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(54) **Title**: ANTIPERSPIRANT COMPOSITIONS

(57) **Abstract**: An anhydrous antiperspirant stick composition in which the oil phase in which a particulate antiperspirant is suspended is solidified by a wax gellant system comprising from 50 to 75% by weight of an ester wax having a melting point of >75°C to 95°C, from 15 to 35% by weight of a linear fatty alcohol having a melting point of from >55°C to <75°C and from 5 to 18% by weight of polyethylene having a melting point of >75°C to 95°C. The resultant composition exhibits a superior combination of sensory properties and avoidance of white visible deposits.

Antiperspirant Compositions

The present invention relates to antiperspirant compositions, more particularly to stick compositions and still more particularly to anhydrous compositions.

Background and Prior Art

As a means of controlling their body temperature, humans perspire, an aqueous salt solution passing through eccrine glands. However, the distribution of eccrine glands on the body is not even, an area of particularly high density occurring in the underarm (axilla). As a consequence, instead of the sweat evaporating, there is a greater tendency for the underarm skin to become visibly wet in the vicinity of the underarm and for clothing that comes into contact with the skin there to exhibit damp patches. In many societies, this is considered to be unsightly, so that localised control of sweating is promoted. Secondly, residual sweat on the skin surface contains a range of chemicals that have little odour in themselves, but are transformed by the population of bacteria such as Coryne bacteria into malodorous compounds. Humans prefer to smell attractively, or at least avoid smelling malodorously, so ameliorating the generation of malodours is a second justification for localised control of sweating. As a consequence of the desire by humans to avoid looking unsightly and/or to offend because they are malodorous, a branch of the cosmetics industry has flourished that devised antiperspirant compositions and/or their localised delivery to skin.

Many different forms of antiperspirant composition have been developed, though they tend to fall into two broad classes. In one category, the composition is retained in an applicator that is brought into contact with the skin and in the second category, the applicator is held at a distance away from the skin and the composition is propelled onto the skin. The present invention relates to the first category, and in particular to a sub-set of that category in which the composition has been solidified to form a stick that is normally dispensed from a holder so that

it does not come into contact with the hand used to apply the composition. In the context of the present invention, as usual, the term stick indicates that the composition is a self supporting solid that would retain its shape at STP, if removed from its holder.

Antiperspirant sticks can be further divided into two classes having different properties. In one class the antiperspirant active is dissolved in a hydrophilic phase, commonly aqueous, and in the second class, the antiperspirant is particulate and suspended in an oil phase that has been solidified by introduction of a gellant/structurant/solidifying agent at a large enough weight proportion of the oil phase. Within that second class of sticks, commonly referred to as anhydrous, there have been many different gellant/structurants/solidifying agents proposed in patent specifications or actually used commercially. For many years, most commercial anhydrous antiperspirant sticks have been solidified by a wax or a mixture of waxes. Herein the term wax indicates an organic (i.e. organic carbon-containing) water-insoluble material that is solid at 40°C and melts at a temperature of up to 95°C forming a mobile liquid that is water-immiscible. The use of waxes is advantageous because the resultant white stick demonstrates positively solidity and purposefulness, waxes are readily available at a reasonable cost, and the fact that they melt at a temperature no higher than 95°C, and many at lower than 85°C, means that there is generally speaking no need to employ ultra-expensive material in the construction of vats, pipework and other manufacturing elements for wax stick production.

However, although the cosmetics industry has gained considerable experience in wax-solidified anhydrous antiperspirant sticks, it has also recognised that waxes can introduce a number of undesirable properties to the sticks, the nature of the property depending on the choice of wax. Commonly, a high proportion of antiperspirant wax-gelled sticks employ a combination of a major proportion of a linear fatty alcohol which typically has a comparatively low melting point with a minor proportion of a higher melting point ester wax, such as from about 12 to

20% for the fatty alcohol and from about 2.5 to 5% for the ester wax, so that the weight ratio often sits in the range of from about 2.5:1 to 6:1, and in many instances from about 3:1 to 4:1. However, one undesirable property of such wax-gelled sticks is that they leave to an undesirable extent a visible residue, which can also be referred to as visible deposits or white deposits. The residue can be apparent on skin itself on clothing that has come into contact with skin to which the composition has been applied. Either way, such deposits are not liked by many consumers.

