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(54) **Title**: ANTIPERSPIRANT COMPOSITIONS COMPRISING FRAGRANCE

(57) **Abstract**: The present invention relates to an antiperspirant composition comprising from 0.1 to 40% by weight of the total composition excluding any propellant that may be present, of an organosiloxane film-forming polymer; from 20 to 99.8% by weight of the total composition, excluding any propellant that may be present, of a volatile solvent which is capable of evaporation to an extent from 80 to 100% by weight within 120 minutes, measured in accordance with DIN 53249 at 25°C; and from 0.1 to 20% by weight of the total composition, excluding any propellant that may be present, of a fragrance comprising components (a) having boiling point of no more than 250°C at 1 bar pressure, and/or (b) having a LogP value of up to 4 and a boiling point of more than 250°C at 1 bar pressure; the total level of said components (a) and/or (b) being at least 40% by weight of the total fragrance. The present invention also relates to a cosmetic method of treating human perspiration as well as a cosmetic use of the film-forming polymer.



ANTIPERSPIRANT COMPOSITIONS COMPRISING FRAGRANCE

FIELD OF THE INVENTION

5 The present invention is in the field of fragrance-containing antiperspirant compositions that do not cause skin stickiness, particularly compositions free from aluminium and/or zirconium salts.

BACKGROUND OF THE INVENTION

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Typical antiperspirant compositions comprise both an antiperspirant active and a fragrance. A fragrance may be used to mask the malodour as well as increase the pleasant smell perceived by the consumers. Herein, the term 'fragrance' may be used interchangeably with the word 'perfume'. Conventional antiperspirant actives are
15 astringent aluminium and/or zirconium salts. Recently, there have been attempts to find alternative antiperspirant actives, to replace some or all of the aluminium and/or zirconium salts conventionally used.

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Polymers capable of forming films on hair and skin are known to the cosmetic industry; in particular, the use of said polymers with solvent to enhance the efficacy of cosmetic agents.

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US2013272995A discloses a cosmetic product containing a film-forming polymer having a polyacrylamide skeleton. The polymer has good compatibility with a variety of oils, especially silicone oils, readily spreads on skin and hair without sticky feeling, and forms a film having excellent water resistance, oil resistance and film properties. Perfume is an optional ingredient in the examples.

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WO2013/131107A1 discloses a composition containing polymeric microparticles, which is effective in reducing perspiration in the absence of aluminium /zirconium antiperspirant compounds. The composition may optionally comprise film-forming polymers, volatile silicone as a carrier and fragrance.

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WO2013/003459A2 discloses a transfer-resistant cosmetic composition comprising at least one silicone film forming polymer derived from acrylic acid, at least one naturally derived volatile solvent and a cosmetically acceptable carrier.

EP2444062A2 discloses a cosmetic product containing film-forming polymer composed of building blocks with cycloolefin skeletons. Said polymer has good compatibility with a variety of oils, especially silicone oil, readily spreads on the skin and hair without sticky
5 feeling and prevents the cosmetic product from staining clothes. Perfume is an optional ingredient in the examples.

WO2005/051337 discloses anhydrous antiperspirant compositions characterized by a skin-adhering polymer, one or more volatile solvents, antiperspirant active, thickening
10 agent and an anhydrous carrier. Fragrance is used in the examples.

GB2407496A discloses a method of forming a film on biological surface comprising mixing an alkylene trialkoxysilyl terminated polysiloxane, an alkoxysilane, a catalyst a
15 filler and a volatile diluent to form a formulation.

SUMMARY OF THE INVENTION

In a first aspect of the present invention, there is provided an antiperspirant composition comprising: 1) from 0.1 to 40% by weight of the total composition excluding any
20 propellant that may be present, of an organosiloxane film-forming polymer, 2) from 20 to 99.8% by weight of the total composition excluding any propellant that may be present, of a volatile solvent which is capable of evaporation to an extent from 80 to 100% by weight within 120 minutes, measured in accordance with DIN 53249 at 25°C, and 3)
25 from 0.1 to 20% by weight of the total composition excluding any propellant that may be present, of a fragrance comprising components (a) having boiling point of no more than 250°C at 1 bar pressure, and/or (b) having a LogP value of up to 4 and a boiling point of more than 250°C at 1 bar pressure; the total level of said components (a) and/or (b) is at least 40% by weight of the total fragrance.

30 The composition is preferably free from aluminium and/or zirconium salts.

In a second aspect of the present invention, there is provided a cosmetic method of treating human perspiration comprising topical application to axillary skin an
35 antiperspirant composition according to the first aspect of the invention.

In a third aspect of the present invention, there is provided cosmetic use of a film-forming polymer described in the first aspect of the invention as an antiperspirant agent, wherein the polymer is applied from an antiperspirant composition according to the first aspect of the invention.

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Herein, 'cosmetic use' should be understood to mean non-therapeutic use and 'cosmetic method' to mean 'non-therapeutic method'.

Herein, 'antiperspirant agent' should be understood to mean a substance that by itself
10 has the effect of reducing or limiting human perspiration

'Free from aluminium and/or zirconium salt' refers to a composition containing less than 1% by weight of, preferably less than 0.1% by weight of, preferably less than 0.09% by weight of and more preferably, containing zero percent by weight of aluminium and/or
15 zirconium salt.

'Film-forming polymer' should be understood to mean a polymer that is capable of forming a solid film that adheres to a substrate, such as human skin.

20 The inventors have surprisingly found that some of the polymers may form sticky films leaving behind a negative sensory feel. Moreover, the fragrance on its own or used together with film-forming polymers may also lead to stickiness.

It is therefore an objective of the present invention to provide a fragrance-containing
25 antiperspirant composition which does not cause skin stickiness.

