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(54) Title: FRAGRANCE COMPOSITION

(57) Abstract: Provided herein is an ethanol-free fragrance composition in both concentrated and ready- to-use forms.

FRAGRANCE COMPOSITION

FIELD OF THE INVENTION

The invention is directed to an ethanol-free fragrance composition. The composition can be in concentrated and ready-to-use (RTU) forms.

All publications, patents, patent applications, and other references cited in this application are incorporated herein by reference in their entirety for all purposes and to the same extent as if each individual publication, patent, patent application or other reference was specifically and individually indicated to be incorporated by reference in its entirety for all purposes. Citation of a reference herein shall not be construed as an admission that such is prior art to the present invention.

BACKGROUND OF THE INVENTION

Fragrance compositions typically use an alcohol, such as ethanol, as a solvent because the fragrance component, such as an essential oil, dissolve well in alcohol. But ethanol is a harsh chemical and classified as a volatile organic compound ("VOC"); a compound defined, for example, by the Environmental Protection Agency, or by EC Directive 1999/13/EC (Solvent Emissions Directive) as an organic compound having a vapour pressure of 0.01 kPa or more at 293.15 K (20°C), or having a corresponding volatility under particular conditions of use.

The replacement of ethanol is very challenging for the perfumer due to the beneficial attributes of this ingredient in perfume formulations. Indeed ethanol is an ideal solvent for perfumery ingredients, e.g. it evaporates rapidly and does not hedonically interfere with the odor of the perfume in applications. Another key characteristic of ethanol is its wetting power, which allows good spreadability of the perfume on the skin and in turn controls the diffusion of the perfume at a later step. The fast evaporation of ethanol also adds a somewhat refreshing aspect to the formulation; a characteristic that is highly appreciated by the customer.

Water-based fragrance formulations are an alternative to ethanol-based compositions. But water-based formulations also suffer from a number of disadvantages. These disadvantages include, for example, restrictions in fragrance creation due to water solubility issues of perfuming ingredients; limitations on the amount of fragrance that can be employed due to

fragrance solubility or solubilization issues; the need of large amounts of solubilizers and surfactants that raise safety, environmental and regulatory issues; undesirable skin feel such as tackiness and oiliness; unacceptable fragrance performance such as spray atomization or diffusion through delivery devices such as wicks or reeds; and surface staining upon application.

Therefore, a need exists in the art for novel, ethanol-free fragrance formulations that are sustainable, non-irritating, cost-effective, and formulated without the need of external mixing forces to disperse or dissolve the fragrance in the formulation, such as high shear, high pressure or phase inversion temperature (PIT).

SUMMARY OF THE INVENTION

The present invention is directed to an ethanol-free fragrance composition, comprising:

- A. 0.1% to 95% by weight fragrance selected from the group consisting of fragrance ingredients, flavor ingredients, essential oils, natural extracts, or a mixture thereof, and optionally fragrance miscible or partial miscible cosmetic ingredients selected from the group consisting of emollients, humectants, cooling agents, vitamins, antioxidants, dyes, pigments, preservatives, UV-blockers and specialty ingredients selected from the group consisting of malodor counteracting ingredients or insect repelling agents;
- B. a phase transfer carrier at a weight ratio of 1:9 to 1:1 versus total amount of fragrance and capable of self-segregating in water into organized clusters;
- C. an ethanol-free water modulator at a weight concentration of 5-95% of said fragrance composition, comprising: (i) an interfacial modulator at weight ratio 1:5 to 10:1 versus total amount of fragrance, comprised of a miscible or partial miscible antimicrobial composition or a mixture thereof, and (ii) a water disrupting solvent at a weight concentration 10-90% versus total amount of water modulator, comprised of one or more water miscible, or partial miscible, hydrotropic or hydrophilic solvent, or mixture of such solvents, having surface tension values less than 60 mN/m measured at 20-25°C and atmospheric pressure 760 mm Hg; and
- D. optionally, up to 20% by weight water versus total amount of functional fragrance.

The invention is also directed to consumer articles or products comprising the ethanol-free fragrance composition and methods of using the composition.

DETAILED DESCRIPTION OF THE INVENTION

The invention provides for an ethanol-free, clear or translucent, temperature stable, fragrance composition, alternative referred to herein as the “composition,” “formulation” or the “functional fragrance.” The inventors unexpectedly discovered that the functional fragrance (alternatively referred to herein as “fragrance,” “parfume” or “perfume”) in the composition self-transfers into water, either by direct dilution or by dispersion, through a dual solvency-solubilization mechanism without the need of applying external forces such as high shear mixing, high pressure, or PIT.

In an embodiment of the invention, the functional fragrance comprises (i) 0.1 to 95% by weight fragrance, also referred in the invention as perfume or parfume, which fragrance contains at least 0.1% by weight one or more fragrance ingredients, flavor ingredients, essential oils, natural extracts, or a mixture thereof, and optionally fragrance miscible cosmetic ingredients such as emollients, humectants, cooling agents, antioxidants, antibacterial agents, dyes, UV-blockers, or specialty ingredients such as malodor neutralizing, counteracting ingredients or insect repelling agents, (ii) a phase transfer carrier at a weight ratio 1:9 to 1:1 versus total amount of fragrance, (iii) an ethanol-free, water modulator at the weight concentration 5-95% versus fragrance composition, and (iv) optionally, up to 20% by weight water.

The aforementioned phase transfer carrier can include, for example, at least one, or more, associative ionic, non-ionic amphiphilic molecules, or a mixture thereof. The phase transfer carrier is capable of self-segregating in water into organized clusters or aggregates such as micelles or to self-structure into water-dispersible lamellar, cubical, or hexagonal crystal liquid morphologies.

The ethanol-free water modulator of the invention can be, for example, of two parts: (i) an interfacial modulator at a weight ratio 1:5 to 10:1 versus total amount of fragrance, which is a fragrance miscible or partial miscible antimicrobial composition, and (ii) a water disrupting solvent at a weight concentration of 1-95% versus total amount of water modulator, which is comprised of at least one or more, water miscible, or partial miscible, hydrotropic or hydrophilic

solvent, or mixture of such solvents, having surface tension values less than 60 mN/m while, surface tension values measured under normal conditions, where herein normal conditions mean room temperature 20-25°C and atmospheric pressure 760 mm Hg.

