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AEROSOL STATIC-DISSIPATING MATERIAL

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ABSTRACT OF THE DISCLOSURE

A chemical composition consisting of a high-melting-point fatty ammonium chloride compound of a waxy consistency and a low order of toxicity and which is film-forming, a straight-chain fatty acid to prevent opacity of such a film, a compatible solvent system for said film-forming and opacity-preventing ingredients, and propellants forming a system for pressurizing the foregoing ingredients and solvents to produce an aerosol for storage in a dispensing container and dispensing therefrom under pressure of the propellants.

BACKGROUND OF THE INVENTION

Electrostatic charges on the surfaces of numerous types of material encountered in the home, in places of business, in theatres and, more recently, in so-called clean rooms where parts are handled and sealed so as to insure maximum, if not absolute, cleanliness, because the same promote clinging to such surfaces of a wide variety of contaminating and otherwise unwanted particles, present problems affecting sanitation and cleanliness generally, and the discomfort of static shocks.

An object of the present invention is to provide an aerosol static-dissipating composition that, when applied to surfaces of various materials, forms a film that renders such surfaces static-free.

Another object is to provide such a spray composition that deposits a colorless coat for the above purpose and which is substantially odorless when the same has dried.

A further object of the invention is to provide a composition, as above characterized, that may be sprayed on once or several times, depending on the material being coated, and the coating renewed, as required.

The above and other objects, features and advantages of the invention will become more fully evident during the course of the following description.

SUMMARY OF THE INVENTION

An aerosol chemical composition for deposit of an antistatic film on the surfaces of various items of clothes, furniture, household and office equipment, plastics, and other surfaces subject to the build-up of electrostatic charges resulting from the contact of the surfaces of dissimilar materials, for the purpose of eliminating the effects of such electrostatic charges, among which are (1) attraction of lint, dust, dirt, hairs and other such unwanted foreign particles, and (2) static shocks. The product consists of a liquid aerosol composition that is adapted to be deposited on surfaces such as above enumerated, to form a thin, conductive film of a waxy consistency to bleed off or dissipate static charges on such surfaces.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The composition that comprises the present preferred embodiment of the invention is as follows:

	Optimum proportion percent	Permissible range percent
DDTAC (dimethyl dihydrogenated tallow ammonium chloride).	4	3 to 5.
HSA (12-hydroxystearic acid)	1	0.8 to 1.2.
Alcohol (anhydrous ethyl, denatured)	9	8 to 9.
Methylene chloride	32	28 to 36.
Propellant 12 (dichloro difluoromethane)	13.5	12 to 15.
Propellant 11 (trichloro monofluoro-methane).	40.5	39 to 42.
Fragrance	Trace	To suit.

In the above composition, the active ingredient is DDTAC, a waxy substance having an approximate melting point of 154° F. and a low order of toxicity, both desirable characteristics for the present purpose. In the form of a film, DDTAC has but slight electrical conductivity, though of a sufficient degree to bleed off or dissipate any electrostatic charges existing or subsequently generated on surfaces upon which the same is sprayed. When so applied, a film of DDTAC is highly durable and has great resistance to friction and wear. While the durability may vary according to the surface on which applied, several applications thereof on shoe soles and heels, even when in use in wet weather, afford adequate durability lasting several days.

The optimum concentration of the DDTAC is 4%, with an acceptable range of 3% to 5%. Below 3%, too many applications are required for effective treatment of shoe soles and heels. Above 5%, difficulty is experienced in maintaining the solids in solution at cold temperatures, and a waxy feel becomes noticeable on articles of clothing that have been sprayed.

HSA is used in the composition to prevent opacity of the active ingredient DDTAC in the thicknesses normally sprayed. It has a melting point of approximately 167° F. and a low order of toxicity, as well as high durability and wear resistance.

The optimum concentration of HSA is 1%, with an acceptable range of 0.8% to 1.2%. Below 0.8%, noticeable whiteness may appear on articles that are heavily sprayed, and above 1.2% precipitation of solids may occur at low temperatures. Above 2%, whiteness may also reappear if the articles are heavily sprayed.

The alcohol and methylene chloride form a solvent system for the two solid ingredients DDTAC and HSA. Neither solvent alone can maintain these solids in solution, whereas the combination will.

The optimum concentration of alcohol is 9%, with an acceptable range of 8% to 9%. Below 8%, precipitation of solids may occur at low temperatures, and below 4%, wetting performance is affected. Above 9%, the composition becomes marginally flammable and required drying time becomes excessive.

The optimum concentration of methylene chloride is 32%, with an acceptable range of 28% to 36%. Below 28%, precipitation of solids may occur at low temperatures, and above 36%, the proportions of other ingredients

are forced outside their acceptable ranges. Above 40%, swelling of the packing material of commercially available aerosol valves becomes excessive.

