **Agent**: **JAMES, Helen, Sarah**; Unilever PLC, Unilever Patent Group, Colworth House, Sharnbrook, Bedford Bedfordshire MK44 1LQ (GB).

(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))

(54) Title: HAIR SHAPING COMPOSITION

(57) **Abstract**: The invention provides a hair shaping composition suitable for topical application to hair, the composition having a pH of 4 or less and comprising, in an aqueous continuous phase: (i) at least 0.5% (by weight based on the total weight of the composition) of a first component selected from D-glucono- δ -lactone, D-glucono- γ -lactone, D-gluconic acid and mixtures thereof; (ii) at least 0.1% (by weight based on the total weight of the composition) of a second component selected from glyoxylic acid, glyoxylic acid hydrate, salts thereof and mixtures thereof; in which the weight ratio of first component (i) to second component (ii) in the hair shaping composition ranges from 10:1 to 1:10.



5 **HAIR SHAPING COMPOSITION**

Field of the Invention

This invention relates to a hair shaping composition, and more particularly a hair
10 shaping composition which does not require the breakage of hair disulfide bonds.

Background and Prior Art

Many people with naturally kinky, curly, or even wavy hair often desire to straighten
15 their hair. Permanent hair straightening compositions that are on the market are based
on chemical treatment of the hair in a two-step process using reducing agents to break
hair disulfide bonds, followed by a neutralisation or oxidation step to re-establish new
disulfide bonds in the desired configuration. Such systems have various negatives
associated with them; in that the process itself is difficult to conduct, in many instances
20 this straightening process is undertaken by a qualified hairdresser in a professional
salon. Furthermore the straightening process damages the hair, has an unpleasant
odour and can cause irritation to the scalp.

Surprisingly we have found that hair can be shaped without causing the chemical
25 damage which is traditionally associated with permanent hair straightening processes
involving breakage of the hair disulfide bonds.

Advantageously the method of the invention can be accomplished by a consumer
without intervention of a professional hairdresser. Furthermore, hair shaped with the
30 method of the invention remains shaped even after subsequent washing.

5 **Summary of the Invention**

The present invention provides a hair shaping composition suitable for topical application to hair, the composition having a pH of 4 or less and comprising, in an aqueous continuous phase:

10

(i) at least 0.5% (by weight based on the total weight of the composition) of a first component selected from D-glucono- δ -lactone, D-glucono- γ -lactone, D-gluconic acid and mixtures thereof;

15 (ii) at least 0.1% (by weight based on the total weight of the composition) of a second component selected from glyoxylic acid, glyoxylic acid hydrate, salts thereof and mixtures thereof;

20 in which the weight ratio of first component (i) to second component (ii) in the hair shaping composition ranges from 1:10 to 10:1.

The invention also provides a method for shaping hair which comprises the steps of treating the hair by topical application of a hair shaping composition as defined above, followed by mechanically shaping the treated hair.

25

Detailed Description and Preferred Embodiments

All molecular weights as used herein are weight average molecular weights, unless otherwise specified.

30

By "aqueous continuous phase" is meant a continuous phase which has water as its basis.

35 A hair shaping composition according to the invention will generally comprise at least 60%, preferably at least 70% and more preferably at least 80% water (by weight based on the total weight of the composition). Preferably, the composition comprises no more than 99% and more preferably no more than 98% water (by weight based on the total

- 5 weight of the composition). Other organic solvents may also be present, such as lower alkyl alcohols and polyhydric alcohols. Examples of lower alkyl alcohols include C₁ to C₆ monohydric alcohols such as ethanol and isopropanol. Examples of polyhydric alcohols include propylene glycol, hexylene glycol, glycerin, and propanediol. Mixtures of any of the above described organic solvents may also be used.
- 10 The hair shaping composition of the invention comprises, *inter alia*, a first component (i) selected from D-glucono- δ -lactone, D-glucono- γ -lactone, D-gluconic acid and mixtures thereof.

D-glucono- δ -lactone is the cyclic 1,5-intramolecular ester of D-gluconic acid, which is
15 produced industrially by enzymatic oxidation of D-glucose.

