

# United States Patent

[11] 3,632,396

[72] Inventor **Pablo O. Perez-Zamora**  
Greenhills, Ohio  
[21] Appl. No. **819,965**  
[22] Filed **Apr. 28, 1969**  
[45] Patented **Jan. 4, 1972**  
[73] Assignee **The Procter & Gamble Company**  
Cincinnati, Ohio

2,694,633 11/1954 Pattilloch ..... 162/182  
2,819,986 1/1958 Edwards et al. ..... 117/92  
3,121,249 2/1964 Affleck et al. ..... 15/506  
3,442,692 5/1969 Gaiser ..... 117/120

## OTHER REFERENCES

Chemical Abstracts, Vol. 62, page 16,442a, 1965.

*Primary Examiner*—William D. Martin

*Assistant Examiner*—Ralph Husack

*Attorneys*—Robert B. Aylor and Richard C. Witte

[54] **DRYER-ADDED FABRIC-SOFTENING  
COMPOSITIONS**  
24 Claims, No Drawings

[52] U.S. Cl. .... **117/76 P**,  
117/76 T, 117/90, 117/92, 117/139.5 CQ,  
117/139.5 A, 252/8.6, 252/8.9

[51] Int. Cl. .... **D06m 13/06**,  
D06m 15/00

[50] Field of Search .... **252/8.6,  
8.8; 117/92, 76 P, 76 T, 90, 139.5 CQ, 139.5 F,  
139.5 A**

[56] **References Cited**  
UNITED STATES PATENTS  
2,665,528 1/1954 Sternfield et al. .... 252/91 X

**ABSTRACT:** Fabric-softening compositions, useful for softening textile fabrics in a standard, automatic, clothes dryer, as well as in the rinse cycle of an automatic washer, consist essentially of a substrate having a substrate coating, which consists essentially of a substantially solid, waxy, cationic or nonionic material, and having a substantially solid outer coating comprising from 30 percent to 100 percent by weight of a fabric softener, wherein at least one of the coatings has a melting point equal to or less than about 170° F.

## DRYER-ADDED FABRIC-SOFTENING COMPOSITIONS

## CROSS-REFERENCE TO RELATED APPLICATIONS

The invention herein relates generally to the softening of fabrics in an automatic, rotary drum, clothes dryer and to compositions employed to achieve softening therein. The invention herein represents a significant improvement over the other dryer-added fabric-softening compositions of the type disclosed in a pending application by David Russell Morton, entitled "Textile Fabric Softeners Impregnated into Absorbent Substrates," Ser. No. 788,102, filed Dec. 30, 1968 and in a pending application by Howard W. Krueger, Jr., entitled "Fabric Softening Compositions," Ser. No. 788,103, filed Dec. 30, 1968, the specifications of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

Certain chemical compounds have long been known in the art to possess the desired quality of imparting softness to textile fabrics. The quality of "softness" or being "soft" is well defined in the art, and, as used herein, means that quality of the treated fabric whereby its handle or texture is smooth, pliable, and fluffy, and not rough or scratchy to the touch. Known generally as "fabric softeners," these compounds have long been used by housewives in the laundry and by the textile industry to soften a finished fabric.

Additionally, many of these compounds act to reduce the "static cling" of the treated fabrics. Static cling, is, generally, the phenomenon of a fabric adhering to another object or to parts of itself as a result of static electrical charges located on the surface of the fabric. It can also involve the adherence of lint, dust, and other undesired substances to the fabric due to these static charges. It is noticeably present in unsoftened fabrics that are freshly washed and dried in an automatic dryer. By softening and reducing the static cling of a fabric, it is more comfortable when worn. Such treated fabrics additionally are easier to iron, and have fewer hard-to-iron wrinkles.

Generally, fabric softeners are used in the rinse cycle of an automatic clothes washer, and liquid, powder, tablet, and granular formulations are known for such use.

Recently, however, fabric-softening compositions have been disclosed for use in softening fabrics in an automatic, rotary drum, clothes dryer. One such composition, sold commercially in Feb. 1968, consists essentially of (as marketed) dense paper coated with a cationic quaternary ammonium fabric softener. Such a composition presents fabric-staining problems. The above-referenced Morton and Krueger applications disclose two other types of softener compositions which do not present staining problems and essentially consist of an absorbent substrate impregnated with, respectively, a fabric softener and an admixture of two or more compatible fabric softeners.