The antiperspirants industry has previously looked at ways of ameliorating visible deposits from wax sticks gelled with a mixture of a fatty alcohol and an ester wax and has contemplated two substantially different routes. One route comprises totally replacing the wax gellant by a non-wax gellant system, for example polymeric gellants or non-polymeric fibre-forming gellants. Such a route is incompatible with retaining a wax-based system. A second route adopts the concept of employing masking oils, such as described in US 5449511 (Coe et al, assigned to Gillette), US 5531986 (Lee et al assigned to Colgate Palmolive), US 5917239 (Linn et al, assigned to Colgate Palmolive), US6361766 (Franklin et al assigned to Unilever), US20030113282 (Buranachokpaisan assigned to Church & Dwight) and US20070166254 (Bianchi, assigned to Unilever). This second route is, indeed, quite successful at ameliorating the appearance of visible deposits but it is a palliative, addressing the symptoms rather than the root cause of the whiteness.

The instant inventors have sought to follow a third route, namely investigating a way of retaining a wax system that continues to employ a fatty alcohol and an ester wax, as described for example in US20070166254 (Bianchi) in which a third wax was added whilst ameliorating visible deposits, a third route that can be employed in conjunction, if desired, with employing a masking oil.

Brief summary of the present invention

According to one aspect of the present invention, there is provided an anhydrous antiperspirant stick composition comprising

from 10 to 30% by weight of a particulate astringent antiperspirant salt

from 45 to 75% by weight of at least one oil

from 14 to 24% by weight of a wax gellant system comprising from 50 to 75% by weight of an ester wax having a melting point of >75°C to 95°C, from 15 to 35% by weight of a linear fatty alcohol having a melting point of from >55°C to <75°C and from 5 to 18% by weight of polyethylene having a melting point of >75°C to 95°C.

By selecting a three component wax gellant system that employs a major fraction of an ester wax having a comparatively high melting point together with only a minor fraction of a fatty alcohol and supplementing the system with a polyethylene wax having a suitable melting point it is possible to produce an anhydrous antiperspirant stick that demonstrates a superior combination of properties of hardness, sensory and visible deposits compared with hitherto disclosed sticks which employ a similar wax gellant system but employ a major fraction of the fatty alcohol and only a minor fraction of the ester wax.

Detailed description and preferred embodiments

The instant invention relates to improvements in anhydrous antiperspirant compositions in which an oil phase is gelled by a combination of a linear fatty alcohol and an ester wax selected that instead of employing a substantial excess of the fatty alcohol compared with the ester wax, the composition employs the ester wax having a melting point of at>75°C and preferably >78°C as the largest fraction of the system, it with a minor fraction of the fatty alcohol and supplements it with a complementary fraction of a polyethylene wax that also has a melting point of >75°C. Even though the ester wax and the polyethylene have a similar or very similar melting point, they are not interchangeable. In particular, their relative

proportions affect the hardness of the resultant stick. So, for example, substituting the polyethylene by the same weight of ester wax noticeably softens the stick. When a stick is softer, there is an increased tendency for consumers to apply a greater weight of the product. In other words, there is a tendency to apply a greater weight than is necessary to achieve sweat inhibition, and thereby impair the cost-effectiveness of the product. Thus the three component wax system enables the consumer to benefit from a cost-effective product. At the same time, the selection of the weight ratios of the two other waxes in accordance with the instant invention enables the consumer to observe a reduction in visible deposits. At the same time, the system still enjoys sensory benefits such as retaining similar value for greasiness compared with a wax system that employs the substantial excess of fatty alcohol over ester wax.

Wax system

The wax system of the instant invention comprises essentially three components. The largest fraction of the system is an ester wax having a melting point of >75°C and preferably greater>78°C. The ester wax preferably has a melting point of <90°C and in many particularly suitable waxes, their melting point is up to 85°C. The melting point of the ester wax is of particular importance, since the choice of an ester wax having a melting point below the selected range results in a product that is softer and thus suffers from the disadvantages outlined above. Said ester wax preferably constitutes at least 60% by weight of the wax system, such as in the region of from 62.5% to 70% of the weight of the system. In many suitable compositions, the proportion of the ester wax is at least 9%, and particularly at least 10% by weight of the antiperspirant composition. The proportion of the ester wax in many desirable compositions is up to 15% and particularly up to 13.5% by weight of the antiperspirant composition.

The ester wax can be a monoester or a multiester, provided that melting point criterion is met. Typically, in monoesters, the melting point is achieved by a molecular weight that is high enough and especially by selecting linear alkyl

substituents, for example at least one substituent containing on average at least 20 carbons and particularly from 20 to 38 on average. The ester wax can be fractionated from a natural wax such as from beeswax. Or be a synthetic analogue. A particularly suitable wax comprises a hydrogenated plant ester oil such a castor oil, the extent of hydrogenation of the unsaturated C18 substituent being sufficient to attain the desired melting point. It will be recognised that in order to satisfy the instant invention, the castor wax must be one selected to attain the desired melting point criterion. An unsuitable alternative such as Castorwax MP70 causes the resultant stick to suffer increased softness and thus present the disadvantages identified above. A particularly preferred ester wax is Castorwax MP80, but castor oil that has been hydrogenated to an even greater extent can be contemplated too.