The water-based products or articles created by the incorporation of the functional fragrance of the invention, also alternatively referred to herein as the “perfuming compositions”, benefit from the presence of the interfacial modulator for at least two reasons: (i) unexpectedly, and surprisingly, the interfacial modulator allows for the lowering of the amount of the phase transfer carrier, while also allowing for the customization of the using level of fragrance into perfuming composition; and (ii) the perfuming compositions containing this interfacial modulator self-preserve in water, with no need to add extra antimicrobial agents.

Embodiments of the invention include, for example, any article or product associated with the functional fragrance, obtained by direct use of the said functional fragrance, or simply by dilution with water or dispersion in water. Other embodiments of the invention include methods of manufacturing such an article or product. Moreover, the functional fragrance of this invention can be directly diluted with water, or can be dispersed in water by gentle mixing, with no need to apply any external mixing force such as high pressure, high shear, or temperature phase inversion (PIT), to form a low viscosity, sprayable, or capillary wicking product or article.

The ethanol-free, self-water-transfer fragrance composition of the invention can be formulated under no restriction rules into skin, hair, home care and environmentally-safe products or articles, and allows the customization of the fragrance level in products or articles. A further feature of the present invention is that the herein protected functional fragrance has a high flash point, which makes it safe in handling and transportation; low viscosity; and excellent clarity and stability over wide temperature ranges. Further, the functional fragrance of the invention can accept certain amounts of functionalized oil- or water-soluble cosmetic ingredients, such as antioxidants, moisturizers, emollients, vitamins, UV stabilizers, dyes, or specialty ingredients such as malodor counteracting ingredients or insect or animal repelling agents. The perfuming products created based on the functional fragrance of this invention are safer, greener and have better performance characteristics than most petrochemical solvent based similar products or articles such as perfumes, cosmetic formulations, air fresheners, household products, I&I products.

The instant invention is distinguishable over other formulations in the art because of at least two aspects: a formulation aspect and a processing aspect. The formulation aspect is related to the fragrance formulation strategy, which is a novel, two-part fragrance formulation strategy to build a self-water-transferable functional fragrance. The first part includes, for example, a fragrance oil and “phase transfer carrier”, while the second part is comprised of a “water modulator”. When the two parts are mixed together, the result is the functional fragrance. This fragrance formulation strategy leads to an unexpected dual solvency-solubilization mechanism which allows for the direct transfer of functional fragrance into water, to form a single-phase, isotropic, clear or translucent, temperature stable perfuming product or article, without the need to apply external mixing forces, such as high shear, high pressure or PIT. The processing aspect relates to the processing of the functional fragrance by direct dilution with water or by dispersion in water by gentle mixing with no need to apply external forces such as high shear, high pressure, and phase inversion temperature.

In one embodiment, a key element of the invention is the antimicrobial interfacial modulator. The antimicrobial modulator of the invention functions to: (i) formulate fragrances with unusual and unexpected properties when are transferred in water, and (ii) transfers fragrances in water, or to handle the fragrances and water mixing process in unusual and unexpected ways. By employing the antimicrobial modulator, the inventors were able to: (i) handle the fragrance as a fragrance “concentrate”, referred to herein as a functional fragrance, which self-disperses in water or is a self-water dilutable fragrance; (ii) dilute the functional fragrance or disperse the functional fragrance in water to form a RTU clear or translucent, single-phase, temperature stable perfuming products or articles that display unusual low viscosity, sprayable, spreadable, skin feeling, skin benefits, hair deposition or capillary wicking properties with no need to apply external mixing forces such as high shear, high pressure or PIT; and (iii) reduce the level of phase transfer carrier needed to transfer the fragrance in water at desired and customized levels, with no ingredient restrictions in fragrance creation and limited restrictions in selection of optional fragrance miscible ingredients; (iv) formulate stable perfuming products or articles with no need to add extra antimicrobial agents.

Representative Embodiments of the Invention

In one embodiment of the invention, the functional fragrance has three parts. The first part, named fragrance, comprises 0.1-95% w/w of the entire fragrance formula. The fragrance can include, for example, fragrance ingredients typically used in the art, flavor ingredients, essential oils, natural extracts or a combination of them, and optionally fragrance miscible or partial miscible cosmetic ingredients such as emollients, humectants, cooling agents, vitamins, dyes, pigments, antioxidants, preservatives, UV-blockers, or specialty ingredients such as malodor counteracting ingredients or insect or animal repelling agent.

“Fragrance ingredients” is defined as fragrance components commonly employed in the art in an appropriate combination, such as ketones, aldehydes, esters, alcohols, ethers, terpenes, natural essential oils, and synthetic musk. Examples of fragrance ingredients that can be used in the invention are not limited in kind and include those usually used in various products, such as preparations for external application (e.g., cosmetics and pharmaceuticals), cleansers for human body, clothes, and hard surfaces, bleachers, and softeners. Useful fragranced ingredients include, for example, synthetic ones and natural ones of animal or plant origin. Examples are hydrocarbons, such as aliphatic hydrocarbons, terpene hydrocarbons, and aromatic hydrocarbons; alcohols, such as aliphatic alcohols, terpene alcohols, and aromatic alcohols; ethers, such as aliphatic ethers and aromatic ethers; oxides, such as aliphatic oxides and terpene oxides, aldehydes, such as aliphatic aldehydes, terpene aldehydes, hydrogenated aromatic aldehydes, thioaldehydes, and aromatic aldehydes; ketones, such as aliphatic ketones, terpene ketones, hydrogenated aromatic ketones, cyclic ketones, and aromatic ketones; acetals, ketals, phenols, phenol ethers; acids, such as fatty acids, hydrogenated aromatic carboxylic acids, and aromatic carboxylic acids; acid amides; lactones, such as aliphatic lactones, macrocyclic lactones, terpene lactones, hydrogenated aromatic lactones' and aromatic lactones; esters, such as aliphatic esters, furan carboxylic esters, alicyclic carboxylic esters, cyclohexylcarboxylic esters, terpene carboxylic esters, and aromatic carboxylic esters; and nitrogen-containing compounds, such as nitromusks, nitriles, amines, pyridines, quinolines, pyrrole, and indole. Typical fragranced ingredients useful in the invention are listed as follows: C 6 -C 12 Aldehydes, anisaldehyde, acetal R, acetophenone, acetylcedrene, adoxal, allylamyl glycolate, allyl cyclohexanepropionate, α -damascone, β -damascone, δ -damascone, ambrettolide, ambroxan,