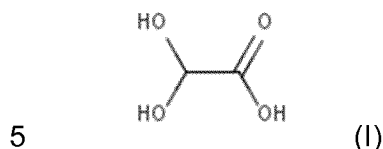
D-glucono- δ -lactone *per se* is available in the form of a particulate solid (e.g. a crystalline powder). In aqueous media it may exist in an equilibrium mixture together with its isomer (D-glucono- γ -lactone), and its hydrolysis product (D-gluconic acid).
20 Any of these forms or a mixture of any of these forms are suitable for use in the invention.

Preferably D-glucono- δ -lactone *per se* is used in the composition of the invention.

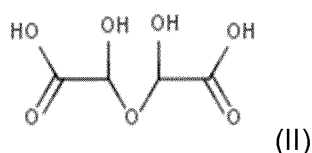
25 In the hair shaping composition of the invention, the level of first component (i) (preferably D-glucono- δ -lactone) preferably ranges from 0.5 to 6%, more preferably from 1 to 3% and most preferably from 1.5 to 2.5% by weight based on the total weight of the composition.

30 The hair shaping composition of the invention comprises, *inter alia*, a second component (ii) selected from glyoxylic acid, glyoxylic acid, glyoxylic acid monohydrate, salts thereof and mixtures thereof

Glyoxylic acid (OHC-COOH) is known to exist as a hydrate of formula (I) under certain
35 conditions.



Also, glyoxylic acid may exist as a mixture of both the aldehyde and hydrate forms. The hydrate may also condense to dimers of formula (II).



10

Glyoxylic acid also forms salts with counterions such as alkali metal (preferably sodium), alkaline-earth metal (preferably calcium), ammonium and substituted ammonium ions.

15 Any of these forms or a mixture of any of these forms are suitable for use in the invention.

Preferably glyoxylic acid in aqueous solution is used in the composition of the invention. Glyoxylic acid in aqueous solution generally exists as the hydrate of formula (I) together with a small proportion of the dimer of formula (II).

20

In the hair shaping composition of the invention, the level of second component (ii) (preferably glyoxylic acid hydrate of formula (I)) preferably ranges from 0.1 to 8%, more preferably from 0.2 to 4% and most preferably from 0.5 to 2.5% by weight based on the total weight of the composition.

25

In the hair shaping composition of the invention, the weight ratio of first component (i) (preferably D-glucono-δ-lactone) to second component (ii) (preferably glyoxylic acid hydrate of formula (I)) preferably ranges from about 8:1 to about 3:5, and more preferably ranges from about 5:1 to about 1:1.

30

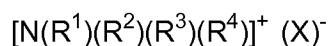
- 5 Advantageously, the hair shaping composition of the invention does not require the incorporation of reducing agents, and a hair shaping composition according to the invention is generally substantially free of such materials.

10 The term “substantially free” in the context of this invention means that reducing agents are absent or included in trace quantities only, such as no more than 0.1%, preferably no more than 0.01%, and more preferably from 0 to 0.001% by weight based on the total weight of the composition.

15 The term “reducing agent” in the context of this invention means an agent which is effective to break hair disulfide bonds when applied to hair for a period ranging from about 3 to 15 minutes and at a temperature ranging from about 20 to 30°C. Examples of such reducing agents are ammonium thioglycolate (in a solution having a pH of between about 7 and 10.5), glyceryl monothioglycolate (employed at a pH of less than 7), thioglycolic acid, dithioglycolic acid, mercaptoethyl amine, mercaptopropionic acid, 20 dithioglycolate and alkali metal or ammonium sulfites or bisulfites.

A hair shaping composition according to the invention may suitably have a conditioning gel phase, which may be generally characterized as a gel ($L\beta$) surfactant mesophase consisting of surfactant bilayers. Such a conditioning gel phase may be formed from a 25 cationic surfactant, a high melting point fatty alcohol and an aqueous carrier. Typically these components are heated to form a mixture, which is cooled under shear to room temperature. The mixture undergoes a number of phase transitions during cooling, normally resulting in a gel ($L\beta$) surfactant mesophase consisting of surfactant bilayers.