The second largest component of the invention wax system is a linear fatty alcohol. Commonly, the alcohol contains on average from 16 to 22 carbons, such as especially from 17.5 to 18.5, including 18. The alcohol is very desirably stearyl alcohol, including commercially available material containing up to about 10% by weight of alcohols containing 16, 20 and/or 22 carbons. The weight proportion of the fatty alcohol in the wax system is often up to 25% and in many suitable compositions is at least 18%. The fatty alcohol in many compositions is present at a concentration selected in the range of from 2 to 6 % by weight. Once again, additional fatty alcohol can result in the stick being softer, with the concomitant disadvantages from increased softness identified above.

The third essential component of the wax system is polyethylene having a melting point of 75°C and preferably >78°C. Particularly desirably, the polyethylene has a melting point of up to 85°C. Suitable polyethylene often has an average molecular weight in the region of 400 to 540 daltons, such as from 420 to 500 daltons. An especially preferred example is Performalene 400 which has a molecular weight of about 450-460. The polyethylene advantageously constitutes at least 9% by weight of the wax system, and in many desirable compositions constitutes up to

13% by weight of the wax system. In one embodiment of interest the polyethylene is present in an amount of from 1 to 3.5% by weight of the composition. In another embodiment of interest the polyethylene is present in the composition in an amount of from 2 to 3.5% by weight, more particularly from 2 to 3% by weight. In yet another embodiment the polyethylene is present at from 2.5 to 3.5% by weight of the composition.

It is often advantageous to select the three essential components of the wax system in the range of from 10:2:1 to 5:3:1 and especially in the ratio of 6+/-10%:2+/-10%:1+/-10%

The total weight proportion of the wax system in the composition is usually at least 16% and commonly it is not greater than 20 or 22%. An especially desirably amount is 17.5% to 18.5%by weight.

Oils

By an “oil” herein is meant a hydrophobic compound or mixture of compounds that is liquid in the range of from 20 to 95°C. Many oils have a boiling point that is significantly in excess of 95°C. The oil typically represents at least 45% and particularly at least 50% by weight of the composition. In some especially favoured compositions, the oil constitutes at least 55% by weight thereof. It is often convenient to employ up to 70% by weight of oil in the composition and in some embodiments, particularly up to 65%.

Oils that can be contemplated for use in the invention compositions can be either volatile or non-volatile. Herein by the term volatile is meant that its vapour pressure at 25°C is at least 1 Pa. Typically, its vapour pressure is up to 2kPa at 25°C. A non-volatile oil has a vapour pressure at 25°C that is less than 1Pa, and for many non-volatile oils is less than 0.1Pa.

The weight ratio of volatile to non-volatile oil in the mixture of oils is often selected in the range of from 3:2 to 2:3. In many desirable compositions, the weight proportion of the volatile oil in the mixture of oils is at least 40% and in many instances is at least 45%.

Volatile polyorganosiloxanes can be linear or cyclic or mixtures thereof. Preferred cyclic siloxanes, otherwise often referred to as cyclomethicones, include polydimethylsiloxanes and particularly those containing from 3 to 9 silicon atoms, preferably at least 4 and especially at least 5 silicon atoms. Preferred cyclomethicones contain not more than 7 silicon atoms and very preferably up to 6 silicon atoms. Volatile silicone oils herein desirably contain on weight average from 4.5 to 5.9 silicone atoms, and especially at least 4.9.

Preferred linear polyorganosiloxanes include polydimethylsiloxanes containing from 3 to 9 silicon atoms. The volatile siloxanes normally by themselves exhibit viscosities of below 10^{-5} m^2/sec (10 centistokes), and particularly above 10^{-7} m^2/sec (0.1 centistokes), the linear siloxanes normally exhibiting a viscosity of below 5 x 10^{-6} m^2/sec (5 centistokes). The volatile silicones can also comprise linear or cyclic siloxanes such as the aforementioned linear or cyclic siloxanes substituted by one or more pendant -0-Si$(CH_3)_3$ groups, the resultant compounds desirably containing not more than 7 silicon atoms. Examples of commercially available silicone oils include oils having grade designations 344, 345, 244, 245 and 246 from Dow Corning Corporation; Silicone 7207 and Silicone 7158 from Union Carbide Corporation; and SF1202 from General Electric.