It is another objective of the present invention to provide a film-forming polymer as an alternative antiperspirant active, delivered from a fragrance-containing composition wherein the performance of the polymer is enhanced by said fragrance, or at least not
30 compromised by the fragrance. An associated objective is to provide such a composition with stability. 'Stability' refers to compositions that do not deteriorate or suffer from physical alteration such as phase separation, colour change, precipitation during the extensive time of storage. One of the key criteria for stable formulation is that the formulation should be homogeneous.

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It is a further objective of the present invention to provide a fragrance-containing antiperspirant composition which can prevent, control or reduce body malodour.

It is still a further objective of the present invention to provide a fragrance-containing antiperspirant composition which does not produce significant marks on skin and/or stains on clothing.

The composition is preferably free from aluminium and/or zirconium salts.

Surprisingly, it has been found that satisfactory antiperspirant benefits and non-sticky skin can both be achieved by using an organosiloxane, film-forming polymer as an antiperspirant agent, delivered from an antiperspirant composition comprising said polymer, solvent with certain volatility and fragrance selected with certain boiling points and hydrophobicity. The antiperspirant composition is stable, giving no significant production of marks on skin and/or associated clothing and preferably free from aluminium and/or zirconium salts.

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.

DETAILED DESCRIPTION OF THE INVENTION

Any feature of one aspect of the present invention may be utilised in any other aspect of the invention. Any feature described as 'preferred' should be understood to be particularly preferred in combination with a further preferred feature or features. Herein, any feature of a particular embodiment may be utilized in any other embodiment 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. The examples given in the description below are intended to clarify the invention but not to limit the invention. 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 or 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, unless specified otherwise. 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.

Antiperspirant compositions

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Preferably, the composition is anhydrous. The term 'anhydrous' refers to compositions that contain less than 1% by weight of added water or free water, preferably less than 0.5wt %, more preferably less than 0.1 wt % and most preferably 0 wt%.

10 Preferably, the composition is free from aluminium and/or zirconium salt.

Preferably, the composition is homogeneous. By 'homogeneous' is meant a composition which is at least in a single phase, without any distinct separate layers (liquid or solid) at 20°C. The separate layers can be observed by naked eyes and/or any suitable
15 instrument. Preferably, the composition is a solution. Hence, the film-forming polymer is typically soluble in the volatile solvent; and both the polymer and the volatile solvent are typically soluble in the fragrance. Herein, by 'soluble' is meant having a solubility of at least 0.1g/100ml at 20°C, preferably at least 1g/100ml, more preferably at least 10g/100ml, even more preferably at least 20g/100ml, most preferably at least 40g/100ml.

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In certain preferred embodiments, the ethanol content of the composition is kept to a minimum, by which is meant the ethanol is no more than 10%, preferably no more than 5%, more preferably no more than 1%, still more preferably no more than 0.1%, most preferably zero percent by weight of the total composition.

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The antiperspirant composition may be in the form of a spray, a roll-on, or an aerosol. An aerosol or a pump-spray is the preferred form. The most preferred form is an aerosol comprising a propellant.

30 Fragrance

Fragrance is an essential feature of the present invention. However, the antiperspirant composition according to the present invention is preferably free from encapsulated fragrance. 'Encapsulated fragrance' should be understood to mean a fragrance
35 entrapped in one of the multiple encapsulating materials used for this purpose. 'Free from' used herein should be understood to mean the level of encapsulated fragrance in

the composition is less than 0.1wt%, preferably less than 0.01wt%, more preferably 0 wt%.

5 The level of the fragrance employed in an antiperspirant composition is from 0.1 to 20% by weight of the total composition excluding any propellant that may be present, preferably from 1 to 20 wt%, more preferably from 5 to 20 wt%, still more preferably from 10 to 15 wt%. If no propellant is employed in an antiperspirant composition, the preferred level of the fragrance is from 0.1 to 2%, more preferably from 0.5 to 1.5% by weight of the total composition.

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The fragrance according to the present invention comprises components (a) having boiling point of no more than 250°C and/or (b) components having boiling point of more than 250°C and LogP value of up to 4; the total level of said components (a) and/or (b) is at least 40% by weight of the total fragrance, preferably at least 50 wt%, more
15 preferably at least 70 wt%, still more preferably at least 90 wt%, even more preferably at least 95 wt%, most preferably the fragrance consisting of only said components (a) and/or (b). Herein, the boiling point is measured at 1 bar pressure.

20 LogP refers to the hydrophobicity of the components defined as log to base 10 of the n-octanol/water partition coefficient at 25°C. This may be expressed as:

$$\text{Log P (n-octanol/water)} = \log_{10}([\text{solute}]_{\text{n-octanol}}/[\text{solute}]_{\text{water}})$$

Wherein $[\text{solute}]_{\text{n-octanol}}$ is the molar concentration of the solute in n-octanol and $[\text{solute}]_{\text{water}}$ is the molar concentration of the solute in deionised water, the “solute” being
25 the fragrance component in question.

LogP can be measured at 25°C, by dissolving some of the solute in question (i.e. the fragrance component) in a volume of octanol and deionised water, shaking for a period of time, then measuring the concentration of the solute in each solvent and use the
30 equation (I) to calculate the log to base 10 of the octanol/water partition coefficient. Alternatively, logP values at 25°C can also be calculated by using COSMOthermo published from COSMOlogic GmbH & Co. KG in 2017.

35 Preferably, the fragrance comprises components (a) having boiling point of no more than 220°C, more preferably no more than 200°C, still more preferably no more than 150°C.

Preferably, the fragrance comprises components (b) having boiling point of more than 220°C and logP value of up to 3, more preferably having boiling point of more than 200°C and logP value up to 2.5, even more preferably having boiling point of more than 150°C and logP value of up to 2. Meanwhile, the total level of such preferred components (a) and/or (b) by weight of the total fragrance is at least 40wt%, preferably at least 50wt%, more preferably at least 70wt%, even more preferably at least 90wt%, still more preferably at least 95wt%, most preferably 100wt%. For example, in preferred embodiments, the fragrance comprises components (a) having boiling point of no more than 220°C, and/or (b) components having boiling point of more than 220°C and logP value of up to 3; wherein the total level of said components (a) and/or (b) is at least 50% by weight of the total fragrance, preferably at least 70wt%, more preferably at least 90 wt% and most preferably 100wt%.

