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(54) Title: LOW PROPELLANT AEROSOL ANTIPERSPIRANT COMPOSITION

(57) Abstract

The present invention relates to an aerosol suspension type antiperspirant composition comprising: 1) an aerosol concentrate comprising: a) from about 10 % to about 35 % antiperspirant active; b) from about 15 % to about 55 % liquid carrier; c) from about 0.05 % to about 3 % suspending agent; and 2) from about 20 % to about 50 % propellant; wherein said aerosol concentrate has a viscosity of from about 10 to about 10,000 centipoise. The composition can further comprise an effective amount of activator for the suspending agent. Preferably, the weight ratio of aerosol concentrate to propellant is from about 1 to 1 to about 2.3 to 1.

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LOW PROPELLANT AEROSOL ANTIPERSPIRANT COMPOSITION

Technical Field

This invention relates generally to an antiperspirant aerosol composition delivered to the skin of a person through use of an aerosol delivery system. In particular, the invention relates to an antiperspirant composition of the powder suspension type suitable for spraying from a pressurized aerosol container.

Background of the Invention

Antiperspirant compositions normally contain an astringent, such as aluminum chlorhydrate, which chemically suppresses the production of perspiration by sweat glands. This astringent is commonly applied to the skin in the form of an aerosol spray.

The antiperspirant active compound is suspended as a dry, impalpable powder in a liquid vehicle together with a non-aqueous liquefied volatile propellant in a pressurized aerosol container. The aerosol spray is produced by rapid boiling of the propellant as it dispenses from the atomizing valve of the aerosol container.

The aerosol method of application has gained wide acceptance for a number of reasons. Aerosol application of an antiperspirant salt in the form of a powder suspended in the propellant is cosmetically desirable because the antiperspirant can be smoothly and effectively applied to the skin in a manner that is perceived by the consumer to be a drier and more comfortable form of application than roll-ons, creams and gels. Furthermore, because the antiperspirant powder does not dissolve in the liquefied propellant medium, the antiperspirant salt cannot corrode ordinary metal aerosol cans.

One difficulty associated with antiperspirant aerosol sprays is that the delivery of small particles of antiperspirant active compound in a spray can readily clog small valve orifices. When a residue of the liquid propellant/aerosol composition mixture remains in the valve passages following a squirt, evaporation of the liquid may lead to deposition of solid material and consequent valve clogging.

Another problem associated with conventional antiperspirant aerosol sprays is that they utilize a large amount of propellant gas. However, an aerosol composition having a high proportion of propellant is undesirable. Fluorocarbon propellants are believed to accumulate in the stratosphere, where they interfere with the protective ozone layer. In addition to contributing to air pollution, hydrocarbon propellants are flammable, requiring that the proportion of hydrocarbons be restricted to avoid a fire hazard. When dispensed the

conventional aerosol antiperspirants provide a gassy cloud of particles.

An object of the invention is to reduce the amount of liquid propellant in an antiperspirant aerosol composition without causing clogging of the valve of the aerosol container.

A need for an aerosol antiperspirant which provides for less cloud/gassiness exists. Further a need for a drier feeling application exists. Consumers are also concerned with value and the impact products have on the environment.

The present invention relates to an aerosol composition which meets these needs. The present invention is an aerosol composition which provides for a higher ratio of aerosol concentrate to propellant allowing for better value since one is paying for less gas, a drier feel, less cloud, and compact packaging which is about half the size of conventional packaging allowing for easier handling and less waste.

All percentages and ratios given are on a weight basis unless otherwise indicated.

Summary of the Invention

The present invention relates to an aerosol suspension type antiperspirant composition comprising:

1) an aerosol concentrate comprising:

a) from about 10% to about 35% antiperspirant active;

b) from about 15% to about 55% liquid carrier;

c) from about 0.05% to about 3% suspending agent; and

2) from about 20% to about 50% propellant;

wherein said aerosol concentrate has a viscosity of from about 10 to about 10,000 centipoise.

The composition can further comprise an effective amount of activator for the suspending agent. Preferably, the weight ratio of aerosol concentrate to propellant is from about 1 to 1 to about 2.3 to 1.

Details of the Invention

Antiperspirant Active

The antiperspirant active comprises any compound having antiperspirant activity. Preferably, the antiperspirant materials used include astringent metallic salts, particularly including the inorganic and organic salts of aluminum, zirconium and mixtures thereof. suitable antiperspirant aluminum or zirconium salts are any of those well known in the art, such as those discussed at length in U.S. Patents Nos. 4,174,386, 4,806,338 and 4,840,786.