It is desirable to include a volatile silicone because it can give a "drier" feel to the applied film after the composition is applied to skin, for example constituting at least 25% and particularly at least 40% by weight of the carrier liquids. The proportion of volatile silicone oils is often less than 60% by weight of the oils.

One class of non-volatile oils contemplated herein comprises non-volatile silicone oils, which include polyalkyl siloxanes, polyalkylaryl siloxanes and polyethersiloxane copolymers. These can suitably be selected from dimethicone and dimethicone copolyols. Other very suitable non-volatile silicones oils comprise a di or trimethicone substituted by at least one phenyl group. Commercially available non-volatile silicone oils include products available under the trademarks Dow Corning 556 and Dow Corning 200 series. Other non volatile silicone oils include that bearing the trademark DC704. Incorporation of at least some non-volatile silicone oil having a high refractive index such as of above 1.5, for example in a proportion of at least 1% by weight of the silicone oils can be beneficial, such as up to 5% of the oils by weight.

Many suitable non-volatile oils are free from silicon. Such oils include liquid aliphatic hydrocarbons such as mineral oils or hydrogenated polyisobutene, often selected to exhibit a low viscosity. Further examples of liquid hydrocarbons are polydecene and paraffins and isoparaffins of at least 10 carbon atoms. Hydrocarbon liquids preferably are present in a range of from 0 to 20% w/w and especially from 0 to 5% of the oils.

Other suitable hydrophobic non-volatile oils comprise liquid aliphatic or aromatic esters. Suitable aliphatic esters contain at least one long chain alkyl group, such as esters derived from C_1 to C_{20} alkanols esterified with a C_8 to C_{22} alkanoic acid or C_6 to C_{10} alkanedioic acid. The alkanol and acid moieties or mixtures thereof are preferably selected such that they each have a melting point of below 20°C. Typically they have a boiling point of above 100°C and many above 150°C. Such esters include isopropyl myristate, lauryl myristate, isopropyl palmitate, diisopropyl sebacate and diisopropyl adipate.

Suitable liquid aromatic esters, preferably having a melting point of below 20°C, and particularly above 100°C, include fatty alkyl benzoates. Examples of such esters include suitable C_8 to C_{18} alkyl benzoates or mixtures thereof, including in

particular C_{12} to C_{15} alkyl benzoates e.g., those available under the trademark Finsolv. Such aromatic, particularly benzoate esters advantageously constitute at least 10% by weight of the oils and in certain highly desirable embodiments at least 15% such as at least 20% by weight of the oils. The weight proportion is normally up to 35% of the oils. An excellent combination of properties of the composition can be attained from incorporating benzoate oils in the range of 20 to 30% of the oils.

A further class of suitable ester oils, which desirably provide up to 10% w/w of the carrier liquids, such as from 0.5 to 5% of the oil blend comprise triglyceride oils, such as those extractable from plants derivable from unsaturated carboxylic acids, such as C16, C18 and/or C20. Suitable examples of such triglyceride oils include caster oil, borage oil, coriander seed oil, safflower oil and sunflower seed oil.

Ester oils, be they aliphatic or aromatic desirably comprise from 0 to 50% w/w, eg 5 to 40% w/w of the oils. The ester oils can advantageously constitute at least 10% by weight of the oils and often up to 35%. A convenient and practical range is from at least 20% by weight of the oils.

The ester oils can comprise a single ester oil or a mixture of oils, such as a mixture of a benzoate ester oil and a triglyceride oil.

A further class of non-volatile oils comprises liquid aliphatic ethers derived from at least one fatty alcohol, such as myristyl ether derivatives e.g. PPG-3 myristyl ether or lower alkyl ethers of polygylcols such as an ether named as PPG-14 butyl ether by the CTFA. Such ethers desirably constitute from 0 to 30%, and preferably at least 10% w/w of the oils.

It is particularly suitable to employ together both ester and ether oils, such as in a weight ratio of the ester to ether oil of from 2:3 to 5:2. A preferred weight range of the ester to ether oil is from 4:5 to 2:1, for example from about 1:1 to about 3:2.

Yet other oils which can beneficially be included, if desired, comprise hydrophobic aliphatic alcohols which are liquid at 20°C and have a boiling point of above 100°. Such oils are preferably employed in a proportion of from 0 to 50% w/w of the carrier liquids, and are of especial benefit for use in conjunction with amido gellants, when they are preferably employed within the proportion of from 25 to 50% w/w of the carrier oils. Especially desirable hydrophobic aliphatic alcohols are branched chain alcohols of at least 15 carbon atoms up to 30 and especially up to 25, including isostearyl alcohol, hexyl-decanol octyl-dodecanol and decyl-tetradecanol. Other suitable water-immiscible alcohols include intermediate chain length linear alcohols, commonly containing from 9 to 13 carbon atoms, such as decanol or dodecanol.