In other preferred embodiments, the fragrance comprises components (a) having boiling point of no more than 200°C, and/or (b) components having boiling point of more than 200°C and logP value up to 2.5; wherein the total level of said components (a) and/or (b) is at least 50% by weight of the total fragrance, preferably at least 70 wt%, more preferably at least 90 wt% and most preferably 100wt%.

Representative components can be selected from butanol, octanol, limonene, linalool, hydroxycitronellal, eugenol, triethylcitrate, dipropylene glycol, acetal, 2-phenoxyethanol, 1,2-hexanediol, menthol, propylene carbonate, diethylphthalate, (-)-(s)-isomethylionone, citronellol, geraniol, menthylacetate, or mixtures thereof. The preferred representative components are selected from butanol, octanol, limonene, linalool, hydroxycitronellal, eugenol, triethylcitrate, dipropylene glycol, acetal, 2-phenoxyethanol, 1,2-hexanediol, menthol, propylene carbonate, or mixtures thereof. The total level of those representative components is at least 40% by weight of the total fragrance, preferably at least 50wt%, more preferably at least 70 wt%, still more preferably at least 90 wt% and most preferably 100 wt%.

In certain preferred embodiments, the fragrance comprises components having a boiling point of no more than 250°C, in a weight proportion of at least 40wt%, preferably at least 50 wt%, more preferably at least 75wt%, still more preferably at least 90wt%, even more preferably at least 95wt% and most preferably 100 wt%.

In other preferred embodiments, the fragrance comprises components having a boiling point of no more than 220°C, in a weight proportion of at least 40wt%, preferably at least 50 wt%, more preferably at least 75wt%, still more preferably at least 90wt%, even more preferably at least 95wt% and most preferably 100 wt%.

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In other preferred embodiments, the fragrance comprises components having a boiling point of no more than 200°C, in a weight proportion of at least 40wt%, preferably at least 50 wt%, more preferably at least 75wt%, still more preferably at least 90wt%, even more preferably at least 95wt% and most preferably 100 wt%.

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Subject to the aforementioned constraints, the fragrance can comprise at least 6 components, particularly at least 12 components and often at least 18 components. Such components can be extracts obtained from living or dead organisms, such as plants, including flowers, seeds, bark, and/or leaves, or can be synthetic possibly mimicking natural extracts and mixtures can comprise mixtures of purely natural extracts, purely synthetic components, or mixtures of both. The components comprised in fragrance include both fragrance ingredients and diluents. Fragrance ingredients used herein refer to those give pleasant and /or aromatic smell to users. Diluents used herein refer to those employed as carriers in fragrance. A diluent is typically an oil which is liquid and has solubility of less than 0.1g/100ml in water at 20°C. The weight ratio of the fragrance ingredients to diluents is often in the range from 1:2 to 1:1, preferably from 3:4 to 1:1.

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The boiling point of components are disclosed in published compilations such as 'Perfume and Flavor Chemicals' (Aroma Chemicals by Stephan Arctander, 1969). For some components, boiling point is available from the supplier such as from Sigma-Aldrich. For others, the boiling point can be measured by the skilled chemist. The components of a mixture can be separated for measurement of their boiling point, if necessary, by conventional analytic tools such as gas chromatography. For some components, a boiling point measurement cannot be made at 1 bar pressure, for example, if the component decomposes prematurely, and for such a component, its boiling point is deemed to be that calculated on the basis of its chemical structure using the ACD/labs Inc Programme for calculating boiling points on the Royal Society of Chemistry (UK) website www.chemspider.com. If any revisions to the programme should alter the calculated boiling point of a component, then its boiling point is deemed to be the altered boiling point rather than the superseded boiling point.

Film-Forming Polymer

The film-forming polymers are organosiloxane polymers. Examples of organosiloxane polymers are silicone resins, silicone gums, silicone resin/silicone fluid copolymers, silicone waxes, silicone polyamides, silicone acrylate copolymers, or mixtures thereof, preferably silicone resins, silicone gums, silicone resin/silicone fluid copolymers, silicone acrylates, or mixtures thereof, more preferably silicone resins, silicone acrylates, or mixtures thereof, and most preferably silicone resins.

- 10 The organosiloxane, film-forming polymer is used as an alternative antiperspirant active in the anti-perspirant composition, to replace some or preferably, all of the aluminium and/or zirconium salt.

15 In an antiperspirant composition, the film-forming polymer is present in a concentration of 0.1-40% by weight of the total composition excluding any propellant that may be present, preferably from 1 to 35 wt%, more preferably from 5 to 35 wt%. If no propellant is employed in the composition, the preferred level of the film-forming polymer is from 0.1 to 30 wt%, more preferably from 1 to 20 wt%, most preferably from 5 to 15% by weight of the total composition.

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The weight ratio of the film-forming polymer to fragrance is typically from 1:15 to 300:1, preferably from 1:10 to 50:1, more preferably from 1:3 to 25:1.

25 Cross-linked organosiloxanes, also known as silicone resins, are suitable for the present invention. 'Silicone resins' can also be called 'siloxane resins'. The nomenclature of silicone resins is known under the name 'MDTQ', the resin being described as a function of the various siloxane monomer units it comprises, each of the letters characterizing a type of unit. Herein, 'silicone resin' refers to a compound with three-dimensional structure and comprising at least 30% T and Q siloxane bonds by total mole of all silicone atoms presented in the resin. Clearly within the meaning of the present invention, a polydimethylsiloxane (PDMS) is not a silicone resin.

