

(10) International Publication Number
WO 2013/174690 A1(43) International Publication Date
28 November 2013 (28.11.2013)

(51) International Patent Classification:

A61K 8/365 (2006.01) *A61Q 5/04* (2006.01)
A61K 8/60 (2006.01)

(21) International Application Number:

PCT/EP2013/060022

(22) International Filing Date:

15 May 2013 (15.05.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

12168632.3 21 May 2012 (21.05.2012) 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, 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, SC, SD, SG, SL, SZ, TT, TZ, UG, US, VC, ZA, ZM, ZW): **UNILEVER N.V.** [NL/NL]; Weena 455, NL-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). **PYE, Susan**; Unilever R&D Port Sunlight, Quarry Road East, Bebington, Wirral Merseyside CH63 3JW (GB). **WALL, Brian**,

Douglas; 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, 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, 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, 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, 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))

Published:

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

(54) Title: METHOD OF TREATING HAIR

(57) **Abstract**: A method of straightening the hair comprising the step of applying to the hair a hair treatment composition comprising: i) at least 0.8 weight percent of the total composition of a sugar lactone; and ii) at least 0.8 weight percent of the total composition of a bi or tridentate carboxylic acid; in which the ratio of sugar lactone to acid is 1:5 to 5:1; and iii) heating the resulting composition to a temperature of greater than 20°C for at least 10 seconds.



WO 2013/174690 A1

- 1 -

METHOD OF TREATING HAIR

The invention relates to a method of hair straightening.

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The current hair market has a wide range of straightening products. A common way to retain a particular hairstyle is by application of a hairspray, mousses, gel, lotions or wax. The materials in these compositions are generally film forming agents, resins, gums, and/or adhesive polymers. Such methods do not straighten the hair from wash to wash.

10

Permanent hair straightening compositions that are on the market are based on chemical treatment of the hair in a two-step process using thiol- or hydroxide-based reducing agents followed by a neutralisation or oxidation step. Such systems have various negatives associated with them; in that the process itself is difficult to conduct, in many instances 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.

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WO2005/084623 discloses styling/straightening compositions containing gluconolactone; however hair styled in this manner does not retain its style after subsequent washing

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The present invention has now found that hair can be straightened in a way that mitigates damage, yet remains straight even after subsequent washing.

- 2 -

Summary of Invention

The present invention relates to a method of straightening the hair comprising the step of applying to the hair a hair treatment composition comprising:

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- i) at least 0.8 wt % of the total composition of a sugar lactone; and
- ii) at least 0.8 wt % of the total composition of a bidentate or tridentate carboxylic acid in which the ratio of sugar lactone to acid is 1:5 to 5:1; and
- 10 iii) heating the resulting composition to a temperature of greater than 120 °C for at least 10 seconds.

Description of Invention

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The composition of the invention comprise a sugar lactone, preferably the sugar lactone is a monosaccharide, more preferably gluconolactone, especially preferred is glucono-delta-lactone.

20

The level of sugar lactone, preferably gluconolactone is at least 0.8 wt% of the total composition, preferably less than 8.0 wt% . More preferably the level of sugar lactone is from 1.0 wt% to 6.0 wt% of the total composition, most preferably the level of sugar lactone is from 1.5 to 5.0 wt%.

25

Compositions of the invention comprise a bidentate or tridentate organic acids. Preferably the organic acid is a di or tri carboxylic acid, more preferably the carboxylic acid is a short chain (C2-C10, preferably C3 to C6)) carboxylic acids, especially preferred are di or tri acid carboxylic acid, citric acid being particularly

30 preferred.

- 3 -

The bi or tridentate carboxylic acid is present in the total composition at a level of at least 0.8 wt%, more preferably at a level greater than 0.9 wt%, most preferably at a level from 1.0 to 5.0 wt%.

- 5 The ratio of sugar lactone to bi.tridentate carboxylic acid is from 1:5 to 5:1, more preferably from 1:3 to 3:1.

Hair care compositions of the present invention can comprise a carrier, or a mixture of such carriers, which are suitable for application to the hair. The carriers
10 are present at from about 0.5% to about 99.5%, preferably from about 5.0% to about 99.5%, more preferably from about 10.0% to about 96.0%, of the composition. As used herein, the phrase "suitable for application to hair" means that the carrier does not damage or negatively affect the aesthetics of hair or cause irritation to the underlying skin.