Antiperspirant actives for use herein are often selected from astringent active salts, including in particular astringent aluminium, zirconium and mixed aluminium/zirconium salts, including both inorganic salts, salts with organic anions and complexes. Preferred astringent salts include aluminium, zirconium and aluminium/zirconium halohydrate salts, and especially chlorohydrates. Aluminium/zirconium chlorohydrates complexed with glycine are particularly desirable antiperspirant actives in stick compositions herein.

Aluminium halohydrates are usually defined by the general formula $Al_2(OH)_xQ_y.wH_20$ in which Q represents chlorine, bromine or iodine, x is variable from 2 to 5 and x + y = 6 while wH_2O represents a variable amount of hydration. Aluminium chlorohydrates comprise a mixture of polymeric species, for example species containing respectively 12, 24 or 36 aluminium atoms and the relative ratio of the various species is controlled by the manufacture process. It is desirable to include a high proportion of Al 24 species, such as products obtained following the teaching in EP-A-6739, sometimes called activated aluminium chlorohydrates.

Zirconium actives can usually be represented by the empirical general formula: $ZrO(OH)_{2n-nz}B_z.wH_20$ in which z is a variable in the range of from 0.9 to 2.0 so that the value 2n-nz is zero or positive, n is the valency of B, and B is selected from the group consisting of chloride, other halide, sulphamate, sulphate and mixtures thereof. Possible hydration to a variable extent is represented by wH_20. Preferable is that B represents chloride and the variable z lies in the range from 1.5 to 1.87. In practice, such zirconium salts are usually not employed by themselves, but as a component of a combined aluminium and zirconium-based antiperspirant.

The above aluminium and zirconium salts may have co-ordinated and/or bound water in various quantities and/or may be present as polymeric species, mixtures or complexes. In particular, zirconium hydroxy salts often represent a range of salts having various amounts of the hydroxy group. Zirconium aluminium chlorohydrates may be particularly preferred.

Antiperspirant complexes based on the above-mentioned astringent aluminium and/or zirconium salts can be employed. The complex often employs a compound with a carboxylate group, and advantageously this is an amino acid. Examples of suitable amino acids include dl-tryptophan, dl-β-phenylalanine, dl-valine, dl-methionine and β-alanine, and preferably glycine which has the formula $CH_2(NH_2)COOH$. It is highly desirable to employ glycine complexes of a combination of aluminium halohydrates and zirconium chlorohydrates together with amino acids such as glycine.

Many suitable antiperspirant salts have an Al/Zr ratio in a range from 2 to 10, especially 2 to 6, a metal to Cl ratio from 2.1 to 0.9:1 and a variable amount of glycine. In some highly desirable complexes, the metal:Cl ratio is from 0.9:1 to 1.25:1 and in others it is from 1.3:1 to 1.45:1.

Other actives which may be utilised include astringent titanium salts, for example those described in GB 2299506A.

The proportion of solid antiperspirant salt in a suspension composition normally includes the weight of any water of hydration and any complexing agent that may also be present in the solid active.

The antiperspirant salt in an anhydrous stick composition is particulate, commonly having particles mainly with a diameter within the range of 0.1 to 200 μm, such as providing a mean particle size in the range of from 3 to 20μm.

The particulate antiperspirant active may be present in the form of hollow spheres or/and non-hollow particles at the discretion of the manufacturer of the invention antiperspirant product. Non-hollow particles can be made, if desired, by crushing hollow particles. Where it is desired that the composition is translucent in bulk or to reduce the appearance of visible deposits on the skin to which the composition is applied or on clothing which comes into contact with the composition, it is preferable for the antiperspirant particles to be substantially free from hollows, such as greater than 90% by weight of the particles and especially greater than 95% by weight.

The antiperspirant active is often present at a concentration of from 0.1 to 35% by weight of a stick composition, particularly at least 5% by weight and in many very desirable compositions at least 15% by weight. Often, its concentration is not greater than 30% by weight, and in many effective compositions is up to 26% by weight. At low concentrations such as up to 5% by weight, the active is more noticeable as a deodorant, whereas at the higher concentrations and especially at above 10% concentration, it increasingly demonstrates effectiveness to reduce perspiration whilst retaining its ability to inhibit malodour formation.