Astringent metallic salts are preferred antiperspirant materials for use herein, particularly including inorganic and organic salts of aluminum, zirconium, and zinc, and

mixtures thereof. Particularly preferred are the aluminum and zirconium salts such as aluminum halides, aluminum hydroxy halides, zirconyl oxide halides, and zirconyl hydroxy halides, and complexes of aluminum, zirconium, and/or zinc with amino acids, e.g., glycines.

Specific exemplary aluminum salts that can be used include aluminum chloride and the aluminum hydroxyhalides having the general formula $Al_2(OH)_aQ_bXH_2O$ where Q is chloride, bromide, or iodide (preferably chloride); a is from about 2 to abut 5, and a+b=about 6, and a and b do not need to be integers; and where X is from about 1 to about 6, and X does not need to be an integer. Particularly preferred are the aluminum chlorhydroxides referred to as "5/6 basic chlorhydroxide" wherein a is 5 and " 2/3 basic chlorhydroxide" wherein a is 4. Aluminum salts of this type can be prepared in the manner described more fully in U.S. Pat. No. 3,887,692, Gilman, issued June 3, 1975; U.S. Pat. No. 3,904,741, Jones and Rubino, issued September 9, 1975; U.S. Pat. No. 4,359,456, Gosling et al., issued November 16, 1982; and British Patent Specification 2,048,229, Fitzgerald et al., published December 10, 198, all incorporated by reference herein. Mixtures of aluminum salts are described in British Patent Specification 1,347,950, Shin, et al., published February 27, 1974, also incorporated by reference herein.

Preferred compounds include the 5/6 basic aluminum salts of the empirical formula $Al_2(OH)_5Dl.2H_2O$; mixtures of $AlCl_3.6H_2O$ and $Al_2(OH)_5Cl.2H_2O$ with aluminum chloride to aluminum hydroxychloride weight ratios of up to about 0.5; ZAG type complexes wherein the zirconium salt is $ZrO(OH)Cl.3H_2O$, the aluminum salt is $Al_2(OH)_5Cl.2H_2O$ or the aforementioned mixtures of $AlCl_3.6H_2O$ and $Al_2(OH)_5Cl.2H_2O$ wherein the total metal to chloride molar ratio in the complex is less than about 1.25 and the Al:Zr molar ratio is about 3.3, and the amino acid is glycine; and the ZAG-type complexes wherein a is from about 1.5 to about 1.87 and n is from about 1 to about 7, the aluminum salt is $Al_2(OH)_5Cl.2H_2O$, and the amino acid is glycine.

The most preferred antiperspirant actives useful in the compositions of the present invention are antiperspirant actives with enhanced efficacy due to improved molecular distribution. Aluminum chlorhydroxide salts, zirconyl hydroxychloride salts, and mixtures thereof having improved molecular distributions are known, having been disclosed, for example, in the following documents, all incorporated by reference herein; U.S. Pat. No. 4,359,456, Gosling et al., issued November 16, 1982; European Published Patent Application, 183,171, Armour Pharmaceutical Company, published June 4, 1986; British Patent Specification 2,048,229, The Gillette Company, published December 10, 1980; European Published Patent Application 191,628, Unilever PLC, published August 20, 1986; and British Patent Specification 2,144,992, The Gillette Company, published March 20,

1985.

The improved molecular distribution is determined by the known analysis method called gel permeation chromatography This analysis method is described for example, in several of the above-incorporated patent specifications as well as in European Published Patent Application 7,191, Unilever Ltd., published January 23, 1980, the disclosures of which are incorporated herein. It is preferred for purposes of the present invention that the antiperspirant actives utilized have enhanced efficacy due to improved molecular distribution with a ratio of peak 4 to peak 3 greater than about 0.1:1 as determined by gel permeation chromatography. This ratio as is recognized by one skilled in the art, relates to the relative area under those two peaks as measured by the gel permeation chromatography analysis method.

Highly desirable antiperspirant salts for use herein include aluminum chlorohydrex (sold under the name Rehydrol®, by Reheis Chemical Company), aluminum chlorohydrex PEG, aluminum chlorohydrex PG, aluminum sesquichlorohydrate, aluminum sesquichlorohydrex PEG, aluminum sesquichlorohydrex PG, and mixtures thereof, particularly aluminum sesquichlorohydrate.