amylcinnamic aldehyde, amylcinnamic aldehyde dimethylacetal, amyl valerianate, amyl salicylate, isoamyl acetate, isoamyl salicylate, aurantiol, acetyl eugenol, bacdanol, benzyl acetate, benzyl alcohol, benzyl salicylate, bergamyl acetate, bornyl acetate, butyl butyrate, p-t-butylcyclohexanol, p-t-butylcyclohexyl acetate, o-t-butylcyclohexanol, benzaldehyde, benzyl formate, caryophyllene, cashmerane, carvone, cedramber, cedryl acetate, cedrol, celestolide, cinnamic alcohol, cinnamic aldehyde, cis-jasmone, citral, citral dimethyl acetal, citrasal, citronellal, citronellol, citronellyl acetate, citronellyl formate, citronellyl nitrile, cyclaset, cyclamen aldehyde, cyclaprop, caron, coumarin, cinnamyl acetate, 6-C 6 -C 13 lactone, dimethylbenzylcarbinol, dihydrojasmon, dihydrolinalool, dihydromyrcenol, dimetol, dimyrcetol, diphenyl oxide, ethyl vanillin, eugenol, fruitate, fenchyl alcohol, phenylethyl phenylacetate, galaxolide, γ -C 6 -C 13 lactone, geraniol, geranyl acetate, geranyl formate, geranyl nitrile, hedion, helional, heliotropin, cis-3-hexanol, cis-3-hexenyl acetate, cis-3-hexenyl salicylate, hexylcinnamic aldehyde, hexyl salicylate, hyacinth dimethyl acetal, hydrotropic alcohol, hydroxycitronellal, indole, ionone, isobornyl acetate, isocyclocitral, Iso E Super, isoeugenol, isononyl acetate, isobutylquinoline, jasmal, jamolactone, jasmopirane, corvone, ligustoral, lilial, lime oxide, limonene, linalool, linalool oxide, linalyl acetate, lyral, manzanate, myol, menthanyl acetate, menthonate, methyl anthranilate, methyl eugenol, menthol, α -methylionone, β -methylionone, γ -methylionone, methyl isoeugenol, methyl lavender ketone, methyl salicylate, muguet aldehyde, mugol, musk TM-II, musk 781, musk C14, musk T, musk ketone, musk tibetene, musk moskene, myrac aldehyde, methylphenyl acetate, nerol, neryl acetate, nopyl acetate, nopyl alcohol, neobergamate, oak moss No. 1, orivone, oxyphenylon, p-cresyl methyl ether, pentalide, phenylethyl alcohol, phenylethyl acetate, phenylacetaldehyde, dimethyl acetal, α -pinene, rubafuran, rosephenone, rose oxide, Sandalore, Sandela, Santalex, Santalinol, styrallyl acetate, styrallyl propionate, terpeneol, terpinyl acetate, tetrahydrolinalool, tetrahydrolinalyl acetate, tetrahydrogeraniol, tetrahydrogeranyl acetate, tonalide, traseolide, tripral, thymol, vanillin, verdox, yara yara, anis oil, bay oil, bois de-rose oil, cananga oil, cardamon oil, cassia oil, cedarwood oil, orange oil, mandarin oil, tangerine oil, basil oil, nutmeg oil, citronella oil, clove oil, coriander oil, elemi oil, eucaryptus oil, fennel oil, galbanum oil, geranium oil, hiba oil, hinoki oil, jasmine oil, lavandin oil, lavender oil, lemon oil, lemongrass oil, lime oil, neroli oil, oak moss oil, ocotea oil, patchouli oil, peppermint oil, perilla oil, petitgrain oil, pine oil, rose oil,

rosemary oil, camphor oil, ho leaf oil, clary sage oil, sandalwood oil, spearmint oil, spike lavender oil, star anise oil, thyme oil, tonka bean tincture, turpentine oil, vanilla bean tincture, vetiver oil, bergamot oil, ylang ylang oil, grapefruit oil, yuzu (Citrus Junos Tanaka) oil, benzoin, balsam peru, balsam tolu, tuberose oil, musk tincture, castrium tincture, civet tincture, and ambergris tincture.

The second part of the functional fragrance is a phase transfer carrier at a weight ratio 1:9 to 1:1 versus entire fragrance formula. In one embodiment, the phase transfer carrier is comprised of one or more associative ionic, non-ionic amphiphilic molecules, or mixture of them, capable to self-structure in water presence into organized clusters or aggregates such as micelles, or to self-segregate into lamellar, or cubical, or hexagonal crystal liquid morphologies. The phase transfer carrier can include, for example, ionic or non-ionic surfactants, humectants, solubilizers, or mixture thereof, is selected from the group consisting of: C₈₋₁₈ alkyl sarcosinates, C₈₋₁₈ alkyl taurates, C₁₀₋₁₈ alkyl and di-alkyl sulfosuccinates, C₁₀₋₁₈ alkyl sulfones, C₁₀₋₁₈ alkyl phosphates, C₈₋₁₈ alkyl sulfates and alkyl ether sulfates, C₈₋₁₆ sulphated alcanolamides, C₁₀₋₁₈ alkyl, alkyl aryl and alkyl ether sulphonates, C₈₋₁₈ alkyl and alky ether carboxylates, C₈₋₁₆ alkyl amino-oxides, C₈₋₁₈ ethoxylated alcohols, C₈₋₁₈ ethoxylated sorbitols, C₈₋₁₆ ethoxylated polyglycols, C₈₋₁₆ polyglucosides, alkyl quaternary amino acids and C₈₋₂₅ alkyl betaines.