Suitable deodorant actives can comprise deodorant effective concentrations of antiperspirant metal salts, deoperfumes, and/or microbicides, including particularly bactericides, such as chlorinated aromatics, including biguanide derivatives, of

which triclosan (eg Irgasan DP300 or Triclorban), and chlorhexidine warrant specific mention. Another class of effective deodorants comprises polyaminopropyl biguanide salts such as are available under the trade mark Cosmosil. Such materials commonly act as bactericides. A still further class of materials that can inhibit malodour formation comprise chelators that can sequester iron, and thereby retard bacterial growth, including aminopolycarboxylates such as EDTA or preferably higher homologues such as DTPA. Deodorant actives other than astringent metal antiperspirant salts are commonly employed at a concentration of from 0.1 to 5% by weight, and particularly 0.1 to 2% by weight.

The antiperspirant compositions herein can comprise, if desired, one or more humectants, preferably comprising at least 2 hydroxyl substituents. Preferred humectants comprise glycerol and PEG (polyethylene glycol) having an average molecular weight of from 200 to 620. Such a humectant can desirably be employed at a concentration of at least 0.25% w/w and particularly at least 0.5% w/w of the composition. The humectant is preferably present at a concentration of up to 10% w/w, in many instances up to 8% w/w, and often advantageously from 1 to 4% w/w of the composition.

The compositions herein can if desired comprise one or more minor ingredients that can be contemplated in cosmetic compositions. Such ingredients normally comprise in total not more than 10% by weight of the composition. Such optional constituents can comprise sensory modifiers, such as talc or finely divided particulate polyethylene, (high molecular weight) such as in an amount of up to 5% by weight; fragrance, including, if desired deoperfumes, and which can be encapsulated or no-encapsulated, or a mixture of both, often in an amount of up to 4%, e.g., 0.3 to 2% by weight, colorants; skin cooling agents such as menthol; and wash-off agents such as non-ionic surfactants including in particular aliphatic polyethylene oxide ether or ester surfactants, commonly having a HLB value of at

least 6, such as at a concentration of up to 3% by weight of composition, e.g. 0.25 to 1% by weight.

Preparation of stick compositions

One convenient process sequence for preparing a stick according to the present invention comprises first forming a solution of the wax gellants combination in the water-immiscible liquid or a fraction of the water-immiscible liquids. This is normally carried out by agitating the mixture at a temperature sufficiently high that all the waxes dissolve (the dissolution temperature) such as a temperature in a range from 70 to 95°C. Any oil-soluble cosmetic adjunct can be introduced into oil phase, either before or after the introduction of the gellants. However, the fragrance oil, be it encapsulated or free, is commonly the last ingredient to be incorporated into the composition, after the antiperspirant active on account of its sensitivity often to elevated temperature. Commonly, the resultant waxes solution is allowed to cool to a temperature that is intermediate between that at which the waxes dissolved and the temperature at which the composition would set, often reaching a temperature in the region of 55 or 60 to 70°C, such as from 5 to 10°C above the previously identified setting temperature. The fluid mixture is them discharged into moulds or more preferably dispensing containers, or passed though a cooling pipe and chopped into suitable lengths and wrapped.

In an alternative process for making the invention compositions, the oils and the waxes are introduced into a macerator, sometimes called a plodder, and the mixture is subjected to vigorous agitation and heated to a temperature above the setting temperature of composition but below the temperature at which all the waxes would melt and dissolve into the oil blend. The remaining ingredients of the composition are introduced with continued vigorous agitation and the resultant mixture is discharged into moulds or more usually the dispensing containers.

Dispenser

Although the stick composition could be formed into an extruded bar and wrapped and sold in that form, generally it is desirable to house the composition in a stick dispenser that conventionally comprises a barrel one at one end, and a platform located beneath the open end adapted to propel the stick composition out of the barrel through the open end. The means for propulsion can comprise an opening at a second end of the barrel remote from the first end through which a finger could be inserted to come into contact with the underside of the platform, or more usually is rotor wheel at the base of a barrel on which is mounted a threaded spindle that extends through a correspondingly threaded aperture in the platform. The barrel engages the platform so as to prevent rotation of the latter, so that when the rotor wheel and spindle are rotated, the platform is advanced or retracted to or from the open end. Examples of suitable dispensers are described, for example, in US 4232977, US4605330, WO09818695, WO09603899, WO09405180, WO09325113, WO09305678, EP1040445, US5997202, US5897263, US5496122, US5275496, US 6598767, US 6299369, or WO2002/03830.