30 Examples of suitable cationic surfactants which are useful for forming the conditioning gel phase include quaternary ammonium cationic surfactants corresponding to the following general formula:



35

in which R^1 , R^2 , R^3 , and R^4 are each independently selected from (a) an aliphatic group of from 1 to 22 carbon atoms, or

- 5 (b) an aromatic, alkoxy, polyoxyalkylene, alkylamido, hydroxyalkyl, aryl or alkylaryl group having up to 22 carbon atoms; and X is a salt-forming anion such as those selected from halide, (e.g. chloride, bromide), acetate, citrate, lactate, glycolate, phosphate nitrate, sulphate, and alkylsulphate radicals.
- 10 The aliphatic groups can contain, in addition to carbon and hydrogen atoms, ether linkages, and other groups such as amino groups. The longer chain aliphatic groups, e.g., those of about 12 carbons, or higher, can be saturated or unsaturated. Specific examples of such quaternary ammonium cationic surfactants of the above general formula are cetyltrimethylammonium chloride, behenyltrimethylammonium
- 15 chloride (BTAC), cetylpyridinium chloride, tetramethylammonium chloride, tetraethylammonium chloride, octyltrimethylammonium chloride, dodecyltrimethylammonium chloride, hexadecyltrimethylammonium chloride, octyldimethylbenzylammonium chloride, decyldimethylbenzylammonium chloride, stearyldimethylbenzylammonium chloride, didodecyldimethylammonium chloride,
- 20 dioctadecyldimethylammonium chloride, tallowtrimethylammonium chloride, cocotrimethylammonium chloride, dipalmitoylethyldimethylammonium chloride, PEG-2 oleylammonium chloride and salts of these, where the chloride is replaced by other halide (e.g., bromide), acetate, citrate, lactate, glycolate, phosphate nitrate, sulphate, or alkylsulphate.
- 25 In a preferred class of cationic surfactant of the above general formula, R^1 is a C_{16} to C_{22} saturated or unsaturated, preferably saturated, alkyl chain and R^2 , R^3 and R^4 are each independently selected from CH_3 and CH_2CH_2OH , preferably CH_3 . Specific examples of such preferred quaternary ammonium cationic surfactants for use
- 30 in forming the conditioning gel phase are cetyltrimethylammonium chloride (CTAC), behenyltrimethylammonium chloride (BTAC) and mixtures thereof.

Mixtures of any of the above-described cationic surfactants may also be suitable.

- 35 The level of cationic surfactant suitably ranges from 0.1 to 10%, preferably from 0.2 to 5% and more preferably from 0.25 to 4% (by total weight of cationic surfactant based on the total weight of the composition).

- 5 By “high melting point” in the context of this invention is generally meant a melting point of 25°C or higher. Generally the melting point ranges from 25°C up to 90°C, preferably from 40°C up to 70° C and more preferably from 50°C up to about 65°C.

10 The high melting point fatty alcohol can be used as a single compound or as a blend or mixture of at least two high melting point fatty alcohols. When a blend or mixture of fatty alcohols is used, the melting point means the melting point of the blend or mixture.

Suitable fatty alcohols of this type have the general formula R-OH, where R is an aliphatic carbon chain. Preferably R is a saturated aliphatic carbon chain comprising
15 from 8 to 30 carbon atoms, more preferably from 14 to 30 carbon atoms and most preferably from 16 to 22 carbon atoms.

R can contain, in addition to carbon and hydrogen atoms, ether linkages, and other groups such as amino groups.
20

Most preferably, the fatty alcohol has the general formula $\text{CH}_3(\text{CH}_2)_n \text{OH}$, where n is an integer from 7 to 29, preferably from 15 to 21.

Specific examples of suitable fatty alcohols are cetyl alcohol, stearyl alcohol, behenyl alcohol, and mixtures thereof. Cetyl alcohol, stearyl alcohol and mixtures thereof are
25 particularly preferred.

Mixtures of any of the above-described fatty alcohols may also be suitable.

30 The level of fatty alcohol suitably ranges from 0.01 to 10%, preferably from 0.1 to 8%, more preferably from 0.2 to 7% and most preferably from 0.3 to 6% (by weight based on the total weight of the composition).

The weight ratio of cationic surfactant to fatty alcohol is suitably from 1:1 to 1:10,
35 preferably from 1:1.5 to 1:8, optimally from 1:2 to 1:5.

5 A hair shaping composition according to the invention may also incorporate other optional ingredients to enhance performance and/or consumer acceptability. Suitable optional ingredients include: preservatives, colouring agents, chelating agents, antioxidants, fragrances, antimicrobials, antidandruff agents, cationic conditioning polymers, styling ingredients, sunscreens, proteins and hydrolysed proteins.