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Preferred silicone resins are MQ types having the general formula:

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wherein R, R₁, R₂, R₃ are each independently a C1-10 straight or branched chain alkyl, phenyl, or phenylalkyl group, and the ratio of x to y are from 0.5/1 to 1.5/1, preferably from 0.6/1 to 1.1/1. It is understood that the 'Q' unit [SiO_{4/2}] has the silicon atom bonded to four oxygen atoms, which are themselves bonded to the remainder of the resin. Hence
5 one or more hydroxyl groups may be attached to the Q unit.

Film-forming polymers comprising silsesquioxane resins are also suitable for the present invention. Silsesquioxane resins are homo-polymers and/or co-polymers having an average siloxane unit of formula



wherein R is a hydrogen atom, or C1-10 alkyl group and n is 1. Preferably, R is a C1-C6 alkyl group and more preferably, R is a propyl group.

Silicone gums such as dimethiconol and silicone resin/silicone fluid copolymers such as
15 trimethylsiloxysilicate/dimethiconol crosspolymer are also suitable for the present invention.

The preferred silicone resins are MQ resins, MQ resin/silicone fluid copolymers, and combinations of MQ and T Propyl resins, more preferably are MQ resins and
20 combinations of MQ and T Propyl resins. Accordingly, the preferred organosiloxane, film-forming polymers are resins such as trimethylsiloxysilicate, trimethylsiloxysilicate/dimethiconol crosspolymer, polypropylsilsesquioxane, or mixtures thereof. More preferably, the polymers are resins such as trimethylsiloxysilicate, polypropylsilsesquioxane, or mixtures thereof. The polymers as described are available
25 from Dow chemical® under the trade names MQ-1600 and MQ-1640.

Also suitable as film-forming polymers are silicone acrylate copolymers. Preferably, the polymers include graft or block copolymers comprised of silicone moieties of the formula R₄R₅R₆Si-O- and C1-12 alkyl acrylate or methacrylate, wherein R₄, R₅, R₆ are each
30 independently a C1-10 straight or branched chain alkyl or phenyl. Preferably R₄, R₅, R₆ are methyl groups. The acrylate can be optionally substituted with one or more groups such as halogen or hydroxy.

Most preferred silicone acrylate copolymer is (meth)acrylates/polytrimethylsiloxy
35 (meth)acrylate copolymer. The copolymer as described is available from Dow chemical® under the trade names FA 4002 ID Silicone Acrylate or FA 4001 CM Silicone Acrylate.

The preferred organosiloxane film-forming polymers are MQ resins, a combination of MQ and T Propyl resins, MQ resin/silicone fluid copolymers, silicone gums, silicone acrylate polymers, or mixtures thereof, preferably MQ resins, a combination of MQ and T Propyl resins, MQ resin/silicone fluid copolymers, silicone acrylate polymers, or mixtures thereof, more preferably MQ resins, a combination of MQ and T Propyl resins, silicone acrylate polymers, or mixtures thereof, still more preferably MQ resins, a combination of MQ and T Propyl resins, or mixtures thereof, most preferably MQ resins. Preferably, the polymers are trimethylsiloxysilicates, polypropylsilsesquioxanes, dimethiconol, trimethylsiloxysilicate/dimethiconol crosspolymer (meth)acrylates/polytrimethylsiloxymethacrylate copolymers, or mixtures thereof, more preferably trimethylsiloxysilicates, polypropylsilsesquioxanes, trimethylsiloxysilicate/dimethiconol crosspolymer (meth)acrylates/polytrimethylsiloxymethacrylate copolymers or mixtures thereof, still more preferably trimethylsiloxysilicates, polypropylsilsesquioxanes, (meth)acrylates/polytrimethylsiloxymethacrylate copolymers or mixtures thereof, even more preferably trimethylsiloxysilicates, polypropylsilsesquioxanes or mixtures thereof, and most preferably trimethylsiloxysilicates. The level of above-mentioned preferred polymers in an antiperspirant composition is typically from 5 to 35 wt%, excluding any propellant that may be present and if no propellant is present, it is from 5 to 15 wt%. The weight ratio of such preferred polymers to fragrance is typically from 1:10 to 50:1, more preferably from 1:3 to 25:1.

Volatile Solvent

The volatile solvent is an essential feature of the present invention. Herein, by 'volatile' is meant a solvent which is capable of evaporation to an extent from 80 to 100% by weight of the solvent within 120 minutes, measured in accordance with DIN 53249 at 25°C. Preferably, the evaporation is to an extent from 95 to 100% by weight within 60 minutes, more preferably from 95 to 100% by weight within 20 minutes, most preferably 100% by weight within 10 minutes.

The rates of evaporation are measured in accordance with DIN 53249 at 25°C by: 1. weighing round filter paper of diameter 150mm, 2. applying a 0.3ml sample using a pipette, and immediately weighing the filter, and 3. weighing the filter at 5-minute interval

at 25°C in a draught-free place. In each case amounts are weighed to an accuracy of 0.001g.

The viscosity of the volatile solvent is typically from 0.65 to 1.5 mm²/s, preferably from 0.65 to 1.0 mm²/s, more preferably 0.65 mm²/s. The viscosity is the kinetic viscosity measured at 25°C by employing the standard test method ASTM D445, Revision 17A, published by ASTM International (ASTM) on May 1st, 2017. A mixture of the volatile solvent is also possible. The key is the final viscosity of the mixture should not be over 1.5 mm²/s, preferably not over 1.0 mm²/s and at least 0.65 mm²/s, for example, a mixture of volatile solvent having viscosity of 0.65 mm²/s.

In an antiperspirant composition, the volatile solvent is typically present in a concentration of 20-99.8% by weight of the total composition excluding any propellant that may be present, preferably from 20 to 91 wt%, more preferably from 50 to 80 wt%. If no propellant is employed in an antiperspirant composition, the preferred level of the volatile solvent is from 65 to 99.8%, more preferably from 65 to 95% by weight of the total composition.

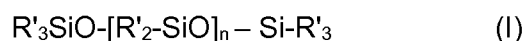
The volatile solvent in the present invention is a liquid at 20°C at atmospheric pressure.