In another embodiment, non-limiting examples of suitable phase transfer carrier ingredients from the above mentioned classes are as follows:

1. **anionic amphiphilic molecules** include, for example, fatty acid soaps, such as soap bases, sodium laurate, and sodium palmitate; higher alkylsulfuric ester salts, such as sodium laurylsulfate and potassium laurylsulfate; alkyl ether sulfuric ester salts, such as triethanolamine POE laurylsulfate and sodium POE laurylsulfate; N-acylsarcosinic acids, such as sodium lauroylsarconinate, higher fatty acid amidosulfonates, such as sodium N-myristoyl-N-methyltaurine, sodium palm oil fatty acid methyltauride, and sodium laurylmethyltauride; phosphoric ester salts, such as sodium POE oleyl ether phosphate and POE stearyl ether phosphate; sulfosuccinates, such as sodium di-2-ethylhexylsulfosuccinate, sodium POE monolauroylmonoethanolamide sulfosuccinate, and sodium lauryl polypropylene glycol sulfosuccinate; alkylbenzenesulfonates, such as

sodium linear dodecylbenzenesulfonate, triethanolamine linear dodecylbenzenesulfonate, and linear dodecylbenzenesulfonic acid; N-acylglutamates, such as monosodium N-lauroylglutamate, disodium N-stearoylglutamate, monosodium N-myristoyl-L-glutamate; higher fatty acid ester sulfuric ester salts, such as sodium hydrogenated coconut oil fatty acid glycerol sulfate; sulfated oils, such as Turkey red oil; POE alkyl ether carboxylic acids, POE alkyl allyl, ether carboxylates, α -olefinsulfonates, higher fatty acid ester sulfonates, secondary alcohol sulfuric ester salts, higher fatty acid alkylolamide sulfuric ester salts, ditriethanolamine N-palmitoylaspartate, sodium lauroyl monoethanolamidesuccinate and sodium casein;

2. **cationic amphiphilic molecules** include, for example, alkyltrimethylammonium salts, such as stearyltrimethylammonium chloride and lauryltrimethylammonium chloride; dialkyldimethylammonium salts, such as distearyldimethylammonium chloride, alkylpyridinium salts, such as poly-N,N'-dimethyl-3,5-methylenepiperidinium chloride; alkyl quaternary ammonium salts, alkyl dimethylbenzylammonium salts, alkylisoquinolinium salts, dialkylmorpholinium salts, POE alkylamines, alkylamine salts, polyamine fatty acid derivatives, amyl alcohol fatty acid derivatives, benzalkonium chloride, and benzethonium chloride;
3. **amphoteric amphiphilic molecules** include, for example, imidazoline surfactants, such as sodium 2-undecyl-N,N,N-(hydroxyethylcarboxymethyl)-2-imidazoline and disodium 2-cocoyl-2-imidazolium hydroxide-1-carboxyethoxy; and betaines, such as 2-heptadecyl-N-carboxymethyl-N-hydroxyethylimidazolium betaine, alkyl betaines, amide betaines, and sulfobetaines;
4. **lipophilic nonionic amphiphilic molecules** include, for example, sorbitan fatty acid esters, such as sorbitan monooleate, sorbitan monoisostearate, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monostearate, sorbitan sesquioleate, sorbitan trioleate, diglycerol sorbitan penta-2-ethylhexylate, and diglycerol sorbitan tetra-2-ethylhexylate; glycerol or polyglycerol fatty acids esters, such as glycerol mono-cotton seed oil fatty acid ester, glycerol monoerucate, glycerol sesquioleate, glycerol monostearate, glycerol α,α' -oleate pyroglutamate, and glycerol monostearate maleate; propylene glycol fatty acid

esters, such as propylene glycol monostearate; hydrogenated castor oil derivatives, and glycerol alkyl ethers; and

5. **hydrophilic nonionic amphiphilics** include, for example, POE sorbitan fatty acid esters, such as POE sorbitan monooleate, POE sorbitan monostearate, POE sorbitan monooleate, and POE sorbitan tetraoleate; POE sorbitol fatty acid esters, such as POE sorbitol monolaurate, POE sorbitol monooleate, POE sorbitol pentaoleate, and POE sorbitol monostearate; POE glycerol fatty acid esters, such as POE glycerol monostearate, POE glycerol monoisostearate, and POE glycerol triisostearate; POE fatty acid esters, such as POE monooleate, POE distearate, POE monodioleate, and ethylene glycol distearate; POE alkyl ethers, such as POE lauryl ether, POE oleyl ether, POE stearyl ether, POE behenyl ether, POE-2-octyldodecyl ether, and POE-cholestanol ether; POE alkyl phenyl ethers, such as POE octyl phenyl ether, POE nonyl phenyl ether, and POE dinonylphenyl ether; Pluronic type surfactants, such as Pluronic; POE.POP alkyl ethers, such as POE.POP cetyl ether, POE.POP 2-decyltetradecyl ether, POE.POP monobutyl ether, POE.POP hydrogenated lanolin, and POE-POP glycerol ether; tetra POE tetra POP ethylenediamine condensates, such as Tetric; POE castor oil or hydrogenated castor oil derivatives, such as POE castor oil, POE hydrogenated castor oil, POE hydrogenated castor oil monoisostearate, POE hydrogenated castor oil triisostearate, POE hydrogenated castor oil monopyroglutamate monoisostearate, and POE hydrogenated castor oil maleate; POE beeswax lanolin derivatives, such as POE sorbitol beeswax; alkanolamides, such as coconut oil fatty acid diethanolamide, lauric acid monoethanolamide, and fatty acid isopropanolamides; POE propylene glycol fatty acid esters, POE alkylamines, POE fatty acid amides, sucrose fatty acid esters, POE nonylphenyl formaldehyde condensates, alkylethoxydimethylamine oxides, and trioleyl phosphate.