Aluminum compounds are preferred to the use of zirconium compounds. The zirconium compounds which may be used in the present invention include both zirconium oxy salts and zirconium hydroxy salts, also referred to as the zirconyl salts and zirconyul hydroxy salts. These are preferred compounds for use herein and may be represented by the following general empirical formula:

$$ZrO(OH)_{2-nz}B_z$$

wherein z may vary from about 0.9 to about 2 and need not be an integer; n is the valence of B; 2-nz is greater than or equal to O; and B may be selected from the group consisting of halides (preferably chloride), nitrate, sulfamate, sulfate, and mixtures thereof. Although only zirconium compounds are exemplified in this specification, it will be understood that other Group IVB metal compounds, including hafnium, could be used in the present invention.

As with the basic aluminum compounds discussed above, it will be understood that the above formula is intended to represent and include compounds having coordinated and/or bound water in various quantities as well as polymers, mixtures and complexes of the above. As will be seen from the above formula, the zirconium hydroxy salts actually represent a range of compounds having various amounts of the hydroxy group varying from about 2.0 to only slightly greater than 0 groups per molecule.

Several types of antiperspirant complexes utilizing the above antiperspirant salts are known in the art. For example, U.S. Pat. No. 4,120,948, Shelton, issued October 17, 1978

and U.S. Pat. No. 3,792,068, Luedders et al., issued February 12, 1974, both incorporated by reference herein, disclose complexes of aluminum, zirconium, and amino acids such as glycines. These complexes and other similar complexes and glycine amino acids are commonly know as ZAG complexes. ZAG complexes useful herein are identified by the specification of both the molar ratio of aluminum to zirconium (hereinafter "Al:Zr" ratio) and the molar ratio of total metal to chloride (hereinafter "Metal:Cl" ratio). ZAG complexes useful herein have an Al:Zr ratio of from about 1.67 to about 12.5 and a Metal:Cl ratio of from about 0.73 to about 1.93.

Also useful are the ZAG complexes disclosed in G.P. Patent Application 2,144,992, Callaghan et al., published March 20, 1985. These ZAG actives, when analyzed by high pressure gel permeation chromatography, exhibit a distribution pattern having fur or more successive peaks or "bands" where the height ratio of Banks IV to III is greater than 2:1.

More preferred are ZAG actives which have a total area under the curve of bands I and II of less than about 10%, preferably less than about 5%, more preferably less than about 2% and most preferably less than about 1%.

Preferred ZAG complexes can be formed by

(A) co-dissolving in water

(1) one part $Al_2(OH)_{6-m}Q_m$, wherein Q is an anion selected from the group consisting of chloride, bromide, and iodide; and m is from about 0.8 to about 2.0;

(2) x parts $ZrO(OH)_{2-a}Q_anH_2O$, where Q is chloride, bromide, or iodide; a is from about 1 to about 2; n is from about 1 to about 8; and x is from about 0.16 to about 1.2;

(3) p parts neutral amino acid selected from the group consisting of glycine, dl-tryptophane, dl-β-phenylalanine, dl-valine, dl-methionine, and β-alanine, and where p is from about 0.06 to about 0.53;

(B) co-drying the resultant mixture to a friable solid; and

(C) reducing the resultant dried inorganic-organic antiperspirant complex to a particulate form.

A preferred aluminum compound for preparation of such ZAG type complexes is aluminum chlorhydroxide of the empirical formula $Al_2(OH)_5Cl.2H_2O$. Preferred zirconium compounds for preparation is such ZAG-type complexes are zirconyl hydroxydchloride having the empirical formula $ZrO(OH)Cl.3H_2O$ and the zirconyl hydroxyhalides of the empirical formula $ZrO(OH)_{2-a}Cl_{2-n}H_2O$ wherein a is from about 1.5 to about 1.87, and n is from about 1 to about 7. The preferred amino acid for preparing such ZAG-type complexes

is glycine of the formula $CH_2(HN_2)COOH$. Salts of such amino acids can also be employed in the antiperspirant complexes. See U.S. Pat. No. 4,017,599, Rubino, issued April 12, 1977, incorporated herein by reference.