The film-forming polymer is preferably soluble in the volatile solvent.

In an antiperspirant composition, the weight ratio of the film-forming polymer to the volatile solvent is typically at least 1/200, preferably at least 1/100, more preferably at least 1/10, but not more than 5/2, preferably not more than 3/2, more preferably not more than 1/1.

The preferred volatile solvents are volatile silicones. Linear volatile silicones are preferred to cyclic volatile silicones. The linear silicones usually have the formula (I):

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wherein R' can be the same or different, and is a hydrocarbon radical having from 1 to 10 carbon atoms, which is optionally substituted and optionally comprising one or more heteroatoms, such as hydroxyl, chlorine, fluorine, or cyano radicals. The average value of n is from 0 to 3.

Preferably, the volatile silicones have the formula (II):



- 5 wherein the average value of n is from 0 to 3, preferably from 0 to 1, more preferably 0. The volatile solvent as described is available from Dow Chemical® under the trade name XIAMETER® PMX-200 silicone fluids. Such volatile silicone is at least 50 wt%, preferably at least 75 wt%, more preferably 100% by weight of the total volatile solvent. Also the total level of the volatile solvent in the antiperspirant composition is from 20 to 99.8% by
- 10 weight of the total composition excluding any propellant that may be present, preferably from 20 to 91 wt%, more preferably from 50 to 80 wt%. If no propellant is employed in an antiperspirant composition, the preferred level of the volatile solvent is from 65 to 99.8%, more preferably from 65 to 90% by weight of the total composition.
- 15 In preferred embodiments, the organosiloxane, film-forming polymers are MQ resins, a combination of MQ and T Propyl resins, silicone acrylate polymers, or mixtures thereof, preferably the MQ resins, a combination of MQ and T Propyl resins, or mixtures thereof. Preferably, the polymers are trimethylsiloxysilicates, polypropylsilsesquioxanes, (meth)acrylates/polytrimethylsiloxo(meth)acrylate copolymers, or mixtures thereof, even
- 20 more preferably trimethylsiloxysilicates, polypropylsilsesquioxanes, or mixtures thereof. Such polymer is applied from a composition comprising said polymer and volatile silicone having formula (II). Preferably, the silicone is disiloxane, trisiloxane, tetrasiloxane, or mixtures thereof, more preferably disiloxane, trisiloxane, or mixtures thereof and most preferably disiloxane. The levels of such preferred polymer and preferred volatile solvent
- 25 are from 5 to 35% and 20 to 91% respectively, by weight of the total composition excluding any propellant that may be present. Preferably and optionally, the weight ratio of such preferred polymer to such preferred volatile solvent is from 1:200 to 5:2, preferably from 1:100 to 1:1.
- 30 The fragrance in the same composition comprises components having boiling point of no more than 220°C at 1 bar pressure in a weight proportion of at least 50wt%, preferably 100wt%. The level of such fragrance is from 1 to 20% by weight of the total composition, excluding any propellant that may be present. Preferably and optionally, the weight ratio of such polymer to such fragrance is from 1:10 to 50:1, more preferably from 1:3 to 5:1,
- 35 still more preferably from 1:1 to 3:1. In further preferred embodiments, the film-forming polymers are MQ resins, a combination of MQ and T Propyl resins, silicone acrylate

polymers, or mixtures thereof, preferably the MQ resins, a combination of MQ and T Propyl resins, or mixtures thereof. Preferably, the polymers are trimethylsiloxysilicates, polypropylsilsesquioxanes, (meth)acrylates/polytrimethylsiloxy(meth)acrylate copolymers, or mixtures thereof, even more preferably trimethylsiloxysilicates, polypropylsilsesquioxanes, or mixtures thereof. Such polymer is applied from a composition comprising said polymer and a mixture of volatile silicones having formula (II). It is advantageous to use a mixture of volatile silicones for the improvement of sensory and/or ease of manufacturing. The mixture of volatile silicones also helps to achieve an optimal balance of antiperspirant benefit from the film-forming polymer and the processing of said polymer. The fragrance comprised in the same composition comprises components having boiling point of no more than 220°C at 1 bar pressure in a weight proportion of at least 50wt%, preferably 100wt%. Preferably and optionally, by weight of the total composition excluding any propellant that may be present, the composition comprises 5-35% said preferred polymer, 20-91% said mixture of silicones according to formula (II) and 1-20% said fragrance; the weight ratio of said polymer to said fragrance is from 1: 10 to 50:1; the weight ratio of said polymer to said mixture of volatile silicones is from 1: 100 to 1:1.

Cosmetically acceptable carrier

The antiperspirant composition does not need to contain additional cosmetically acceptable carrier, other than the volatile solvent. 'Cosmetically acceptable carrier' or 'carrier' should be understood to mean a substance that is compatible with the skin and/or its integuments or mucous membranes, not causing any unacceptable discomfort liable to discourage the consumer from using and preferably, having pleasant colour, odour and/or feel. However, additional carriers such as hydrocarbon oils, ester oils, ether oils and alcohol oils, or mixtures thereof can be used.

A preferred class of suitable carrier is an oil. The term 'oil' used herein refers to an organic material that is liquid and has solubility of less than 0.1g/100ml in water at 20°C. A preferred class can be non-volatile silicone oils such as Cyclopentasiloxane (and) Dimethiconol, available as Dow chemical® 1501 fluid.

The composition according to the present invention is preferably homogeneous. Hence, the film-forming polymer and volatile solvent are typically soluble in the cosmetically acceptable carrier and/or any propellant that may be present.

The cosmetically acceptable carrier is typically employed at a level of no more than 50 wt% of the total composition excluding any propellant that may be present, preferably no more than 30 wt%, more preferably no more than 20 wt% and most preferably no more than 10 wt%.