The third part of the functional fragrance of the invention is an ethanol-free water modulator that represents 5% to 95% by weight of the entire functional fragrance. The water modulator can comprise (i) water miscible, or partial miscible interfacial modulator at weight ratio 1:5 to 10:1 versus total amount of fragrance, selected from antimicrobial molecules such as phenoxyethanol, glycols, geminal diols, dialkyl-alkyl diols, alkyl or dialkyl-salicylates or

combination of those, and (ii) a water disrupting solvent, at weight concentration 10-90% versus total amount of water modulator, which is a linear, branched, cyclic, or aromatic mono-, di- or poly-alcohols, ethoxylated alcohols, alcohol derivatives with at least one hydroxyl group, polyglycol-ethers, or any combination of those, and optionally hydrotropic organic salts such as benzoates, hydroxyl benzoates, carboxyl amino pyrrolidones, taurates, or any combination of those.

Non-limiting examples of suitable solvents from the above mentioned classes are as follows: ethylene glycol, propylene glycol, trimethylene glycol, 1,2-butylene glycol, 1,3-butylene glycol, tetramethylene glycol, 2,3-butylene glycol, pentamethylene glycol, 2-butene-1,4-diol, hexylene glycol, and octylene glycol; trihydric alcohols, such as glycerol, trimethylolpropane, and 1,2,6-heanetriol; tetrahydric alcohols, such as pentaerythritol; pentahydric alcohols, such as xylitol, hexahydric alcohols, such as sorbitol and mannitol; polyhydric alcohols, such as diethylene glycol, dipropylene glycol, triethylene glycol, polypropylene glycol, tetraethylene glycol, diglycerol, polyethylene glycol, triglycerol, tetraglycerol, and polyglycerol; dihydric alcohol alkyl ethers, such as ethylene glycol monomethyl ether, ethylene glycol monoethyl ether, ethylene glycol monobutyl ether, ethylene glycol monophenyl ether, ethylene glycol monoethyl ether, ethylene glycol mono-2-methylexyl ether, ethylene glycol isoamyl ether, ethylene glycol benzyl ether, ethylene glycol isopropyl ether, ethylene glycol dimethyl ether, ethylene glycol diethyl ether, and ethylene glycol dibutyl ether; dihydric alcohol alkyl ethers, such as diethylene glycol monomethyl ether, diethylene glycol monoethyl ether, diethylene glycol monobutyl ether, diethylene glycol dimethyl ether, diethylene glycol diethyl ether, diethylene glycol butyl ether, diethylene glycol methyl ethyl ether, triethylene glycol monomethyl ether, triethylene glycol monoethyl ether, propylene glycol monomethyl ether, propylene glycol monoethyl ether, propylene glycol monobutyl ether, propylene glycol isopropyl ether, dipropylene glycol methyl ether, dipropylene glycol ethyl ether, and dipropylene glycol butyl ether; dihydric alcohol ether esters, such as ethylene glycol monomethyl ether acetate, ethylene glycol monoethyl ether acetate, ethylene glycol monobutyl ether acetate, ethylene glycol monophenyl ether acetate, ethylene glycol diadipate, ethylene glycol disuccinate, diethylene glycol monoethyl ether acetate, diethylene glycol monobutyl ether acetate, propylene glycol monomethyl ether acetate, propylene glycol monoethyl ether acetate,

propylene glycol monopropyl ether acetate, and propylene glycol monophenyl ether acetate; glycerol monoalkyl ethers, such as chimyl alcohol, selachyl alcohol, and butyl alcohol; sugar alcohols, such as sorbitol, maltitol, maltotriose, mannitol, sucrose, erythritol, glucose, fructose, starch sugars, maltose, xylitose, and reduction products of starch sugars; Glysolid, tetrahydrofurfuryl alcohol, POE tetrahydrofurfuryl alcohol, POP butyl ether, POP-POE butyl ether, tripolyoxypropylene glycerol ether, POP glycerol ether, POP glycerol ether phosphate, and POP.POE pentaerythritol ether.

Thus, in one embodiment of the invention, provided is an ethanol-free fragrance composition, comprising:

- A) 0.1% to 95% by weight fragrance selected from the group consisting of fragrance ingredients, flavor ingredients, essential oils, natural extracts, or a mixture thereof, and optionally fragrance miscible or partial miscible cosmetic ingredients selected from the group consisting of emollients, humectants, cooling agents, vitamins, antioxidants, dyes, pigments, preservatives, UV-blockers and specialty ingredients selected from the group consisting of malodor counteracting ingredients or insect repelling agents;
- B) a phase transfer carrier at a weight ratio of 1:9 to 1:1 versus total amount of fragrance and capable of self-segregating in water into organized clusters;
- C) an ethanol-free water modulator at a weight concentration of 5-95% of said fragrance composition, comprising: (i) an interfacial modulator at weight ratio 1:5 to 10:1 versus total amount of fragrance, comprised of a miscible or partial miscible antimicrobial composition or a mixture thereof, and (ii) a water disrupting solvent at a weight concentration 10-90% versus total amount of disrupting water modulator, comprised of one or more water miscible, or partial miscible, hydrotropic or hydrophilic solvent, or mixture of such solvents, having surface tension values less than 60 mN/m measured at 20-25°C and atmospheric pressure 760 mm Hg; and
- D) optionally, up to 20% by weight water versus total amount of functional fragrance.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said phase transfer carrier comprises ionic or non-ionic surfactants, humectants, solubilizers, or mixture thereof, selected from the group consisting of: C₈₋₁₈ alkyl sarcosinates, C₈₋₁₈ alkyl taurates, C₁₀₋₁₈ alkyl and di-alkyl sulfosuccinates, C₁₀₋₁₈ alkyl sulfones, C₁₀₋₁₈ alkyl phosphates, C₈₋₁₈ alkyl sulfates and alkyl ether sulfates, C₈₋₁₆ sulphated alcanolamides, C₁₀₋₁₈ alkyl, alkyl aryl and alkyl ether sulphonates, C₈₋₁₈ alkyl and alkyl ether carboxylates, C₈₋₁₆ alkyl amino-oxides, C₈₋₁₈ ethoxylated alcohols, C₈₋₁₈ ethoxylated sorbitols, C₈₋₁₆ ethoxylated polyglycols, C₈₋₁₆ polyglucosides, alkyl quaternary amino acids and C₈₋₂₅ alkyl betaines.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said water modulator comprises a water disrupting solvent that contains at least one water miscible or partial miscible solvent, or mixture of solvents, which solvents have surface tension values less than 60 mN/m at 20-25°C and atmospheric pressure of 760 mmHg.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said interfacial modulator comprises an antimicrobial agent, an antimicrobial organic salt or a combination thereof.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said antimicrobial agent is phenoxyethanol, geminal diols, alkyl- or dialkyl-diols, alkyl or dialkyl-salicylates, or a mixture thereof.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said antimicrobial organic salt is a benzoate, hydroxyl benzoate, carboxyl amino pyrrolidone, taurate, or combinations thereof.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said interfacial modulator is 2-phenoxyethanol, 3-(2-