Propellants 12 and 11 form a commonly used propellant system for pressurizing the composition when stored in an aerosol container and atomizing the liquid as it emerges from the aerosol nozzle. Propellant 11 effectively reduces the vapor pressure of propellant 12 to the desired value of approximately 25 p.s.i.g. at room temperature, and acts as a diluent and drying agent for the composition.

The optimum concentration of propellant 12 is 13.5%, with an acceptable range of 12% to 15%. Below 12%, the vapor pressure of the propellant mixture is too low to properly atomize the spray, especially when the can is nearly empty, and at cold temperatures. Above 15%, the vapor pressure may be too high, with resulting overspray and difficulty in confining the spray to small surfaces.

The optimum concentration of propellant 11 is 40.5%, with an acceptable range of 39% to 42%. Below 39%, the vapor pressure of the propellant mixture may be too high and overspray excessive. Above 42%, the vapor pressure may be too low for proper atomization.

The composition given above has been found to provide electrostatic-free protection that eliminates static problems in the clothes dryer and makes garments easy to gather and fold, ends problems with phonograph records, combs, brushes, pets, blankets, fabrics, plastics, paper, etc., and eliminates such problems with office machines, helps repel lint, dust, dirt, hairs and other such unwanted materials, prevents clinging of garments, and ends electrostatic shocks resulting from walking on carpets and rugs or sliding across upholstery and seat covers, and protects the user against such shocks in numerous situations.

The ranges of permissible proportions given in the above composition allow any combination of proportions within the stated limits, provided they add up to 100%. Due to interactions of the functions of the various ingredients, additional variations are permitted if done systematically and certain relative proportions are maintained. For instance, if application to shoe soles and heels is not contemplated, the concentration of the active ingredient DDTAC may be reduced below the normal 3% limit, and the range of percentages of HSA should then also be reduced in the same proportion. The minimum percentages of alcohol and methylene chloride may also be reduced in proportion to the reduction in total solids, since the solvent requirements of the composition have been correspondingly reduced. The resulting deficit in composition weight should then be made up of propellants 11 and 12, keeping the same range of relative proportions between these two propellants as indicated by the table above.

Simply stated, both the active ingredients and the solvents may be reduced in the same proportions whenever the use to which the composition is to be put requires a lower percentage of the active ingredient than the 3% given, and this reduction replaced by a corresponding amount, by weight, of the propellants. Retention of these proportions will insure against precipitation of the solids at low temperatures and loss of transparency of the applied film.

While DDTAC is preferred as the active ingredient, any ammonium chloride compound of liquid or solid consistency may be substituted therefor, provided the same is compatible with the other ingredients of the composition. In particular, a fatty ammonium chloride compound that may serve as a substitute for the DDTAC is DDSAC (dimethyl distearyl ammonium chloride), the same having a melting point slightly above that of DDTAC (154° F.). Either of these latter two ingredients is preferred if the present aerosol composition is to have the durability required for use on shoe soles and heels, since a relatively high melting point is desirable for such use. Where extreme durability is not required, ammonium chlorides having lower melting points may be used. Uses of substitutes having melting points higher than that of DDTAC or DDSAC may cause loss of transparency (excessive whiteness) beyond the control capabilities of the HSA. Such control, along with solubility, is likely to become a problem in such cases.

Considering the weight of total solids (DDTAC and HSA) to be 100%, the best range of transparency for a general antistatic spray was, by actual test, found to be 10% to 40% of HSA to the total weight of the HSA/DDTAC mixture. Opacity was noticeable at 10% and 40%, but not at 20% and 30%. Below 10% and above 50%, opacity was objectionable.

According to the invention, a unique combination of ingredients was developed whereby the active ingredient was rendered transparent and, therefore, invisible in the thickness normally sprayed on articles to be made static-proof, such as clothes, shoes, upholstery, etc. This was accomplished by the addition of one part HSA (12-hydroxystearic acid), a synthetic wax, to approximately four parts of the active ingredient, fatty ammonium chloride, by weight.

HSA and such fatty, waxy ammonium chlorides produce objectionable whiteness or opacity when sprayed singly on articles. However, over a certain range of proportions, they render each other effectively transparent when combined. This feature was determined by the following data obtained during development of the product:

Each of seven pieces of dark wool material, approximately 5" x 5", was sprayed with 1 cc. of a 5% solution of various DDTAC/HSA mixtures, with the following results:

	Percent of HSA to total solids	Opacity after drying
Sample Number:		
1	0	Objectionable.
2	10	Noticeable.
3	20	Not noticeable.
4	30	Do.
5	40	Noticeable.
6	50	Objectionable.
7	100	Very objectionable.