A wide variety of other types of antiperspirant complexes are also known in the art. For example, U.S. Pat. No. 3,903,258, Siegal, issued September 2, 1975, discloses a zirconium aluminum complex prepared by reacting zirconyl chloride with aluminum hydroxide and aluminum chlorhydroxide. U.S. Pat. No. 3,979,510, Rubino, issued September 7, 1976, discloses an antiperspirant complex formed from certain aluminum compounds, certain zirconium compounds, and certain complex aluminum buffers. U.S. Pat. No. 3,981,896, issued September 21, 1976, discloses an antiperspirant complex prepared from an aluminum polyol compound, a zirconium compound and an organic buffer. U.S. Pat. No. 3,970,748, Mecca, issued July 20, 1976, discloses an aluminum chlorhydroxy glycinate complex of the appropriate general formula $[Al_2(OH)_4Cl][H_2CNH_2\text{-}COOH]$. All of these patents are incorporated by reference herein.

The amount of antiperspirant active in the composition according to the invention may vary from about 10% to about 35%, preferably from about 20% to about 30% and most preferably about 25% of the composition.

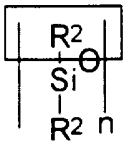
Liquid Carrier

The antiperspirant active is suspended in a hydrophobic emollient liquid carrier. The emollient liquid carrier improves initial adhesion of the suspended powders to the skin, thus aiding in the capture of the antiperspirant active by the skin as it is dispensed in spray form. Also, the carrier serves as a diluent, lubricant or spreading agent to facilitate uniform distribution of the antiperspirant material on the skin.

The carrier can comprise volatile silicone fluids, nonvolatile silicone fluids, volatile organic fluids,nonvolatile organic fluids functionalized silicones and mixtures thereof.

Suitable volatile silicone fluids may be cyclic or linear. A description of various volatile silicone oils is found in Todd, et al., "Volatile Silicone Fluids for Cosmetics", 91 Cosmetics and Toiletries, 27-32 (1976), incorporated by reference herein. Linear volatile silicones generally have viscosities of less than about five centistokes at 25°C., whereas the cyclic silicones have viscosities of less than about 10 centistokes.

In general, the volatile silicone fluid can be any combination of tetramer, pentamer, and hexamer, or low viscosity diorgano fluid. Generally, suitable cyclic volatile silicone fluids can be represented by the formula:



wherein R^2 is a 1 to 3 carbon alkyl group and n is a number from 3 to 10, preferably form 3 to 7.

Examples of volatile silicone fluids useful in the present invention include, for example (a) (i) SF 1202, containing a pentamer in a minimum amount of 95%, and 5% of other cyclics; (ii) SF 1204, containing 85% of pentamer and 15% of tetramer; (iii) SF 1173, containing 95% of tetramer and 5% of other cyclics; all of the foregoing products being available from General Electric Company; (b) Dow Corning 344 fluid, wherein R^2 is methyl and wherein the fluid typically comprises by weight about 88% tetramer, about 11.8% pentamer, and traces of trimer and hexamer; and (c) SWS-03314 (sold by SWS Silicones, a Division of Stauffer Chemical Company) in which R^2 is methyl and which is substantially all tetramer. Other suitable volatile silicone fluids are Dow Corning 345 (sold by Dow Corning Corporation) and 7207 and 7158 (sold by General Electric Company).

The preferred volatile silicone fluids for use in this invention are the cyclomethicone pentamer and the cyclomethicone tetramer. The most preferred volatile silicone fluid is the cyclomethicone pentamer.

Examples of suitable volatile organic fluids are linear or branched isoparaffinic hydrocarbons having about 6 to about 16 carbon atoms and preferably about 10 to about 14 carbon atoms. The most preferred isoparaffinic hydrocarbons are those available from Exxon Corporation and having the designation ISOPAR (Registered Trade Mark).

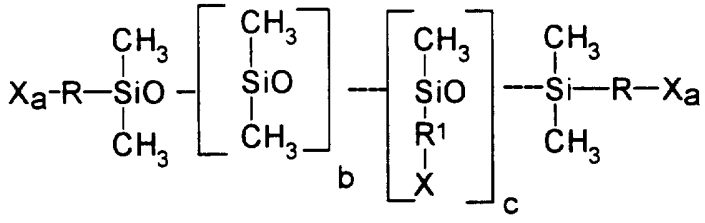
The term "nonvolatile" means that the liquid will not volatilize during the time the composition is on the skin. Thus, the term "nonvolatile" does not exclude materials that are slowly volatile and require a long time to evaporate fully, such as the low viscosity linear silicones. These are generally polydimethylsiloxanes of low viscosity, e.g., about 3 to 10 centistokes at 25°C.