ethylhexyloxypropane-1,2 diol, 1,2 hexanediol, 2-methyl-2,4-pentanediol or combinations thereof.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein the interfacial modulator and water disrupting solvent are at a weight ratio 1:1 to 1:5.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said optional water is deionized water further comprising functionalized water soluble ingredients selected from the group consisting of pH buffers, antioxidant agents, antimicrobial agents, dyes, preservatives, organic and inorganic salts and combinations thereof.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said composition has a low viscosity, is sprayable, spreadable, or capillary-wicking.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said optional water is least 10 % w/w relative to the total weight of the composition.

In another embodiment of the present invention, provided is a consumer article comprising the ethanol-free fragrance composition of the invention. The consumer article can be in the form of air freshener, textile freshener, all-purpose cleaner, perfume, hair or skin formulation.

In another embodiment of the invention, provided is a method of conferring, enhancing or modifying the odor properties of a surface selected from the group consisting of glass, tiles, textiles, wood, a kitchen or bathroom, comprising the step of applying to such surfaces an olfactive amount of the ethanol-free fragrance composition of the invention. In certain embodiments, the surface is glass, tiles, textiles or wood.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said composition is in concentrated form.

In another embodiment of the invention, provided is an ethanol-free fragrance composition, wherein said composition is in ready-to-use form.

The invention will now be further described in the Examples below, which are intended as an illustration only and do not limit the scope of the invention.

EXAMPLES

The Examples provide for a number of products. Such products include air freshener products with customized level of fragrance, which can be released into a surrounding environment through wicks, reeds, or any natural or synthetic porous materials over customized periods of time (Examples 1 and 2); an antimicrobial air freshener spray (Example 3); an antimicrobial surface cleaner that leaves no residual on application (Example 4); an ethanol-free, body mist with high level of natural fragrance (essential oil) and water (Example 5); an ethanol-free high fragrance load cologne (Example 6); and an ethanol-free, high fragrance load reed diffuser solution (Example 7).

Example 1

Functional Fragrance		14% Perfume - Perfuming Composition with 60% DIW
Phase Transfer Carrier + Fragrance	50.0%	40.0% Functional Fragrance
Aerosol OT-75** : Fragrance Oil* = 1 : 2.4		60.0 % DIWater
Water Modulator	50.0%	
Interfacial Modulator – Antimicrobial Composition	10.0%	
Phenoxyethanol : 1,2 Hexanediol : Euxyl PE 9010 = 1 : 1 : 6		
Water Disrupting Solvent	40.0%	
Methyl-Methoxy-Butanol (MMB) : Butyl Carbitol = 1 : 2		

* Jasmine, fragrance oil free of any solvent, from Ungerer and Company

** Aerosol OT-75 is sodium di-2-ethylhexylsulfosuccinate from Cytec, Inc.

*** MMB is Methyl-Methoxy Butanol from Kuraray

**** Phenoxyethanol from Dow Chemical

***** 1,2 Hexanediol is from Vigon

***** Butyl Carbitol is Ethanol, 2-(2-butoxy-ethoxy) from Dow Chemical

Example 2

Functional Fragrance		7% Perfume - Perfuming Composition with 70% DIW
Phase Transfer Carrier + Fragrance	33.3%	30.0% Functional Fragrance
Aerosol OT-75** : Fragrance Oil* = 1 : 3		70.0 % DIWater
Water Modulator	66.7%	
Interfacial Modulator – Antimicrobial Composition	50.0%	
1,2 Hexanediol**** : Phenoxyethanol***** : Euxyl PE 9010*** : Hexyleneglycol***** = 1 : 2.1 : 3.1 : 6.2		

Water Disrupting Solvent	50.0%	
Butyl Carbitol*****		

- * Clean Cotton, fragrance oil free of any solvent, from Ungerer and Company
- ** Aerosol OT-75 is sodium di-2-ethylhexylsulfosuccinate from Cytec, Inc.
- *** Euxyl PE 9010, from Schülke, a blend of 2-phenoxyethanol/3-(2-Ethylhexyloxypropane-1,2 diol
- **** 1,2 Hexanediol is from Vigon
- ***** Phenoxyethanol from Dow Chemical
- ***** Hexyleneglycol, 2-Methyl-2,4-pentanediol from Vigon
- ***** Butyl Carbitol is Ethanol, 2-(2-butoxy-ethoxy) from Dow Chemical

Example 3

Functional Fragrance		1.5% Perfume - Perfuming Composition with 85.0% DIW
Phase Transfer Carrier + Fragrance	33.3%	15.0% Functional Fragrance
Aerosol OT-75** : Fragrance Oil* = 2.3 : 1		85.0 % DIWater
Water Modulator	66.7%	
Interfacial Modulator – Antimicrobial Composition	50.0%	
Phenoxyethanol**** : Euxyl PE 9010*** = 1 : 4		
Water Disrupting Solvent	50.0%	
Zemea*****		

- * Lavender, essential oil free of any solvent, from Ungerer and Company
- ** Aerosol OT-75 is sodium di-2-ethylhexylsulfosuccinate from Cytec, Inc.
- *** Euxyl PE 9010, from Schülke, a blend of 2-phenoxyethanol/3-(2-Ethylhexyloxypropane-1,2 diol
- **** Phenoxyethanol from Dow Chemical
- ***** Zemea, 1,3 Propanediol from DuPont Tate & Lyle