10

The pH of the hair shaping composition of the invention is 4 or less, and preferably ranges from 1.5 to 3.8, more preferably from 2.5 to 3.5 and most preferably from 2.8 to 3.2.

15 Preferably, the hair shaping composition is a single dose composition. The term "single dose" in the context of this invention means that the composition is to be topically applied to the hair in one go.

20 The hair shaping composition of the invention is suitable for topical application to hair for improved hair volume-down. The term "volume-down" in the context of this invention generally means reduced visible bulkiness of the hair. For many consumers, improved hair volume-down provides a number of associated benefits, such as improved straightness, smoothness, manageability and style retention.

25 The hair shaping composition of the invention is preferably topically applied to the hair at a temperature from 15 to 40°C, and more preferably at a temperature from 20 to 30°C.

30 Preferably, the composition is applied to dry hair. The term "dry hair" in the context of this invention generally means hair from which free water (i.e. water disposed as a film or droplets on the cuticle surface) has been substantially removed. Hair may be dried by exposure to air, by use of a heated hair drying appliance, by rubbing with a water-absorbent article, or by a combination of any of these methods. Preferably, the dry hair will not have been washed or actively wetted, (such as by shampooing, conditioning, 35 rinsing or otherwise treating with an aqueous composition) in the preceding 2 hours and more preferably in the preceding 3 hours prior to topical application of the composition, and will have been permitted to acclimatise to atmospheric conditions. In such

5 circumstances there is substantially no free water present which interferes with the adsorption of the composition on application. A suitable indicator of dry hair in the context of this invention would be a hair fibre whose calculated water content does not exceed 25% by weight based on the total weight of the hair fibre.

10 After topical application to the hair, it is preferred that the hair shaping composition is allowed to remain in contact with the hair without rinsing. More preferably, the hair shaping composition is allowed to remain in contact with the hair without rinsing until the hair thus treated is dry.

15 The hair thus treated may be dried naturally by exposure to air, by use of a heated hair drying appliance, by rubbing with a water-absorbent article, or by a combination of any of these methods.

20 The hair shaping composition may thus remain in contact with the hair after topical application for a period of at least about 3 minutes up to 3 hours or more if the hair is allowed to dry naturally.

In step (ii) of the method of the invention, the treated hair is mechanically shaped.

25 Mechanical shaping of the hair in the method of the invention can be accomplished by such means as the finger tips, a plastic hair pick or the tail of a comb, the shaping being performed on portions of the hair comprising strands of hair in various numbers. Using such means the hair may be pulled, combed, smoothed, pressed or flattened into a straightened configuration; or shaped gently into bends, waves or curls.

30 Preferably in step (ii) of the method of the invention, the hair is mechanically shaped by mechanically straightening it. For example, the hair may be pulled, combed, smoothed, pressed or flattened into a straightened configuration.

35 A hot tool, such as an electrically heated flat hair iron or hand-held hair dryer, may be used in the mechanical shaping step. Such tools apply high levels of heat directly to the

- 5 hair, and are usually employed at temperature settings of at least 50°C, with an upper limit dependent on the particular tool.

Preferably the hair is mechanically shaped in step (ii) of the method of the invention by mechanically straightening it with an electrically heated flat hair iron. Electrically
10 heated flat hair irons are usually employed at a temperature of at least 120°C and can reach temperatures as high as 230°C. However, the method of this invention also gives good results at significantly lower operating temperatures than this (e.g. around 170 to 200°C). This is particularly advantageous for minimizing damage to hair.

- 15 In a typical method for shaping hair according to the invention, the hair shaping composition is topically applied to dry hair and the hair thus treated is combed straight at a temperature from 15 to 40°C, preferably at a temperature from 20 to 30°C. The treated, combed hair is dried (or allowed to dry) without rinsing the composition from the hair, and the dry hair is then mechanically shaped by mechanically straightening it with
20 a hot tool (preferably an electrically heated flat hair iron) at an operating temperature from 120 to 220°C, preferably from 150 to 210°C, and more preferably from 170 to 200°C.