Nonvolatile organic liquids such as isopropyl myristate are generally added to a dispersion-type aerosol antiperspirant composition to improve adherence of the astringent salt to the skin. This type of formulation is described in many patents, including for example, U.S. Pat., No. 3,968,203, patented July 6, 1976, to Spitzer et al.; U.S. Pat. No. 3,752,540, patented April 13, 1973, to Wahl; U.S. Pat. No. 3,959,459, patented May 25, 1976 to Curry.

Suitable examples include fatty acid esters of polyalkylene glycols wherein the fatty acid contains from about two to about 20 carbon atoms, and from about two to about 200

alkylene glycol units per fatty acid molecule; fatty acid esters of aliphatic alcohols where the esters contain from about 12 to about 26 carbon atoms, such as ethyl laurate, isopropyl myristate, isopropyl palmitate, isopropyl behenate, decyl acetate, behenyl butyrate, hexadecyl acetate, decyl decanoate, methyl oleate, lauryl laurate, oleyl acetate, and dioctyladipate.

Among these various liquid carboxylic acid esters, those having from about 12 to 26 carbon atoms are preferred. As described above, they can be either aliphatic or aromatic and can contain either one or more ester groups especially preferred for use in this invention is isopropyl myristate. Functionalized siloxanes, among those useful herein, include those of the following formula:



wherein a is 0 or 1, b is from about 50 to about 2,000, and c is from about 0 to about 300; x is Cl, F, --COOH, or $--N(R^3)_2$; R is CH_3 (if a = 0) or R^1 (if a = 1); R^1 is straight or branched alkyl containing from 1 to 10 carbon atoms; R^2 is H or R^1; R^3 is R^2 or $R^1N(R^2)_2$; and wherein a+c>O and the ratio of (a+c)/(b+c) is from about 0.01 to about 0.30. It is understood that, in the above formula, the substituted "c" siloxane units may be interspersed with the unsubstituted "b" siloxane units. In preferred functionalized siloxanes of the above formula, b is from about 200 to about 1200, c is from 1200, c is from about 2 to about 200, and the ratio of (a+b)/(b+c) is from about 0.01 to about 0.15. Particularly preferred functionalized siloxanes are diamine substituted, wherein X is $NR^2(R^1N(R^2)_2)$.

Molecular weights of preferred functionalized siloxanes useful herein, as determined by gel permeation chromatography/low angle laser light scattering (GPC/LALLS), are from about 2,000 to about 150,000 preferably from about 20,000 to about 150,000, more preferably from about 50,000 to about 150,000. For preferred amino-functional silicones, the ratio (a+c)/(b+c) of the above formula, manifested as milliequivalents of amine per gram (meq/g) of silicone polymer, preferably is from about 0.01 to about 1.5 meq/g, more preferably from about 0.01 to about 0.7 meq/g.

Among the amino-functional silicones useful herein are the following commercially-available materials: Q2-8075 and X2-8107, manufactured by Dow Corning Corporation; Y-7717 and Y-12035, manufactured by Union Carbide Corporation; 756, 784 and 801, manufactured by SWS Silicones Corporation; GE 176-10977 and GE 179-10979, manufactured by General Electric Company; and 2181 manufactured by Petratch Systems, Inc. Dow Corning Y-12035, GE 176-10977, and SWS 801 are particularly preferred amino-

functional silicone materials useful herein. Among the other commercially-available functionalized (non-amino) siloxanes useful herein are PS402 carboxy-substituted siloxane and PS183 trifluoro-substituted siloxane (manufactured by Petrarch Systems, Inc.).

Suitable emollient liquid carriers are disclosed in U.S. Patents Nos. 4,822,596 and 4,904,463, the disclosures of which are specifically incorporated by reference herein.

In accordance with the preferred embodiments of the present invention, the emollient liquid carrier can be a mixture comprising cyclomethicone, dimethicone, isopropyl palmitate, isopropyl myristate, dibutyl phthalate and mixtures thereof. In particular, the cyclomethicone used is the cyclic pentamer of dimethyl siloxane having a molecular weight of about 370.

The amount of liquid carrier in the composition according to the invention may vary from about 15% to about 55%, preferably from about 20% to about 45% and most preferably from about 25% to about 35%.