15

Compositions according to the invention comprise a buffer or pH adjuster. Preferred buffers or pH adjusters include weak acids and bases such as glycine/sodium hydroxide, lactic acid, succinic acid, acetic acid and salts thereof. Frequently a mixture of buffering system. Preferably the pH is 4 or below; more
20 preferably between 2.5 and 3.5.

Compositions according to the invention are preferably aqueous compositions intended to be applied to the hair after shampooing and rinsing. They are massaged into preferably dry hair and, heating, preferably followed by further
25 rinsing with water prior to drying the hair. By aqueous composition, it is meant that the compositions of the invention comprise 60% by weight or more of water, preferably 70% or more, more preferably 80% or more.

When the hair care composition is a hair spray, tonic, gel, or mousse the preferred
30 solvents include water, ethanol, volatile silicone derivatives, and mixtures thereof.

- 4 -

The solvents used in such mixtures may be miscible or immiscible with each other. Mousses and aerosol hair sprays can also utilise any of the conventional propellants to deliver the material as a foam (in the case of a mousse) or as a fine, uniform spray (in the case of an aerosol hair spray). Examples of suitable

5 propellants include materials such as trichlorofluoromethane, dichlorodifluoromethane, difluoroethane, dimethylether, propane, n-butane or isobutane. A tonic or hair spray product having a low viscosity may also utilise an emulsifying agent. Examples of suitable emulsifying agents include nonionic, cationic, anionic surfactants, or mixtures thereof. If such an emulsifying agent is
10 used, it is preferably present at a level of from about 0.01% to about 7.5% by weight based on total weight of the composition. The level of propellant can be adjusted as desired but is generally from about 3% to about 30% by weight based on total weight for mousse compositions and from about 15% to about 50% by weight based on total weight for aerosol hair spray compositions.

15 Hair styling creams or gels also typically contain a structurant or thickener, typically in an amount of from 0.01% to 10% by weight of the total composition.

Suitable spray containers are well known in the art and include conventional, non-
20 aerosol pump sprays i.e., "atomisers", aerosol containers or cans having propellant, as described above, and also pump aerosol containers utilising compressed air as the propellant.

The formulation may include conditioning materials such as surfactants, cationic
25 conditioners suitable for hair, quaternary silicone polymers, silicone based conditioners and their emulsions, and amino functional silicones and their emulsions.

Further general ingredients suitable for all product forms include, sun-screening
30 agents, anti-dandruff actives, carboxylic acid polymer thickeners and emulsifiers

- 5 -

for emulsifying the various carrier components of the compositions of the invention.

5 In some aspects of this invention it is highly desirable if the composition comprises a styling aid.

Particularly useful as styling aids with this invention are hair styling polymers. Hair styling polymers are well known articles of commerce and many such polymers are available commercially which contain moieties which render the polymers
10 cationic, anionic, amphoteric or nonionic in nature. The polymers may be synthetic or naturally derived.

The amount of the hair styling polymer may range from 0.1 to 10%, preferably 0.5 to 8 %, more preferably 0.75 to 6% by weight based on total weight of the
15 composition.

The compositions of the present invention may also contain adjuncts suitable for hair care. Generally such ingredients are included individually at a level of up to 2, preferably up to 1 wt% of the total composition. Suitable hair care adjuncts,
20 include amino acids, sugars and ceramides.

Although the product may be in any form suitable for application to the hair it is preferable if it is a rinse off product. Products used to condition the hair are especially preferred.

25

In use the composition of the invention is applied to the hair and then preferably rinsed off up to 60 minutes after application, more preferably this product is rinsed off 40 minutes after application.

- 6 -

The method of the invention comprises applying compositions of the invention followed by a heating step. The hair should be heated to a temperature above 120°C, more preferably above 150°C, most preferably above 170°C. It is preferable if the maximum temperature applied to the hair is 220°C.

5

The following non-limiting Examples further illustrate the preferred embodiments of the invention. All percentages referred to in the examples and throughout this specification are by weight based on total weight unless otherwise indicated.

10

Examples

Experiment 1:

Dark brown European wavy#6 switches of length 25cm and weight 2gms, were dosed with 1ml each of 2% citric acid; 4% citric acid; 2% gluconolactone; 4% gluconolactone and (2% citric acid + 2% gluconolactone) solutions. They were left to dry at 20°C and 50%RH for at least 30 minutes. When dry the switches were straightened 7 times with irons (set at 180°C) and exposed to high humidity (30°C 80%RH) for an hour. The volume of the switches at the end of the hour shows the straightening benefit of the sugars (volume refers to the projection of the switch image on to the screen and is given in mm²).