Example 4

Functional Fragrance		0.8% Perfume - Perfuming Composition with 86.5% DIW
Phase Transfer Carrier + Fragrance	3.2%	31.0% Functional Fragrance
Aerosol OT-75** : Fragrance Oil* = 1 : 4		69.0 % DIWater
Water Modulator	96.8%	
Interfacial Modulator - Antimicrobial Composition	33.4%	
1,2 Hexanediol**** : Euxyl PE 9010*** = 1 : 1		
Water Disrupting Solvent	66.6%	
Butyl Carbitol*****		

* Clean Cotton, fragrance oil, free of any solvent, from Ungerer and Company

** Aerosol OT-75 is sodium di-2-ethylhexylsulfosuccinate from Cytec, Inc.

*** Euxyl PE 9010, from Schülke, a blend of 2-phenoxyethanol/3-(2-Ethylhexyloxypropane-1,2 diol

**** Phenoxyethanol from Dow Chemical

***** Butyl Carbitol is Ethanol, 2-(2-butoxy-ethoxy) from Dow Chemical

Example 5

Functional Fragrance		6.7% Natural Perfume - Perfuming Composition with 73.6% DIW*****
Phase Transfer Carrier + Fragrance	74.0%	39.0% Functional Fragrance
Crodasinc CS-30 LQ ** : Fragrance Oil* = 1 : 1		61.0 % DIWater dilution
(30% active sodium cocoyl sarcosinate)		
Water Modulator	26.0%	
Interfacial Modulator - Antimicrobial Composition	21.7%	
1,2 Hexanediol*** : Sensiva SC-50***** = 0.8 : 1.0		

Water Disrupting Solvent	78.3%	
Zemea*****		

- * Natural Citrus Tea, essential oil free of any solvent, from Ungerer and Company
- ** Crodasinc CS-30 LQ, sodium cocoyl sarcosinate from Croda
- *** Sensiva SC50, 3-(2-Ethylhexyloxypropane)-1,2 diol from Schülke
- **** 1,2 Hexanediol from Vigon
- ***** Zemea, 1,3 Propanediol from DuPont Tate & Lyle
- ***** Total % Water in Perfuming Product = 73.6% (61% + 12.6% from functional fragrance (comes with Crodasinc CS-30)

Example 6

Functional Fragrance		(i)11.5% perfume - Perfuming Composition with 68% DIW
(ii) Phase Transfer Carrier + Fragrance	59.375%	32% Functional Fragrance
Aerosol OT-75PG** : Fragrance 1:1.533		68% Deionized Water
(iii) Water Modulator	40.625%	
1. Interfacial Modulator – Antimicrobial Composition		
1,2 Hexanediol**** : Hexylene Glycol*****		
Sensiva PA40*** : 1:1:0.25	69.23%	
2. Water Disrupting Solvent		
Tegosoft GCJ*****	30.77%	

- * fragrance oil free of any solvent, from Ungerer and Company
- ** Aerosol OT75PG, sodium dioctyl sulfosuccinate(and)pg from Solvay
- *** Sensiva PA40, phenyl propanol(and)propanediol(and)capryl glycol from Schülke
- **** 1,2 Hexanediol from Vigon
- *****Hexylene Glycol from Vigon
- *****Tegosoft GCJ, Peg-7 Glyceryl Cocoate from Evonik

	INGREDIENTS	INCI	% BY WEIGHT	VENDOR
1	FRAGRANCE	FRAGRANCE	11.50	UNGERER & CO.
2	AEROSOL OT75PG	SODIUM DIOCTYL SULFOSUCCINATE (AND) PROPYLENE GLYCOL	7.50	SOLVAY-CYTEC
3	1,2 - HEXANEDIOL	HEXANEDIOL	4.00	VIGON
4	HEXYLENE GLYCOL	HEXYLENE GLYCOL	4.00	LOCAL
5	TEGOSOFT GCJ	PEG-7 GLYCERYL COCOATE	4.00	EVONIK
6	SENSIVA PA40	PHENYL PROPANOL(AND) PROPANEDIOL(AND)CAPRYLYL GLYCOL(AND)TOCOPHEROL	1.00	SCHULKE
7	DEIONIZED WATER	WATER	68.00	
			100.00%	

Example 7

Functional Fragrance		(i)10% perfume - Perfuming Composition with 70% DIW
(ii) Phase Transfer Carrier + Fragrance	66.666%	30% Functional Fragrance
Aerosol OT-75PG** : Fragrance* 1:1		70% Deionized Water
(iii) Water Modulator	33.334%	
3. Interfacial Modulator – Antimicrobial Composition		
1,2 Hexanediol**** : Phenoxyethanol***** :Dowanol PM*** 0.07:0.60:1	76%	
4. Water Disrupting Solvent		
Butyl Carbitol*****	24%	

* fragrance oil free of any solvent, from Ungerer and Company

** Aerosol OT75PG, sodium dioctyl sulfosuccinate(and)pg from Solvay

*** Dowanol PM, methoxy isopropanol from Dow

**** 1,2 Hexanediol from Vigon

*****Phenoxyethanol from Vigon

*****Butyl Carbitol, butoxyglycol from Evonik

	INGREDIENTS	INCI	% BY WEIGHT	VENDOR
1	FRAGRANCE*	FRAGRANCE	10.00	UNGERER & CO.
2	AEROSOL OT75PG	SODIUM DIOCTYL SULFOSUCCINATE (AND) PROPYLENE GLYCOL	10.00	SOLVAY- CYTEC
3	BUTYL CARBITOL	BUTOXYDIGYLCOL	5.00	DOW
4	DOWANOL PM	METHOXY ISOPROPANOL	3.00	DOW
5	ROSE ETHER	PHENOXYETHANOL	1.80	DOW
6	1,2-HEXANEDIOL	1,2-HEXANEDIOL	0.20	VIGON
7	DEIONIZED WATER	WATER	70.00	LOCAL
			100.00%	