Other cosmetic adjuncts

Anti-microbial agent is another preferred feature in the antiperspirant composition. When employed, the level of the incorporation is typically at least 0.01%, preferably 0.03%, but not more than 5%, preferably not more than 2%, more preferably not more than 1% by weight of the total composition. Preferred anti-microbial agents are those that are more efficacious than simple alcohols such as ethanol. Examples include niacinamide; quaternary ammonium compounds, like cetyltrimethylammonium salts; chlorhexidine and salts thereof; and diglycerol monocaprates, diglycerol monolaurate, glycerol monolaurate, and similar materials, as described in "Deodorant Ingredients", S.A. Makin and M.R. Lowry, in "Antiperspirants and Deodorants", Ed. K. Laden (1999, Marcel Dekker, New York). More preferred are polyhexamethylene biguanide salts (also known as polyaminopropyl biguanide salts), an example being Cosmocil CQ available from Arch Chemicals, 2',4,4'-trichloro,2-hydroxy-diphenyl ether (triclosan), 3,7,11-trimethyldodeca-2,6,10-trienol (farnesol), essential oils such as Tea Tree Oil and Thyme Oil, climbazole, octapyrox, ketoconazole, zinc pyrithione and mixtures thereof.

Both anti-microbial agent and fragrance are typically deodorant agents. Herein, 'deodorant agent' refers to an agent capable of treating the body odour by controlling, suppressing, reducing, or preventing the formation of unpleasant odours on the surface of the human body, preferably in the underarm areas.

Additional antiperspirant agents may also be included. Those may be routinely chosen by the person skilled in the art and the chosen ones may also have anti-microbial efficacy. The preferred agents include but not limited to chitosan, chitosan derivatives, chitosan salts, or mixtures thereof. Other suitable antiperspirant agents may be chosen from water-dispersible thiolated polymers according to US 2009/0016978A1, non-pore blocking antiperspirant agents according to WO 2016/066518 selected from 6-geringerol, 6-geringerdiol, or ethyl cinnamate, etc.

The key is the antiperspirant or the anti-microbial agents chosen are free from aluminium and/or zirconium salts.

Another preferred component is a preservative, such as ethyl or methyl parabens or
5 BHT (butyl hydroxy toluene), typically in an amount of from 0.01 to 0.1% by weight of the total composition.

The antiperspirant compositions of the present invention may be in the form of roll-ons, sprays, or aerosols, preferably pump sprays or aerosols. When the composition is an
10 aerosol, it further comprises a propellant which is typically either a compressed gas or a liquefied propellant gas. Examples of compressed gas include nitrogen (N₂) and air. Preferred liquefied propellant gases are hydrocarbons or halogenated hydrocarbon gases (particularly fluorinated hydrocarbons such as 1,1-difluoroethane and/or 1-trifluoro-2-fluoroethane) that have a boiling point of below 10°C and especially those with
15 a boiling point below 0°C. It is especially preferred to employ dimethyl ether (DME) or liquefied hydrocarbon gases, for instance, C₃ to C₆ hydrocarbons, including propane, butane, isobutane, pentane and isopentane and mixtures of two or more thereof. Of these especially preferred propellants, DME, isobutane, /propane, butane and mixtures thereof are most preferred. The level of the liquefied propellant gas in an aerosol
20 composition is typically from 30 to 99% by weight, preferably from 40 to 95% by weight and even more preferably from 50 to 90% by weight of the total composition.

Preferably, any adjunct chosen is soluble in the mixture of film-forming polymer, volatile solvent and fragrance.

25

Antiperspirant products

Antiperspirant products in accordance with the present invention comprise an antiperspirant composition as described in the third aspect of the present invention and
30 a dispenser wherein said composition is housed.

A suitable dispenser for an aerosol composition typically comprises a can, usually made from steel or aluminium, often having a coated interior to prevent contact between the can contents and the can wall, which the content can be vented to the exterior through
35 a dip tube leading via a valve that is openable and closable by an actuator, into a spray

channel terminating in a spray nozzle. Suitable dispensers are described, for example in EP1219547, EP1255682, or EP1749759.

Aerosol products can be made in a conventional manner by first preparing a base composition, charging the composition into the aerosol can, fitting a valve assembly into the mouth of the can, thereby sealing the latter, and thereafter charging the propellant into the can to a desired pressure, and finally fitting an actuator on or over the valve assembly together. For compressed-gas aerosol products, the compressed gas such as air or nitrogen is charged into the can containing a base composition, to a desired pressure of 2-10 bar, preferably 2-8 bar.

A suitable dispenser for a spray composition typically comprises a canister, a valve, and a nozzle. In order to aid the spray quality, it is preferred that the device comprises a means for enhancing the atomisation of the spray, for example a mechanical break up unit such as a swirl chamber. The canister can be made from thermoplastic polymers or can be a pressure canister made from metal, for example tinplate, or preferably, aluminium. Metal canisters are preferably lacquered on their inside, for example with an epoxyphenolic resin or, more preferably, with polyamide imide resin. It is preferred that the spray device is capable of containing and dispensing a composition at a pressure of from 398 to 487 kPa at 21°C and generating a spray of D[4,3] droplet size of from 10 to 50 µm at 21°C. A suitable spray device is described in WO 2005/123025. Other suitable spray devices include but are not limited to devices for trigger spray, pump spray and squeeze spray.

A suitable dispenser for a roll-on composition typically comprises a bottle having a mouth at one end defining a retaining housing for a rotatable member, commonly a spherical ball or less commonly a cylinder which protrudes above the top wall of the bottle. Suitable applicators are described for example in EP1175165, or WO2006/007987. The bottle mouth is typically covered by a cap, typically having a screw thread that cooperates with a thread on the housing or in an innovative design by a plurality of staggered bayonet/lug combinations. Suitable material for making roll-on dispensers includes thermoplastic polymers.

Method of Application

The antiperspirant compositions of the present invention may be topically applied to underarm area of human skin in an amount effective to reduce or inhibit perspiration. Typically, the composition is applied in an amount of at least 0.1g to no more than 20g, preferably from 0.5 g to no more than 10g, more preferably from 1g to no more than 5g.

