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3,715,428

HAIR SPRAY UNIT CONTAINING A SOLUTION OF A POLYMERIC QUATERNARY CELLULOSE ETHER SALT

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No Drawing. Filed Nov. 4, 1970, Ser. No. 86,980

Int. Cl. A61k 7/00, 9/00

U.S. Cl. 424—47

3 Claims

ABSTRACT OF THE DISCLOSURE

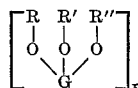
A hair spray unit containing propellant and a solution in a volatile liquid solvent of a polymeric quaternary cellulose ether salt.

This invention relates to the setting of hair and pertains more specifically to a pressurized dispensing device for spraying onto hair a solution in a volatile liquid of selected polymeric quaternary cellulose ether salts.

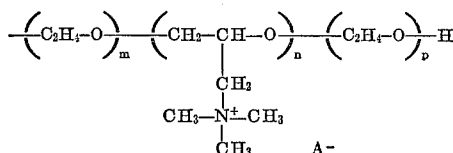
A variety of resin compositions have hitherto been employed for spraying onto hair to set it in a desired configuration including such materials as shellac and polyvinylpyrrolidone, inter alia. However, the resins which are water-insoluble have suffered from the disadvantages, when used for this purpose, that they can be removed from the hair, when desired, only with difficulty, since they tend to be resistant to removal by means of ordinary shampoo and that hair set with them cannot readily be restyled simply by the use of a water-wet comb. Conventional water soluble resins, on the other hand, which do permit such restyling of the hair, to some extent at least, are not resistant to conditions of high humidity and consequently have poor set-holding properties on the hair.

The present invention provides a device for applying to the hair in the form of a spray a solution in a volatile liquid such as water or preferably a water-alcohol mixture of a limited class of polymeric quaternary cellulose ether salts. Although these polymeric salts are indeed water soluble, when applied to the hair even in very small amounts, of the order of one-tenth the amount of resin conventionally used, they exhibit unusually high resistance to the effects of high humidity, i.e., they provide excellent set-holding properties. Furthermore, hair to which the compositions of the present invention have been applied can be restyled and reset by means of a water-wet comb so as to exhibit set-holding properties nearly identical to those it had after the initial setting, whereas hair set with conventional water-soluble resins such as carboxymethyl cellulose, after being restyled and reset as above, exhibits set holding properties markedly inferior to those exhibited by the hair before restyling.

The polymeric quaternary cellulose ether salts which may be used in the present invention are those having the following structural formula:



in which G represents the residue of an anhydroglucose unit, x is an integer from 50 to 20,000, and R, R', and R'' represent substituent groups having the structure



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in which the average value, per anhydroglucose unit, of n is 0.25 to 3, of m+p is 1 to 2, and in which A represents an anion. In a preferred embodiment, x represents an integer from 200 to 5000, the average value of n is 0.25 to 2.5, and of m+p is 1.5 to 1.8.

The anion A may be any water-soluble anion commonly found in conventional quaternary ammonium salts, such as chloride, bromide, iodide, sulfate, methylsulfate, sulfonate, nitrate, phosphate, acetate, etc., the chloride being normally the most convenient. In the case where the anion is polyvalent, of course, the number of anions present is inversely proportional to the valency.

The polymeric salts employed in the present invention are well known materials, the preparation of which is described in U.S. Pat. 3,472,840 granted Oct. 14, 1969.

The volatile liquid solvents which may be employed in the present invention include water and, preferably, mixtures of water with ethyl alcohol or with isopropyl alcohol, the alcohols being more readily volatile than water alone. The preferred solvents are accordingly mixtures of water with ethyl or isopropyl alcohol containing from 20 to 80% water by weight.

The solution of the polymeric quaternary cellulose ether salt is packaged in a conventional closed container provided with a dispensing orifice through which the solution is forced in the form of a spray by means of any conventional pressure propellant. The container may have a single compartment in which are present both the solution and the propellant and be provided with a conventional valve and dip tube, or it may be provided with two compartments, in one of which the propellant is isolated from the solution, as described for example in Nissen U.S. Pat. 3,241,766 or Roth U.S. Pat. 3,289,949.