The invention stick compositions are applied topically to human skin and particularly to the axillae by wiping an exposed surface of the stick across the skin surface, thereby depositing a small fraction of the composition on the surface. Commonly, the stick is wiped back and forth enough times until approximately 0.3g has been deposited per axilla. By selecting the wax gellant system and the oils in accordance with the present invention, the user can undergo a superior combination of reduced visible deposits and acceptable sensory experience compared with the employment of a stick that has been gelled with a wax system comprising a weight excess of fatty alcohol over ester wax.

Having included a summary of the present invention and described preferred embodiments, further compositions will now be described in more detail by way of example only.

Examples 1 and 2 and Comparisons CA to CE

Stick compositions having the ingredients summarised in Table 1 below were made by the same general process in which as a first step, the oils were blended together in a vessel equipped with agitation and heating means at ambient temperature, together with any surfactant. The oil blend was heated up to approximately 85°C and during the heating process, the waxes identified in Table 1 were introduced gradually. The resultant mixture was maintained at 85°C and agitated until wax was no longer observable by eye, heating was halted and the antiperspirant salt and any other solid introduced which brought the temperature to below 70°C, and thereafter the fragrance was added. When the temperature had reached around 55 to 60°C, the compositions were poured into the barrel of a conventional oval stick dispenser and cooled to permit the composition to solidify.

Table 1

Example/Comparison	Ex 1	Ex 2	CA	CB	CC	CD	CE
	% by weight						
Vol Silicone	Balance						
Non-volatile silicone	1.5	1.5	1	1	1	1	1
Silica	0.5	0.5		1			
Ether oil	9.	12	9.5	12.5	9.5	9.5	9.5
Benzoate ester oil	15	12	15	14.5	12	12	15
Triglyceride oil	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Fatty alcohol	4	4	18	18		8	18
Ester wax	12	12	3.5	3.5	16	8	3.5
Polyethylene wax	2	2	1	1	1	1	2
AZAG salt	20	24	20	20	20	20	20
POE surfactant	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Fragrance	1.3	1.3	1	1	1	1	1
Panel test 1							
Panel Whiteness	0.43		0.83		0.44	1.06	
Panel rub-off (10 mins)	1.18		1.85		1.02	1.18	
Force to spread	4.33		4.60		4.95	3.85	
Panel test 2							
Whiteness	6.3	7.65		11.5			
Greasiness 20 mins	14.15	13.95		16.35			
Measured whiteness							
After 1 min		38.2					40.05
After 2 hours		37.0					39.25
Stickiness (0 min)	0.67				0.75		
Slippery feel (0 min)	5.23				4.23		
Filmy Residue (10 min)	0.95				1.01		

In the first panel test, Ex1 and comparisons, CA, CC and CD were compared in a head to head panel test to compare various attributes. 12 trained and qualified panellists participated in the test, each comparing two products. They identified various sensory characteristics on a unitary 10 point scale ranging from 0, the best to 10, the worst for undesirable attributes but the reverse for desirable attributes. Thus, whiteness, stickiness and filmy residue are considered to be negative, undesirable attributes, whereas a slippery feel is a desirable, positive attribute. Products were blind coded and the order of test presentation to the panellists fully randomised.

Table 1 above shows that visible whiteness was noticeably better when the composition was gelled in the absence of the fatty alcohol or when it contributed only a minor fraction (16.7% by weight) of the wax gellant system. Likewise, rub-off was significantly improved by employing a wax gellant system that comprised less than half fatty alcohol. All the compositions contained similar proportions of masking oils (the ether, esters and non-volatile silicone oil) so that the improvement is attributable to the change in composition of the wax gellant system.

Table 1 furthermore shows that the users encountered greater difficulty applying the composition that was free from fatty alcohol (CC) than applying any of the other compositions. Moreover, comparison CC was significantly worse in terms of stickiness on application, being perceived as stickier by the users. The corollary of stickiness, namely slippery feel, confirms that perception, because the users perceived the invention composition to have a more slippery feel than comparison CC that lacked the fatty alcohol.

Consequently, the instant invention selection provides a balanced product combining the benefit of low visible whiteness with ease of application and

superior feel on application, a combination of benefits not shared by those wax-structured sticks that did not satisfy the invention criteria.

In a second panel test, carried similarly to the first panel test, but employing a 100 point observation scale, the test confirmed that the composition gelled with a wax system comprising over 75% by weight fatty alcohol was noticeably whiter than the Example compositions in which the fatty alcohol constituted only 16.7%. It was also directionally greasier.