5 The composition is typically applied once or twice per day. Preferably, the composition can also be applied once per every other day or once per every third or fourth day to achieve the antiperspirant efficacy over an extended period.

10 The composition can be preferably sprayed onto the underarm skin, wherein the volatile solvent evaporates and leaves behind a polymer film that can inhibit sweating. However, the composition may be applied by any suitable means. For example, application of a liquid composition may be by adsorption onto a carrier matrix like paper, fabric, or sponge and application by contacting said carrier matrix with the human skin. Application may also comprise a combination of any two or more of the above techniques.

15

Method of Manufacture

The antiperspirant compositions of the present invention may be prepared by any known or otherwise effective techniques, especially suitable for providing an anhydrous
20 composition in aerosol form and having the essential features of film-forming polymers and volatile solvents described herein.

An example of manufacturing process may include steps as such: A film-forming polymer supplied either as a solid or in solution is added at the required level to the solvent or
25 volatile solvent. The mixture is stirred at ambience until the polymer is fully solubilised. Preferably, the mixing is undertaken in an enclosed vessel. Then, fragrance is added with mixing. Any additional components such as antimicrobials and/or cosmetically acceptable carriers can then be added with further mixing until a solution with homogeneity is obtained. The solution is then filled into the dispenser of choice. If an
30 aerosol is manufactured, the solution is charged into an aerosol can, fitting a valve assembly into the mouth of the can and thereafter the propellant is charged into the can to a desired pressure. Finally, an actuator is fitted on or over the valve assembly together.

The present invention may be illustrated by the following non-limiting examples.

35

EXAMPLES

Table 1 Anti-perspirant aerosol compositions

Trade Name	INCI Name	Function	Aerosol (wt%)
AP40	Butane, Iso-Butane, Propane	Propellant	91
PMX-200 0.65cSt	Disiloxane	Ingredients for base formulations	4.5
MQ1600	Trimethylsiloxysilicate		3
Model fragrance components	Model fragrance components		1.5

In the Examples and Comparisons herein, the antiperspirant compositions as described in Table 1 were made by conventional methods. Instead of adding the final, complete fragrance, 1.5% individual model fragrance components with known boiling points and known logP polarities were added to the mixtures of PMX-200 (0.65cSt) and MQ1600, respectively. The boiling points can be measured by the skilled chemist. The logP values are calculated by using COSMOthermo published from COSMOlogic GmbH & Co. KG in 2017. This created base formulations of the aerosol compositions. Those base formulations containing different model fragrance components were each diluted conventionally in the aerosol canister with propellant (AP40), in a weight ratio of 9:91 (base formulation : propellant).

The stickiness of the base formulations was tested by the following method: A single drop (approximate 0.01g) of each base formulation was pipetted onto a plastic weighing boat, spreading out to an area about 2cm in diameter (approximate 3.1cm²). This made the base dosage of about 0.003g/cm². The boat was dried at 40°C. The stickiness was assessed by finger feel after 20-minute waiting time, then after 2-hour, 4-hour, 8-hour and 24-hour waiting time respectively. The observation of phase behaviour of all base formulations was made by naked eyes. The formulations were assessed fresh. When the formulation was homogeneous, a clear mixture was observed. A non-homogeneous mixture was milky and/or cloudy.

Table 2 Boiling points and logP values of the model fragrance components and observations of phase behaviour

Base formulation	Model fragrance components	Boiling Point (°C)	LogP	Homogeneous formulation(Y/N)
Ex1	Butanol	117	0.85	Yes
Ex2	Octanol	194	3.03	Yes
Ex3	Limonene	175	4.17	Yes
Ex4	Linalool	199	3.03	Yes
Ex5	Hydroxycitronellal	241	1.60	No
Ex6	Eugenol	252	2.74	No
Ex7	Triethylcitrate	294	1.60	No
Ex8	Dipropylene Glycol	227	-0.67	No
Ex9	Acetal	102	1.47	Yes
Ex10	2-phenoxyethanol	245	1.47	No
Ex11	1,2-hexanediol	223	0.82	No
Ex12	Menthol	212	2.92	Yes
Ex13	propylene carbonate	240	-0.43	No
Ex 14	Citronellol	221	3.42	Yes
Ex 15	Geraniol	230	3.05	Yes
Ex 16	Alpha-isomethyl ionone	285	3.5	Yes
Ex17	Menthyl acetate	229	3.98	Yes
Ex 18	diethyl phthalate	296	2.65	No
A	Dodecanol	258	5.23	Yes
B	Hexyl Cinnamal	308	4.62	Yes
C	Isopropyl myristate	315	7.80	Yes
D	n-Hexadecane	287	9.13	Yes
E	Squalene	285	15.41	Yes
F	Tocopherol acetate	300	10.61	Yes
G	Decanoic acid	268	4.02	Yes

Table 3 Stickiness of the aerosol base compositions

Base formulation	Model fragrance components	Assessment of stickiness at different time points (0=not sticky, 3=sticky, 5=very sticky)				
		20 min	2hr	4 hr	8 hr	24hr
Ex1	Butanol	0	0	0	0	0
Ex2	Octanol	0	0	0	0	0
Ex3	Limonene	0	0	0	0	0
Ex4	Linalool	0	0	0	0	0
Ex5	Hydroxycitronellal	0	0	0	0	0
Ex6	Eugenol	0	0	0	0	0
Ex7	Triethylcitrate	0	0	0	0	0
Ex8	Dipropylene Glycol	0	0	0	0	0
Ex9	Acetal	0	0	0	0	0
Ex10	2-phenoxyethanol	0	0	0	0	0
Ex11	1,2-hexanediol	0	0	0	0	0
Ex12	Menthol	0	0	0	0	0
Ex13	propylene carbonate	0	0	0	0	0
Ex 14	Citronellol	5	0	0	0	0
Ex 15	Geraniol	5	0	0	0	0
Ex 16	Alpha-isomethyl ionone	3	0	0	0	0
Ex17	Menthyl acetate	3	0	0	0	0
Ex 18	diethyl phthalate	3	0	0	0	0
A	Dodecanol	5	5	5	5	0
B	Hexyl Cinnamal	5	3	0	0	0
C	Isopropyl myristate	3	3	3	3	3
D	n-Hexadecane	5	5	5	5	3
E	Squalene	5	5	5	5	3
F	Tocopherol acetate	5	5	5	5	3
G	Decanoic acid	5	5	5	3	0

Data in Table 2 and Table 3 illustrate the benefit of the present invention. Formulations Ex1-Ex18 comprise model fragrance components according to the present invention.