Included among the conventional liquefied gaseous propellants which may be employed are isobutane, propane, halogenated hydrocarbons such as trichloromono-fluoromethane, dichlorodifluoromethane, tetrachlorodifluoroethane, trichlorotrifluoroethane, dichlorotetrafluoroethane, and the like as well as mixtures of two or more of them. Vinyl chloride may also be employed in admixture with any one or more of the halogenated hydrocarbons above in amounts up to 15 to 20% by weight of the total propellant. It is sometimes desirable to isolate the propellant from the solution when the propellant is a liquefied gas and has a density different from the solution tending to cause separate liquid layers to form in a single-compartment container and to cause a spray of non-uniform composition to be produced unless the container is shaken during use. The halogenated hydrocarbon propellant generally amounts to 15 to 65% by weight of the total composition in such a package, the balance being the volatile solvent, polymeric salts, and any conventional cosmetic additives such as propellant diluents, plasticizers, emollients, conditioning agents, perfumes, color, and the like. When the liquefied gaseous propellant is a hydrocarbon such as isobutane or n-butane, it is generally employed in amounts of 30% or less by weight of the total composition. Gaseous propellants such as nitrogen, nitrous oxide, or carbon dioxide can also be used as the propellant and as a part of the total composition, the amount of such gaseous propellant being sufficient to provide an initial pressure from 25 to 75 p.s.i.g. in the package.

The amount of polymeric salt may vary from 0.1 to 2.5% by weight, based on the weight of the total composition as set forth above.

When it is desired to use water-alcohol mixtures to apply the polymer to the hair, it is preferred to prepare such compositions by first dissolving the polymer in the water portion using mild agitation at room temperature after which the alcohol and propellant diluents, if any, are added with additional agitation to prevent localized precipitation of the polymer.

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The following specific examples are intended to illustrate the nature of the invention without acting as a limitation upon its scope.

EXAMPLE 1

There was dissolved in a mixture of equal parts by weight of ethyl alcohol and water 0.2% (based on the weight of the solvent) of a polymeric quaternary cellulose ether salt having the structural formula set forth above in which the anion A is chlorine, x is an integer from 50 to 20,000, n has an average value per anhydroglucose unit from 0.35 to 0.45, and $m+p$ has an average value from 1 to 2. Eighty parts by weight of the solution was packaged along with 20 parts by weight of isobutane in a conventional single-compartment aerosol spray container provided with a conventional valve. The hair was combed to the desired hair style and the spray was applied in the usual manner. Drying occurred promptly, after which the hair style was found to be firmly set. When forcibly disarranged, the hair could readily be restyled by combing without appreciable flaking of the coating from the hair fibers, and could be reset in the same or a new style by moistening the hair slightly during the combing operation, as by dipping the comb in water, the coating present on the fibers being softened and rendered sufficiently adhesive by application of the water so that the hair fibers were again set. After restyling, the hair was as resistant to conditions of high humidity as it was after the initial application of the setting composition.

Similar results were obtained by dissolving the same polymeric salt at the same concentration in water alone or in mixtures of water and ethyl alcohol varying in composition up to 90% alcohol and 10% water. Best results in terms of set-holding ability were obtained with mixtures containing from 20 to 80% water by weight. Similar results were also obtained when the amount of isobutane employed as propellant was decreased to as little as about 6% by weight of the solution or increased to as much as 185% by weight of the solution, but it is preferred to limit the amount of isobutane to no more than about 55% by weight of the solution in order to minimize the flame hazard during spraying. Somewhat larger amounts of isobutane can conveniently be used when the proportion of water in the mixed solvent is increased above 50% by weight of the mixture.

EXAMPLE 2

There was prepared a solution containing 0.2%, by weight of the solvent, of the polymeric salt described in Example 1 in a mixture of equal weights of water and ethyl alcohol. Fifty parts by weight of this solution was placed in the outer compartment of the two-compartment container shown in U.S. Pat. 3,289,949 and 40 parts by weight of dichlorodifluoromethane was placed in the separate inner compartment. When sprayed from the orifice onto a head of hair, the hair style was quickly set in the same manner and with the same results as described in Example 1. Similar results were obtained when a solution containing 2.5% by weight of the polymeric quaternary salt based on the amount of solvent was substituted for the solution containing 0.2% by weight.

EXAMPLE 3

Two solutions were prepared containing the polymeric salt of Example 1 dissolved in a mixture of ethyl alcohol and water containing 22% by weight of water, the first solution containing 0.2% by weight of polymeric salt, the second containing 0.4% by weight of polymeric salt, based on the weight of solvent. Each solution was then separately packaged in an individual conventional one-compartment aerosol pressure container provided with spray dispensing valve, in each case along with 27%, based on the weight of solution, of a mixture of liquefied gaseous propellants containing 38% by weight of methylene dichloride, the balance being a 4 to 1 by volume mixture of iso-

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butane with propane. When applied to the hair by spraying in the usual manner, the results were substantially the same as those obtained in Example 1 above.