Suspending Agent

In order to prevent caking or settling out of the astringent salt in the hydrophobic emollient liquid carrier, a bulking or suspending agent is incorporated in the composition of the invention. The suspending agent assists in filling the void space between suspended particles.

Clays and silicas can be used as suspending agents. Colloidal silica is available commercially as CAB-O-SIL™ a submicroscopic particulated pyrogenic silica. Silicas are not preferred for use. If utilized, silica can comprise from about 0.05% to about 3% of the composition.

Clay suspending agents suitable for use are selected from the group consisting of montmorillonite clays and hydrophobically treated montmorillonite clays. Montmorillonite clays are those which contain the mineral montmorillonite and are characterized by having a suspending lattice. Examples of these clays include the bentonites, hectorites, and colloidal magnesium aluminum silicates. Clay materials are typically made hydrophobic by treatment with a cationic surfactant, such as quaternary ammonium cationic surfactants (e.g., ditallow dimethyl ammonium chloride, i.e., quaternium-18).

Bentonite is colloidal, hydrated aluminum silicate obtained from montmorillonite and has the formula $Al_2O_34SiO_2.H_2O$. A more detailed discussion of bentonites can be found in the Kirk-Othmer Encyclopedia of Chemical Technology, 2nd ed., Vol 3 (1964), pp 339-360, published by Interscience Publishers, which is incorporated herein by reference.

Hectorite, also amontmorillonite clay, differs from bentonite in that there is almost a complete substitution of aluminum in the lattice structure of bentonite by magnesium. In

addition, hectorites contain lithium and fluorine.

The magnesium aluminum silicates are complexes of colloidal magnesium aluminum silicate richer in magnesium than aluminum.

Preferred clay suspending agents for use in the present invention include hydrophobically treated montmorillonite clays, e.g., hydrophobic bentonites available under the trade name of Bentone™. Bentone™ is prepared by reacting bentonite in a cation exchange system with an amine. Different amines are reacted to obtain a variety of Bentones, which may also differ in proportions of SiO_2, MgO and Al_2O_4. Specific examples of Bentones within the scope of the present invention are Bentone 38, Bentone 34, Bentone 27, bentone 14, and Bentone LT, all of which have a particle size of below about 5 microns and are commercially available from the NL Industries, Inc.

The amount of suspending agent, preferably clay, in the composition of the invention may vary from about 0.05% to about 3% , preferably from about 0.2% to about 2% and most preferably from about 0.5% to about 1%.

The compositions that utilize hydrophobically treated hectorite and bentonite clays to suspend the antiperspirant active material will also generally include a clay activator. Many such clay activators, as well as the levels of use are known in the art. Such activating materials include, for example, propylene carbonate, ethanol, and mixtures thereof. Typically, the level of the activator will be from about 25% to about 75% of the weight of the clay, more typically from about 30% to about 50% of the weight of the clay. The suspending agents are combined with an activator that enables the hectorite or bentonite clay to suspend the antiperspirant active in the hydrophobic liquid carrier. The preferred activator is propylene carbonate. The amount of propylene carbonate in the composition of the invention is based on the weight ratio of suspending agent to activator of about 1 to about 0.33.

Propellant

In accordance with invention, the antiperspirant composition has no more than 50 wt.% of an aerosol propellant. The propellant gas according to the invention can be any liquefiable gas known to the art for use in aerosol containers. Examples of suitable propellants are trichlorofluoromethane, trichlorotrifluoromethane, trichlorotetrafluoromethane, monochlorodifluoromethane, difluoroethane, propane, butane or isobutane used singly or in combination.

The amount of propellant in the composition of the invention should be from about 20% to about 50%, preferably from about 30% to about 50% and most preferably from about 38% to about 42%.

Optional Components:

The compositions of the present composition can also comprise a number of non-emollient optional components to provide cosmetic or aesthetic benefits. For example, preservatives, deodorant actives, such as antimicrobials or bactericides, perfumes, coloring agents, fillers, dyes and thickeners may be used .

Although not preferred for use, the antiperspirant composition can include particulate filler material. A suitable filler material is aluminum starch octenyl succinsate, which is a modified corn starch commercially available under the trade name Dry Flo from National Starch and Chemical Corporation, Findeme Avenue, P.O. Box 6500, Bridgewater, New Jersey, 08807. The amount of filler material in the final composition may vary from 0% to about 5% preferably less than about .1% and more preferably less than about 0.05% and most preferably 0% of the total content of particulate material.