- 5 Apart from the initial assessment at 20 minutes, none of the Examples 1-18 were found 'sticky'. Examples 1-13 are according to the preferred embodiments of the present invention, because none of the Examples 1-13 showed any stickiness at any time point of assessment. Furthermore, Examples 1-4, 9, and 12 are particularly preferred because they produce homogeneous formulations. In contrast, formulations A-G comprise model

fragrance components not according to the present invention. A-G were found either sticky or very sticky and the stickiness lasted for at least 2 hours.

5 CLAIMS

1 An antiperspirant composition comprising:

i) from 0.1 to 40% by weight of the total composition excluding any propellant that may be present, of an organosiloxane film-forming polymer,

10 ii) from 20 to 99.8% by weight of the total composition, excluding any propellant that may be present, of a volatile solvent which is capable of evaporation to an extent from 80 to 100% by weight within 120 minutes, measured in accordance with DIN 53249 at 25°C, and

15 iii) from 0.1 to 20% by weight of the total composition, excluding any propellant that may be present, of a fragrance comprising components (a) having boiling point of no more than 250°C at 1 bar pressure, and/or (b) having a LogP value of up to 4 and a boiling point of more than 250°C at 1 bar pressure; the total level of said components (a) and/or (b) being at least 40% by weight of the total fragrance.

20

2 An antiperspirant composition according to claim 1, wherein the composition is free from aluminium and/or zirconium salt.

25 3 An antiperspirant composition according to claim 1 or 2, wherein the volatile solvent has viscosity from 0.65 to 1.5 mm²/s.

4 An antiperspirant composition according to any of the preceding claims, wherein the total level of components (a) and/or (b) described in claim 1 is at least 70% by weight of the total fragrance.

30

5 An antiperspirant composition according to any of the preceding claims, wherein the fragrance consists of components (a) having boiling point of no more than 250°C at 1 bar pressure, and/or (b) having a LogP value of up to 4 and a boiling point of more than 250°C at 1 bar pressure.

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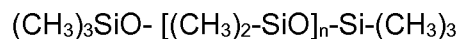
6 An antiperspirant composition according to any of the preceding claims, wherein the fragrance components each have boiling points of no more than 250°C.

5 7 An antiperspirant composition according to any of the preceding claims, wherein the composition is homogeneous.

8 An antiperspirant composition according to any of the preceding claims, the volatile solvent is a volatile silicone.

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9 An antiperspirant composition according to claim x, the volatile silicone has the formula



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wherein the value of n is from 0 to 2, preferably from 0 to 1, more preferably 0.

10 An antiperspirant composition according to any of the preceding claims, wherein the film-forming polymer is selected from silicone resins, silicone gums, silicone resin/silicone fluid copolymers, silicone acrylate copolymers or mixtures thereof, preferably from silicone resins, silicone acrylate copolymers or mixtures thereof, more preferably from silicone resins.

20

11 An antiperspirant composition according to claim 11, wherein the film-forming polymer is selected from trimethylsiloxysilicates, polypropylsilsesquioxanes, (meth)acrylates/polytrimethylsiloxy(meth)acrylate copolymers, or mixtures thereof, preferably selected from trimethylsiloxysilicates, polypropylsilsesquioxanes, or mixtures thereof, more preferably selected from trimethylsiloxysilicates.

25

12 An antiperspirant composition according to any of the preceding claims, wherein the weight ratio of the film-forming polymer to the fragrance is from 1:15 to 300:1.

30

13 An antiperspirant composition according to any of the preceding claims, wherein the weight ratio of the film-forming polymer to the volatile solvent is from 1:200 to 5:2.

35

14 A cosmetic method of treating human perspiration comprising topical application to axillary skin an antiperspirant composition according to any of the claims 1-13.

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15 Cosmetic use of a film-forming polymer as an antiperspirant agent, wherein the polymer is as described in any of the claims 1,10,11 and applied from an antiperspirant composition according to any of the claims 1-13.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/079743

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/58 A61Q15/00 A61K8/891
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.
X	WO 2017/194292 A1 (UNILEVER NV [NL]; UNILEVER PLC [GB]; CONOPCO INC D/B/A UNILEVER [US]) 16 November 2017 (2017-11-16)	1-14
Y	page 8, line 18 - page 11, line 5; examples 1, 2, 3	15
X	US 2014/364394 A1 (TAMURA SEIKI [JP] ET AL) 11 December 2014 (2014-12-11)	1-14
Y	claims 1, 15; example 43; table 4	15
Y	US 2005/112073 A1 (BOWENS-JONES ANDREA D [US] ET AL) 26 May 2005 (2005-05-26) paragraphs [0004], [0017], [0020], [0021]; claims 1-3, 5, 9, 13, 15, 17, 18; tables 1, 2, 3, 4	1-15
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"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

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INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2019/079743

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2017/105923 A1 (CANFIELD LYLENETTE [US] ET AL) 20 April 2017 (2017-04-20) paragraphs [0003], [0004], [0009] - [0015]; claims 1-7; figures 1, 2; tables 1, 2, 3 -----	1-15
Y	US 2015/283044 A1 (SWAILE DAVID FREDERICK [US] ET AL) 8 October 2015 (2015-10-08) paragraph [0090] -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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