* * *

It is to be understood that the invention is not limited to the particular embodiments of the invention described above, as variations of the particular embodiments may be made and still fall within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. An ethanol-free fragrance composition, comprising:
 - A) 0.1% to 95% by weight fragrance selected from the group consisting of fragrance ingredients, flavor ingredients, essential oils, natural extracts, or a mixture thereof, and optionally fragrance miscible or partial miscible cosmetic ingredients selected from the group consisting of emollients, humectants, cooling agents, vitamins, antioxidants, dyes, pigments, preservatives, UV-blockers and specialty ingredients selected from the group consisting of malodor counteracting ingredients or insect repelling agents;
 - B) a phase transfer carrier at a weight ratio of 1:9 to 1:1 versus total amount of fragrance and capable of self-segregating in water into organized clusters;
 - C) an ethanol-free water modulator at a weight concentration of 5-95% of said fragrance composition, comprising: (i) an interfacial modulator at weight ratio 1:5 to 10:1 versus total amount of fragrance, comprised of a miscible or partial miscible antimicrobial composition or a mixture thereof, and (ii) a water disrupting solvent at a weight concentration 10-90% versus total amount of water modulator, comprised of one or more water miscible, or partial miscible, hydrotropic or hydrophilic solvent, or mixture of such solvents, having surface tension values less than 60 mN/m measured at 20-25°C and atmospheric pressure 760 mm Hg; and
 - D) optionally, up to 20% by weight water versus total amount of functional fragrance.
2. The ethanol-free fragrance composition according to claim 1, wherein said phase transfer carrier comprises ionic or non-ionic surfactants, humectants, solubilizers, or mixture thereof, selected from the group consisting of: C₈₋₁₈ alkyl sarcosinates, C₈₋₁₈ alkyl taurates, C₁₀₋₁₈ alkyl and di-alkyl sulfosuccinates, C₁₀₋₁₈ alkyl sulfones, C₁₀₋₁₈ alkyl phosphates, C₈₋₁₈ alkyl sulfates and alkyl ether sulfates, C₈₋₁₆ sulphated alcanolamides, C₁₀₋₁₈ alkyl, alkyl aryl and alkyl ether sulphonates, C₈₋₁₈ alkyl and alkyl ether carboxylates, C₈₋₁₆ alkyl amino-oxides, C₈₋₁₈ ethoxylated alcohols, C₈₋₁₈ ethoxylated sorbitols, C₈₋₁₆ ethoxylated polyglycols, C₈₋₁₆ polyglucosides, alkyl quaternary amino acids and C₈₋₂₅ alkyl betaines.

3. The ethanol-free fragrance composition according to claim 1, wherein said water modulator comprises a water disrupting solvent that contains at least one water miscible or partial miscible solvent, or mixture of solvents, which solvents have surface tension values less than 60 mN/m at 20-25°C and atmospheric pressure of 760 mmHg.
4. The ethanol-free fragrance composition according to claim 1, wherein said interfacial modulator comprises an antimicrobial agent, an antimicrobial organic salt or a combination thereof.
5. The ethanol-free fragrance composition according to claim 4, wherein said antimicrobial agent is phenoxyethanol, geminal diols, alkyl- or dialkyl-diols, alkyl or dialkyl-salicylates, or a mixture thereof.
6. The ethanol-free fragrance composition according to claim 4, wherein said antimicrobial organic salt is a benzoate, hydroxyl benzoate, carboxyl amino pyrrolidone, taurate, or combinations thereof.
7. The ethanol-free fragrance composition according to claim 1, wherein said interfacial modulator is 2-phenoxyethanol, 3-(2-ethylhexyloxypropane-1,2 diol, 1,2 hexanediol, 2-methyl-2,4-pentanediol or combinations thereof.
8. The ethanol-free fragrance composition according to claim 1, wherein the interfacial modulator and water disrupting solvent are at a weight ratio 1:1 to 1:5.
9. The ethanol-free fragrance composition according to claim 1, wherein said optional water is deionized water further comprising functionalized water soluble ingredients selected from the group consisting of pH buffers, antioxidant agents, antimicrobial agents, dyes, preservatives, organic and inorganic salts and combinations thereof.
10. The ethanol-free fragrance composition according to claim 1, wherein said composition has a low viscosity, is sprayable, spreadable, or capillary-wicking.
11. The ethanol-free fragrance composition according to claim 1, wherein said optional water is least 10 % w/w relative to the total weight of the composition.
12. A consumer article comprising an ethanol-free fragrance composition according to claim 1.
13. The consumer article according to claim 12 in form of air freshener, textile freshener, all-purpose cleaner, perfume, hair or skin formulation.

14. A method of conferring, enhancing or modifying the odor properties of a surface selected from the group consisting of glass, tiles, textiles, wood, a kitchen or bathroom, comprising the step of applying to such surfaces an olfactive amount of an ethanol-free fragrance composition according to claim 1.
15. The method according to claim 14, wherein said surface is glass, tiles, textiles or wood.
16. The ethanol-free fragrance composition according to claim 1, wherein said composition is in concentrated form.
17. The ethanol-free fragrance composition according to claim 1, wherein said composition is in ready-to-use form.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US17/26489

A. CLASSIFICATION OF SUBJECT MATTER
 IPC - A61K 8/02, 8/04; A01N 31/04, 31/06, 31/08, 31/14; A61Q 13/00, 19/00; C11B 9/00 (2017.01)
 CPC - A61K 8/02, 8/04; A01N 31/04, 31/06, 31/08, 31/14; A61Q 13/00, 19/00; C11B 9/00

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)

See Search History document

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

See Search History document

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

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2015/0322374 A1 (FIRMENICH SA) 12 November 2015; paragraphs [0013]-[0019], [0021], [0036], [0042]	1-17
A	EP 1617914 B1 (FIRMENICH SA) 15 October 2008; paragraphs [0009], [0011], [0018], [0025]-[0026], [0042]	1-17
A	US 2012/0097754 A1 (VLAD F-J, et al.) 26 April 2012; paragraphs [0009], [0018], [0023], [0028], [0030], [0037], [0070], [0072]	1-17
A	US 8,513,180 B2 (WIEDEMANN J, et al.) 20 August 2013; column 1, lines 11-20, column 2, lines 47-52; column 3, lines 24-30, 35-38 and 57-61; column 4, lines 54-56; column 10, lines 52-56	1-17

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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"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

11 June 2017 (11.06.2017)

Date of mailing of the international search report

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