In addition, the composition in accordance with the invention can incorporate allantoin and perfume. Allantoin is a known stimulator of cell proliferation and tissue growth. The addition of allantoin serves to reduce irritation caused to some sensitive individuals upon using any aluminum base product and even helps to heal such areas of irritation.

These optional components are chosen so as not to unduly interfere with the antiperspirant efficacy and the composition stability or other benefits. Such optional components are generally present in the compositions of the present invention at a level of from about 0.01% to about 20%.

Method of Manufacture

The present invention encompasses methods of preparing aerosol antiperspirant compositions having improved application and cosmetic characteristics. These compositions can be made by a variety of well established methods known in the art. A preferred method of manufacturing involve dispersing the suspending agent and activator in the carrier. The dispersion is stored until it thickens due to swelling of the suspending agent. The antiperspirant active is added with mixing. The mixture is then homogenized such as by using a Gifford-Wood shearing type homogenizer until a gel is formed. The gel constitutes the antiperspirant concentrate.

It is essential that the antiperspirant concentrate (which comprises the antiperspirant active liquid carrier, suspending agent/activator and optional components if any are utilized) have a viscosity of from about 10 to about 10,000, preferably from about 500 to about 5000 and most preferably from about 1000 to about 3,000, centipoise. The viscosity is measured by Brookfield viscometer 1/2 RVT with a #3 spindle at about 20 rpm (revolutions per

minute). The can is pressurized by adding the aerosol propellant and sealing the package.

EXAMPLE I

An antiperspirant composition of the present invention is prepared as follows:

INGREDIENT	WEIGHT %
Aluminum Chlorohydrate	24.0
Isobutane	40.0
Cyclomethicone D5	31.4
Dimethicone 350 centipoise (cps)	1.5
Isopropyl Myristate	1.5
Quaterium 18 hectorite	0.75
Fragrance	0.60
Propylene Carbonate	0.25
	100

The concentrate was prepared by mixing the cyclomethicone, dimethicone and isopropyl myristate. Then the clay and propylene carbonate are dispersed into the mixture. The dispersion is stored for 15 to 20 minutes until it thickens due to the swelling of the clay in response to activation by the propylene carbonate. The aluminum chlorohydrate is added and mixed. (Fragrance can be added at this point or just prior to the addition of the propellant.)

The mixture is homogenized utilizing a Gifford-Wood shearing type homogenizer until a gel is formed. After the concentrate is homogenized, it has a viscosity of about 1,500 cps as measured on a Brookfield 1/2 RVT viscometer using spindle #3 at about 20 rpm (revolutions per minute).

The homogenized concentrate is then combined with the isobutane propellant. When the composition is dispensed utilizing a stem orifice of 0.18", a vapor tap orifice of 0.25", a dip tube of 0.50" and an actuator orifice of 0.18" the average spray rate is about 0.25 grams/second calculated by spraying for 10 seconds and averaging the amount sprayed.

It has been discovered that compositions of the present invention having a weight ratio of aerosol concentrate to propellant of from about 1 to 1, to about 2.3 to 1 and preferably from about 1 to 1 to about 1.5 to 1 and an aerosol concentrate viscosity of from about 10 to about 10,000, preferably from abut 500 to about 5,000 and most preferably from abut 1,000 to about 3,000 centipoise, achieve significantly reduced spray rates utilizing conventional known in the art aerosol valve systems. Thus, less cloud, less gassiness and surprisingly a drier feel with equal or superior efficacy can be achieved.

EXAMPLE II

An antiperspirant concentrate and antiperspirant composition is prepared as follows:

INGREDIENT	WEIGHT %
Aluminum Chlorohydrate	30.00
Isobutane	40.00
Cyclomethicone D5	23.07
Dimethicone 350 centipoise	3.00
Isopropyl Myristate	3.00
Bentone clay	0.25
Fragrance	0.60
Propylene Carbonate	0.08
	100.00

Example II is prepared as in Example I. After the concentrate is homogenized, it has a viscosity of about 2,500 cps as measured on a Brookfield 1/2 RVT viscometer using spindle #3 at about 20 rpm's.

When the composition is dispersed utilizing a stem orifice of about 0.18", a vapor top orifice of 0.25", a dip tube of 0.5" and an actuator orifice of 0.18" the average spray rate is about 0.25" as calculated in Example I.