The hair shaping composition may then be rinsed from the hair at the next wash.
25

Surprisingly, the inventors have found that the improved “volume-down” provided by the hair shaping composition in accordance with the invention is capable of persisting after washing.

- 30 Accordingly the invention also provides a method for shaping and re-shaping hair comprising the following steps:

- (i) treating the hair by topical application of a hair shaping composition as defined above;
- 35 (ii) mechanically shaping the treated hair;
- (iii) rinsing the shaped hair, and
- (iv) mechanically re-shaping the rinsed hair.

5

In a typical method for shaping and re-shaping hair according to the invention, the hair shaping composition is topically applied to dry hair and the hair thus treated is combed straight at a temperature from 15 to 40°C, preferably at a temperature from 20 to 30°C. The treated, combed hair is dried (or allowed to dry) without rinsing the composition from the hair, and the dry hair is then mechanically straightened with a hot tool at an operating temperature from 120 to 220°C, preferably from 150 to 210°C, and more preferably from 170 to 200°C. The hair shaping composition is then rinsed from the hair at the next wash: typically after a period of about 24 to 72 hours following the initial application of the composition in step (i). The rinsed hair is then mechanically re-shaped.

15

The rinsing step may be conducted with water alone or with shampoo.

20

The use of hot tools is not essential in the re-shaping step. This is especially advantageous for consumers who wish to reduce or avoid the exposure of their hair to high temperatures, for example if their hair is fragile or overprocessed from previous chemical treatments such as bleaching and perming.

25

Accordingly the hair is preferably re-shaped by combing it into a straightened configuration at a temperature from 15 to 40°C, more preferably at a temperature from 20 to 30°C.

30

Method steps (i) to (iv) as described above may also be repeated over one or more (e.g. two or three) cycles.

The invention is further illustrated with reference to the following, non-limiting Examples.

In the Examples, all ingredients are expressed by weight percent of the total formulation, and as level of active ingredient. Comparative Examples (not according to the invention) are indicated by letter; Examples according to the invention are indicated by number.

35

5 **EXAMPLES**

Example 1 and (Comparative) Examples A and B

Dark brown European wavy#6 switches of length 25 cm and weight 2gms, were
10 soaked in the following test solutions:

Example A: Aqueous solution, 2% D-glucono- δ -lactone

Example B Aqueous solution, 2% glyoxylic acid

Example 1: Aqueous solution, 2% glyoxylic acid and 2% D-glucono- δ -lactone
15

Control switches were soaked in water.

After 30 minutes, the switches were removed and were left to dry at 20°C and 50%RH.
When dry the switches were ironed with 5-7 passes using straighteners at 200°C.
20

The switches were subsequently washed a number of times and images of the
switches were captured when dry and after combing.

The volumes of the switches were measured using an image analysis kit. The volume
25 of the switches shows the volume-down (straightness) benefits of the treatment (here
volume refers to the projection of the switch image on to the screen and is given in
mm²). The percentage benefit (i.e. decrease in volume) with respect to control (water)
was also measured.

30 The results are shown in Table 1.

5

Table 1

Volumes of treated hair switches in mm² after a single heat treatment and subsequent three washes.

10

Treatment	after 1st wash		after 2nd wash		after 3rd wash	
	volume	%benefit	volume	%benefit	volume	%benefit
Control (water)	18142	0.0	17309	0.0	17392	0.0
Example A	13577	25.2	12156	29.8	15139	13.0
Example B	10903	39.9	12929	25.3	14795	14.9
Example 1	8944	50.7	9661	44.2	10713	38.4

15

From the table it can be seen that the switches treated with Example 1 maintain their straightness after multiple washes. By contrast, the straightness of the switches treated with either Example A or Example B tapers off. This shows that the composition according to the invention provides synergistic benefits in terms of longer lasting straightness.