Treatment	Volume (mm²)	%Benefit
water	13617	0.0
2% Gluconolactone	11020	19.1
2% Citric acid	12017	11.8
4% Gluconolactone	8700	36.1
4% Citric acid	11948	12.3
2% Citric acid + 2% Glucoconolactone	6989	48.7

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- 7 -

From the table it can be seen that the combination gives synergistic benefits compared to the benefits expected from single actives alone i.e. the %benefit of combination is far greater than the sum of the %benefit of the individual actives at 2% level. The combination benefit is also greater than the single actives at the 4% level.

Experiment 2:

Dark brown European wavy#6 switches of length 25 cm and weight 2 gms, were dosed with 1ml each of solutions, the compositions of which are given in table below. They were left to dry at 20°C and 50%RH for at least 30 minutes. When dry the switches were straightened 7 times with irons (set at 180°C) and exposed to high humidity (30°C 80%RH) for 1 hour. The volume of the switches shows the straightening benefit of the sugars (volume refers to the projection of the switch image on to the screen and is given in mm²).

Treatment	Volume (mm ²)	%benefit
0%Citric acid + 2% Gluconolactone	11020	0.00
0.1%Citric acid + 2% Gluconolactone	11822	-7.28
0.5%Citric acid + 2% Gluconolactone	11174	-1.40
1%Citric acid + 2% Gluconolactone	8406	23.72
2%Citric acid + 2% Gluconolactone	6989	36.57

From the table it is clear that adding small amounts of citric acid to gluconolactone does not provide any benefits over gluconolactone alone.

Experiment 3:

Switches were treated with 1 gm of the combination of aqueous solution of 2%Citric acid + 2% Gluconolactone solution or 4% Citric acid solution or 4% Gluconolactone solution. They were dried for at least 30 minutes and ironed

- 8 -

straight with 180°C irons. They were subsequently washed twice with shampoo and conditioner. After the second wash the switches with the combination showed better straightness, more volume down and greater length of switches compared to the single active treated switches. The combination switches

5 retained the original straight style created with the initial application better than the single active treated switches.

CLAIMS

1. A method of straightening the hair comprising the step of applying to the hair
a hair treatment composition comprising:
5
 i) at least 0.8 weight percent of the total composition of a sugar lactone;
 and
 ii) at least 0.8 weight percent of the total composition of a bi or tridentate
10 carboxylic acid; in which the ratio of sugar lactone to acid is 1:5 to 5:1;
 and
 iii) heating the resulting composition to a temperature of greater than
120°C for at least 10 seconds.
15
2. A method according to claim 1 in which the sugar lactone is a
monosaccharide.
3. A method according to claim 2 in which the sugar lactone is gluconolactone.
20
4. A method according to any preceding claim in which the carboxylic acid is a
short chain (C2-C6) carboxylic acid.
5. A method according to any preceding claim in which the carboxylic acid is a
25 di or tri acid carboxylic acid.
6. A method according to any preceding claim in which the carboxylic acid is
citric acid.
- 30 7. A method according to any preceding claim in which the level of sugar
lactone is from 1.5 to 5 wt% of the total composition.

- 10 -

8. A method according to any preceding claim in which the level of short chain carboxylic acid is from 1 to 5 wt% of the total composition.
- 5 9. A method according to any preceding claim in which the pH of the composition is 4 or below at 20°C.
10. A method according to claim 6 in which the hair is heated to a temperature above 150°C.
- 10 11. A method of straightening the hair according to any preceding hair in which the composition is not washed off between application of the composition and the heating process.
- 15 12. A method according to claim 9 in which the composition is left on the hair for a minimum of 10 minutes before application of heat.
- 20 13. A method according to any preceding claim in which the composition is applied to dry hair.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/060022

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61K8/365 A61K8/60 A61Q5/04
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.
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A	WO 2010/049434 A2 (OREAL [FR]; DIXON FELICIA [US]; PISTORIO BRADFORD [US]; ELLINGTON ANGE) 6 May 2010 (2010-05-06) the whole document	1
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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

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"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

8 July 2013

Date of mailing of the international search report

17/07/2013

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

Donovan-Beermann, T

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2013/060022

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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