Whiteness test

This was carried out using a KS Image Analyser fitted with a Sony XC77 monochrome video camera with a Cosmicar 16mm focal length lens positioned vertically above a black table illuminated from a high angle using fluorescent tubes to remove shadowing. The apparatus was initially calibrated using a reference white card, after the fluorescent tubes had been turned on for long enough to give a steady light output. A cloth with a deposit thereon from the previous test was placed on the table and the camera was used to capture an image. An area of the image of the deposit was selected and analysed using KS400™ image software. This notionally divided the image into a large array of pixels and measured the grey level of each pixel on a scale of 0 (black) to 255 (white). The average of the grey intensity was calculated and can be compared with the background reading for the cloth of 10. This was a starting point to measure the whiteness of the deposit, with higher numbers indicating a whiter deposit. It was assumed that low numbers show a clear deposit allowing the substrate colour to be seen.

The measured whiteness at 1 minute showed that doubling the polyethylene wax proportion from Comparison CA actually increased visible whiteness compared with a composition according to the present invention. It also verifies the panel test data.

Claims:

1. An anhydrous antiperspirant stick composition comprising from 10 to 30% by weight of a particulate astringent antiperspirant salt from 45 to 75% by weight of at least one oil from 14 to 24% by weight of a wax gellant system comprising from 50 to 75% by weight of an ester wax having a melting point of >75°C to 95°C, from 15 to 35% by weight of a linear fatty alcohol having a melting point of from >55°C to <75°C and from 5 to 18% by weight of polyethylene having a melting point of >75°C to 95°C.

2. A composition according to claim 1 in which the wax gellant system comprises at least 60% by weight of the ester wax.

3. A composition according to claim 1 or 2 in which the ester wax has a melting point of from 80 to 85°C.

4. A composition according to any preceding claim in which the ester wax comprises a hydrogenated castor oil.

5. A composition according to any preceding claim in which the wax gellant system comprises from 18 to 25% by weight of the linear fatty alcohol.

6. A composition according to any preceding claim which the linear fatty alcohol comprises stearyl alcohol.

7. A composition according to any preceding claim in which the gellant system comprises from 9 to 13% by weight of the polyethylene.

8. A composition according to any preceding claim in which the polyethylene has a melting point in the range of from 80 to 85°C.

9. A composition according to any preceding claim in which from 16 to 20% by weight of the wax gellant system is employed.

10. A composition according to any preceding claim in which the oil comprises a mixture of a volatile oil and a non-volatile oil in a weight ratio of from 3:2 to 2:3.

11. A composition according to any preceding claim which contains from 25 to 35% by weight of a volatile silicone oil.

12. A composition according to any preceding claim which contains from 22 to 35% by weight of a non-volatile oil having a refractive index of at least 1.44.

13. A composition according to any preceding claim which contains from 6 to 15% by weight of a polypropylene glycol alkyl ether.

14. A composition according to claim 13 in which the polypropylene glycol ether is PPG-14 butyl ether.

15. A composition according to any preceding claim containing from 9 to 22% by weight of an alkyl or aryl benzoate.

16. A composition according to claim 15 in which the alkyl or aryl benzoate is C_{12-15} alkyl benzoate.

17. A composition according to any preceding claim which contains from 15 to 26% by weight of the antiperspirant.

18. A composition according to any preceding claim in which the antiperspirant is an aluminium zirconium chlorohydrate, optionally complexed with glycine.

19. A composition according to any preceding claim which contains the wax gellant system at a concentration sufficient to produce a stick having a penetration of less than 10mm measured using a Seta penetrometer.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/051279

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/34 A61K8/58 A61K8/81

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)
A61Q A61K

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 practical, search terms used)
EPO-Internal, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 531 986 A (SHEVADE MAKARAND [US] ET AL) 2 July 1996 (1996-07-02) cited in the application column 3, line 7 - line 18 claims; examples	1-19
Y	HUNTER, ALLISON ET AL.: "linear polyethylene and long chain alcohols in underarm sticks and soft solids" COSMETIC & TOILETRIES, vol. 118, no. 12, 2003, XP009121372 the whole document	1-19
Y	US 2007/166254 A1 (BIANCHI JAMES M [US]) 19 July 2007 (2007-07-19) cited in the application the whole document	1-19

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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

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

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 March 2010	17/03/2010

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2010/051279

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 2003/113282 A1 (BURANACHOKPAISAN THITIWAN [US]) 19 June 2003 (2003-06-19) the whole document	1-19
A	BAKER PERTROLITE DIVISION OF BAKER HUGHES INCORPORATED: "Antiperspirant gellants" RESEARCH DISCLOSURE, MASON PUBLICATIONS, HAMPSHIRE, GB, vol. 469, no. 45, 1 May 2003 (2003-05-01), XP007132604 ISSN: 0374-4353 the whole document	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2010/051279

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		AU 2320295 A	18-01-1996
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		CO 4410173 A1	09-01-1997
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