As regard the solvent system and the minimum solids concentration required in the total composition for practical use on shoe soles and heels (3.8%), it was found that no single solvent approved for aerosol use could keep the solids in solution after freezing to subzero Fahrenheit temperatures (such as may be encountered in shipment of aerosol products), even after warming again to room temperature. This included alcohol, the recommended solvent for HSA, and methylene chloride, the most powerful aerosol-type solvent. Certain combinations of these two solvents, however, were found capable of keeping the solids in solution. Various mixtures of alcohol and methylene chloride were tested with a 5% concentration of the HSA/DDTAC mixture (1 to 4) incorporated in the solvent system only, with no propellant present. After freezing to below zero degrees Fahrenheit, and warming to room temperature, the following results were observed:

	Alcohol in total solvent mix (percent)	Precipitation of solid phase
Sample Number:		
1	0	Severe.
2	10	Slight.
3	20	None.
4	50	Do.
5	90	Slight.
6	100	Severe.

In the total aerosol composition, the concentration of solids, in the alcohol/methylene chloride solvent system, is 11% (5 parts out of 46 parts) and the minimum desirable percentage of alcohol, from the standpoint of precipitation, was found to be 8% of the total composition, or 18% in the solvent system (8 parts out of 44 parts). The

presence of the liquefied propellants was found to be of little help in maintaining the solids in solution.

Any propellant or system of propellants may be substituted for the propellant 12/11 system if it is non-toxic, compatible with the other ingredients, and possesses a vapor pressure at normal working temperatures (40° to 100° F.) that is comparable to that of the 12/11 system.

The above composition includes a propellant for dispensing the static-dissipating composition. The propellant may be omitted and the remainder of the composition, which is in liquid form, may be applied by spraying, as from a squeeze bottle, or by means of a brush, dauber, or other such common applicator means. In such case, the film-forming ammonium chloride compounds will have a percentage value in the range of 0.1% to 20%, the synthetic wax (HSA) will have a percentage value in the range of 0.1% to 15%, and the balance required to make up 100% of the composition, by weight, will consist of the solvent system, the solvent system consisting of denatured anhydrous ethyl alcohol (10% to 90% of said solvent system) and methylene chloride (90% to 10% of said system). The three ingredients, thereby, comprise 100% of the composition.

In this disclosure, "low toxicity" means toxicity safe for contact by humans, as encountered in aerosol applications.

The chemical composition hereinabove described, while preferred, is intended as exemplary. The applicants, therefore, do not wish to be restricted to the particular disclosed chemical compounds and proportions thereof disclosed, but desire to claim modifications that fall within or are equivalent to the defined ingredients and proportions thereof as set forth, and fall within the scope of the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A static-dissipating chemical composition contained under pressure in an aerosol container and consisting of:

	Percent
(a) a film-forming composition consisting of a compound selected from the group consisting of dimethyl dihydrogenated tallow ammonium chloride and dimethyl distearyl ammonium chloride	3 to 5
(b) a synthetic wax composition consisting of 12-hydrobystearic acid	.8 to 1.2
(c) a solvent system for retaining said compound and synthetic wax composition in liquid form and consisting of 8 to 9% denatured anhydrous ethyl alcohol and 28 to 36% methylene chloride having a combined proportion of	36 to 45
(d) a non-flammable propellant system compatible with said compound, wax composition, and solvent system and having a normal vapor pressure approximating 25 p.s.i.g., and	51 to 57
(e) fragrance	Trace

2. An aerosol composition according to claim 1 in which the mentioned ammonium chloride compound is selected from the group consisting of dimethyl dihydrogenated tallow ammonium chloride and dimethyl distearyl ammonium chloride.

3. An aerosol composition according to claim 2 in which the synthetic wax comprises 12-hydroxystearic acid.

4. An aerosol composition according to claim 2 in which the propellant comprises a system consisting of:

	Percent
dichloro difluoromethane	12 to 15
and	
trichloro monofluoromethane	39 to 42

5. An aerosol composition according to claim 2 in which the optimum weight percentage of the fatty ammonium chloride compound, for maximum durability and resistance to wear of the film formed thereby, is 4% of the total composition, by weight.

6. An aerosol composition according to claim 5 and in which the optimum weight percentage of the synthetic wax, for satisfactory transparency of the film formed by the combination of such compound and wax, is 1% of the total composition, the wax, by weight, thereby comprising 25% of the weight of the compound.

7. A static-dissipating chemical composition contained under pressure in an aerosol container and consisting of:

(a) a film forming composition consisting of a compound selected from the group consisting of dimethyl dihydrogenated tallow ammonium chloride and dimethyl distearyl ammonium chloride—.1 to 20%

(b) a synthetic wax composition consisting of 12-hydroxystearic acid—.1 to 15%

(c) a solvent system for retaining said compound and wax in liquid form and consisting of denatured anhydrous ethyl alcohol and methylene chloride, in a proportion, by weight, to make up the balance of 100% of the total composition,

(d) the denatured anhydrous ethyl alcohol of the solvent system having a percentage value between about 10% to 90% and the methylene chloride of said system having a percentage value between between about 90% to 10%.

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