5 Example 2

The following formulation illustrates a hair shaping composition according to the invention

Ingredient	% activity	%w/w raw material
Behentrimonium chloride	70	1.1429
Cetearyl alcohol	100	3.0
Perfume	100	0.60
Preservative	100	0.2
Dimethicone emulsion	70	1.429
Glyoxylic Acid	50	2.0
D-glucono- δ -lactone	100	2.0
Water	100	To 100%
pH = 3.0		

5 CLAIMS

1. A hair shaping composition suitable for topical application to hair, the composition having a pH of 4 or less and comprising, in an aqueous continuous phase:
10 (i) at least 0.5% (by weight based on the total weight of the composition) of a first component selected from D-glucono- δ -lactone, D-glucono- γ -lactone, D-gluconic acid and mixtures thereof;
15 (ii) at least 0.5% (by weight based on the total weight of the composition) of a second component selected from glyoxylic acid, glyoxylic acid hydrate, salts thereof and mixtures thereof;
20 in which the weight ratio of first component (i) to second component (ii) in the hair shaping composition ranges from 10:1 to 1:10.
2. A composition according to claim 1, in which the level of first component (i) ranges from 1.5 to 2.5% by weight based on the total weight of the composition.
- 25 3. A composition according to claim 1 or claim 2, in which the first component (i) is D-glucono- δ -lactone.
4. A composition according to any one of claims 1 to 3, in which the level of second component (ii) ranges from 0.5 to 2.5% by weight based on the total
30 weight of the composition.
5. A composition according to any one of claims 1 to 4, in which the second component (ii) is glyoxylic acid hydrate.
- 35 6. A method for shaping hair which comprises the steps of treating the hair by topical application of a hair shaping composition according to any one of claims 1 to 5, followed by mechanically shaping the treated hair.

- 5 7. A method according to claim 6, in which the treated hair is mechanically shaped
by mechanically straightening it with a hot tool at an operating temperature from
170 to 200°C.
- 10 8. A method according to claim 6 or claim 7, in which the hair shaping composition
is topically applied to dry hair.
9. A method for shaping and re-shaping hair comprising the following steps:
- 15 (i) treating the hair by topical application of a hair shaping composition
according to any one of claims 1 to 5,
- (ii) mechanically shaping the treated hair;
- (iii) rinsing the shaped hair, and
- (iv) mechanically re-shaping the rinsed hair.

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/066949

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61K8/365 A61Q5/04 A61Q5/06
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)

A61K A61Q

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2011/104282 A2 (ALDERAN S A S DI D OTTAVI ADELE & C [IT]; MANNOZZI ALDERANO [IT]) 1 September 2011 (2011-09-01) page 2, line 28 - page 7 page 13; table 1; compound 66 -----	1-9
A	WO 2014/072645 A1 (OREAL [FR]) 15 May 2014 (2014-05-15) page 1, line 28 - page 2, line 25 page 3, line 18 - page 5, line 31 -----	1-9
A	WO 2013/174690 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]; CONOPCO INC DBA UNILEVER [US]) 28 November 2013 (2013-11-28) the whole document ----- -/-	1-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

5 September 2016

Date of mailing of the international search report

13/09/2016

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Paul Soto, Raquel

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/066949

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 2005/084623 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]; ELLIOTT) 15 September 2005 (2005-09-15) the whole document -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/066949

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011104282 A2	01-09-2011	AU 2011219795 A1 BR PI1002742 A2 CN 102970962 A EP 2538916 A2 IT 1398503 B1 JP 2013520468 A JP 2016047851 A RU 2012140303 A SG 183477 A1 SG 10201406083S A US 2012312317 A1 WO 2011104282 A2	18-10-2012 29-05-2012 13-03-2013 02-01-2013 01-03-2013 06-06-2013 07-04-2016 27-03-2014 27-09-2012 27-11-2014 13-12-2012 01-09-2011
WO 2014072645 A1	15-05-2014	EP 2916806 A1 FR 2997845 A1 US 2015305469 A1 WO 2014072645 A1	16-09-2015 16-05-2014 29-10-2015 15-05-2014
WO 2013174690 A1	28-11-2013	EA 201491865 A1 EP 2852376 A1 JP 2015517542 A US 2015328119 A1 WO 2013174690 A1	29-05-2015 01-04-2015 22-06-2015 19-11-2015 28-11-2013
WO 2005084623 A1	15-09-2005	AT 407655 T BR PI0507821 A CN 1929810 A CN 1929814 A EP 1722750 A1 JP 4913033 B2 JP 2007527878 A US 2008019938 A1 WO 2005084623 A1	15-09-2008 10-07-2007 14-03-2007 14-03-2007 22-11-2006 11-04-2012 04-10-2007 24-01-2008 15-09-2005