EXAMPLE III

An antiperspirant composition of the present invention is prepared as follows:

INGREDIENT	WEIGHT %
Aluminum Chlorohydrate	10.00
Isobutane	40.00
Cyclomethicone D5	45.90
Dimethicone 350 centipoise	0.50
Isopropyl Myristate	1.00
Quaternium 18 hectorite	1.50
Fragrance	0.60
Propylene Carbonate	0.05
	100.00

Example III is prepared as in Example I. After the concentrate is homogenized, it has a viscosity of about 500 cps as measured on a Brookfield 1/2 RVT viscometer using spindle #3 at about 20 rpm's.

When the composition is dispensed utilizing a stem orifice of about 0.18", a vapor tap orifice of about 0.25", a dip tube of about 0.5" on an actuator orifice of about 0.18", the

spray rate is about 0.25" as calculated in Example I.

The preferred embodiments have been described in detail herein above for the purpose of illustration only. It will be apparent to a practitioner of ordinary skill in the art of aerosol antiperspirant formulations that various modifications could be made to the above-described formulas without departing from the spirit and scope of the invention as defined in the claims set forth hereinafter.

WHAT IS CLAIMED IS:

1. An aerosol antiperspirant composition comprising:

1) an aerosol concentrate comprising:

a) from 10% to 35% by total composition weight antiperspirant active;

b) from 15% to 55% by total composition weight liquid carrier;

c) from 0.05% to 3% by total composition weight suspending agent; and

2) from 20% to 50% by total composition weight propellant;

wherein said aerosol concentrate has a viscosity of from 10 to 10,000 centipoise.

2. A composition according to Claim 1 wherein the weight ratio of aerosol concentrate to propellant is from 1 to 1 to 2.3 to 1.

3. A composition according to Claim 1 further comprising an effective amount of an activator.

4. An aerosol antiperspirant composition comprising:

1) an aerosol concentrate comprising:

a) from 20% to 30% by total composition weight antiperspirant active;

b) from 20% to 45% by total composition weight liquid carrier;

c) from 0.02% to 2% by total composition weight suspending agent; and

2) from 30% to 50% by total composition weight propellant;

wherein said aerosol concentrate has a viscosity of from 500 to 5,000 centipoise.

5. A composition according to Claim 4 further comprising an effective amount of an activator.

6. A composition according to Claim 4 wherein the weight ratio of aerosol concentrate to propellant is from 1 to 1 to 1.5 to 1.

7. An aerosol antiperspirant composition comprising:

1) an aerosol concentrate comprising:

a) 25% by total composition weight antiperspirant active;

b) from 25% to 35% by total composition weight liquid carrier;

c) from 0.05% to 1% by total composition weight suspending agent which is clay;

d) an effective amount of activator which is propylene carbonate; and

2) from 38% to 42% by total composition weight propellant which is isobutane;

wherein said aerosol concentrate has a viscosity of from 1,000 to 3,000 centipoise and the weight ratio of aerosol concentrate to propellant is from 1 to 1 and 2.3 to 1.

8. A composition according to Claim 7 wherein the weight ratio of aerosol concentrate to propellant of from 1 to 1 to 1.5 to 1.

INTERNATIONAL SEARCH REPORT

In ional Application No
PCT/US 95/09100

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K7/32

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)
IPC 6 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 485 012 (THE PROCTER & GAMBLE COMPANY) 13 May 1992 see the whole document	1-8
X	US,A,4 840 786 (JOHNSON ET AL.) 20 June 1989 see the whole document	1-8
X	EP,A,0 028 853 (THE PROCTER & GAMBLE COMPANY) 20 May 1981 see the whole document	1-8
X	EP,A,0 334 203 (THE PROCTER & GAMBLE COMPANY) 27 September 1989 see the whole document	1-8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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

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Date of the actual completion of the international search	Date of mailing of the international search report
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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-485012	13-05-92	CA-A-	2054825	09-05-92
		US-A-	5298236	29-03-94
US-A-4840786	20-06-89	EP-A-	0334210	27-09-89
EP-A-28853	20-05-81	AT-T-	8333	15-07-84
		CA-A-	1164347	27-03-84
		JP-A-	56127306	06-10-81
		US-A-	5156834	20-10-92
EP-A-334203	27-09-89	CA-A-	1328817	26-04-94
		US-A-	4904463	27-02-90