EXAMPLE 4

A solution in water alone containing 0.25% by weight of the polymeric salt of Example 1 was prepared and packaged in a conventional single-compartment aerosol pressure container provided with dispensing valve along with 11%, by weight of solution, of dichlorodifluoromethane. When shaken and sprayed on the hair in the usual manner, the results were substantially the same as those obtained in Example 1 except that a somewhat longer time was required for the initial drying of the sprayed solution. When there were substituted for the water solution, solutions containing mixtures of water and ethyl alcohol containing varying amounts of alcohol, from 20% to 88% by weight of the mixture, the results also were very similar to those obtained in Example 1, the time required for drying the initial sprayed deposit of polymeric salt on the hair decreasing progressively as the relative amount of ethyl alcohol in the solvent was increased.

EXAMPLE 5

Bundles of European hair having a length of about 17 cm. and a weight of $\frac{1}{2}$ gram were glued at both ends to plastic tabs to provide tresses approximately 2 cm. wide and 14.0 cm. in length between tabs. The prepared tresses were then wet with water and dried in a roller frame designed to produce a sinuous curvature in the fibers, the dried tress having a length from tab to tab of 11 cm. The dried tresses were then sprayed with equivalent quantities of the compositions to be tested and allowed to dry overnight at a relative humidity of 30%. The tresses were then suspended vertically in a chamber having a relative humidity of 85%, and changes in tress length measured at various time intervals. Results given below were obtained from an experiment in which solutions of the specified polymers containing 0.2% by weight (based on the weight of solvent) in a mixture of equal parts by weight of ethyl alcohol and water were applied to the tresses with a pressurized atomizer to eliminate the effects, if any, of propellants and other materials normally present in aerosol packaged products. The "Percent Relaxation" means the extent to which the length of the hair tress (measured between tabs) increased over the set length of 11.0 cm. (0% relaxation) to the original length of 14.0 cm. (100% relaxation). After two hours exposure to 85% relative humidity the tress length was measured; the tresses were then restyled by wetting with water and again constraining in the same roller frame to produce the sinuous curl pattern in a tress measuring 11 cm. between tabs. After drying thoroughly at 30% relative humidity and again suspending the tresses vertically, exposed to 85% relative humidity and without any additional application of polymer, the tress lengths were again measured, with the following results:

	Percent relaxation at 85% R.H.		
	Before restyling		After re- styling
	Time 0	After 2 hrs.	After 2 hrs.
Cellulose polymer			
A polymeric quaternary cellulose ether salt having the structural formula set forth above in which the anion A is chloride, x is an integer from 50 to 20,000, n has an average value per anhydroglucose unit from 0.35 to 0.45 and $m+p$ has an average value from 1 to 2	14	48	50
Hydroxyethyl cellulose	14	56	80
Methyl cellulose	12	48	76

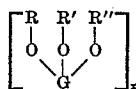
As the above data illustrates clearly, the polymeric salts of the invention provide a much greater degree of set holding after restyling than do other cellulosic poly-

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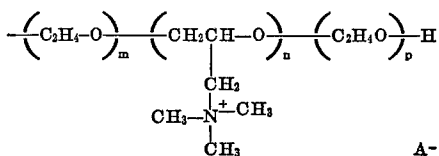
mers having a similar degree of set holding before restyling.

What is claimed is:

1. A hair setting device comprising a closed container having a dispensing orifice and containing a composition comprising a pressure propellant for forcing the composition through said orifice and a solution in a solvent selected from the group consisting of water and mixtures of water with ethyl alcohol or isopropyl alcohol containing from 0.1 to 2.5% by weight, based on the weight of the total composition, of a polymeric quaternary cellulose ether salt of the structural formula



in which G represents the residue of an anhydroglucose unit, x is an integer from 50 to 20,000, and R, R' and R'' represent substituent groups having the structure



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in which the average value, per anhydroglucose unit, of n is 0.25 to 3, of $m+p$ is 1 to 2, and in which A represents an anion.

2. The device as claimed in claim 1 in which x is from 200 to 5000, the average value of n is 0.25 to 2.5, and of $m+p$ is 1.5 to 1.8.

3. The device as claimed in claim 1 in which said solvent is a mixture of water with ethyl or isopropyl alcohol.

References Cited

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15 ALBERT T. MEYERS, Primary Examiner

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U.S. Cl. X.R.

20 8—122.51; 132—7; 424—71, Dig. 1, 2