In softening fabrics in a clothes dryer with the prior art types of compositions, adequate release of fabric softener from the substrate during use cannot be achieved. The prior art has not provided a softener composition of this type which will release 80 percent or more fabric softener during use. Such release can reduce the cost of fabric softener used in dryer-added compositions by reducing the retention of the fabric softener in the substrate. Additionally, certain nonstaining fabric softeners, as described in detail hereafter, can be more conveniently used in the compositions of this invention.

Therefore, it is an object of this invention to provide novel, fabric-softening compositions which can be used to soften fabrics in a standard, automatic, rotary drum clothes dryer.

Additionally, it is an object of the invention herein to provide dryer-added fabric-softening compositions which eliminate or substantially eliminate fabric staining.

It is a further object of the invention herein to provide dryer-added fabric-softening compositions which exhibit desirable fabric softener release from the substrate.

It is also an object of the invention herein to provide a composition which can be used to impart antistatic qualities to a variety of fabric materials, especially synthetic fabrics from which automobile and some furniture upholstery are generally made.

Moreover, it is an object of the invention herein to provide a composition which can be used as a detergent to cleanse articles made of wood (furniture), plastic and the like.

10

## BRIEF SUMMARY OF THE INVENTION

These and other objects are achieved by the invention herein which is a fabric-softening composition consisting essentially of a substrate; a waxy, substantially solid, cationic or nonionic substrate coating; and a solid or substantially solid outer coating which comprises a fabric softener. Efficient fabric softener release (from the outer coating) is achieved in the compositions of this invention because the substrate coating provides a "releasing" force and/or prevents entrapment of the fabric softener (of the outer coating) within the structure of the substrate.

The fabric-softening compositions herein, while effective when used to soften fabrics in rinse water, particularly in the rinse cycle of an automatic clothes washer, find particular application in effectively softening fabrics in a standard, automatic, clothes dryer. As the fabrics in the dryer contact the compositions of this invention by means of the spinning or tumbling action of the dryer's rotary drum, fabric softening occurs as the outer coating is transferred from the substrate to the fabrics.

Preferably, the fabric-softening compositions herein are made up into tubular rolls or into individual sheets. When used as a dryer additive, a desired length of the fabric-softening composition is torn off the roll or a sheet removed from its package and placed into the clothes dryer wherein the fabrics to be treated have been loaded, the dryer is then operated in customary fashion.

The fabric-softening composition can be formulated for use in a washer by using, e.g., a conventional cationic softener for the substrate coating. When a sheet of such a composition is removed from its package or desired length torn off its roll and placed into the rinse water, e.g., in the rinse water of the final rinse cycle, both the substrate and outer coatings disperse into the rinse water and are then absorbed by the fabrics.

## DETAILED DESCRIPTION OF THE INVENTION

The invention herein relates to a fabric-softening composition consisting essentially of: (a) a substrate; (b) a substantially solid, waxy substrate (inner) coating, which consists essentially of a substantially solid, waxy, cationic or nonionic material; and, (c) a solid or substantially solid outer coating, which comprises from about 30 percent to 100 percent by weight of the outer coating of a fabric softener. The fabric softener is a compound or an admixture of two or more compounds having a different composition than the substrate coating (that is, when the substrate coating consists essentially of a nonionic material, the outer coating is some material other than the same nonionic material, and, when the substrate coating consists essentially of a cationic material, the outer coating is some material other than the same cationic material). Either the substrate coating or the outer coating (or both) has a melting point equal to or less than about 170° F.; that is, at least one of the coatings has a melting point of no more than about 170° F. The weight ratio of the substrate to the total sum of the inner and outer coatings ranges from 2:1 to 1:10.

The coated substrate in the instant composition is a vehicle for the fabric softener in the outer coating to effect an efficient use of the softener. The substrate coating serves (a) to prevent or reduce entrapment of fabric softener in any open structure that the substrate may have, including the open structure of any fibers present in the substrate, and/or (b) to improve the releasability of the fabric softener in the outer coating by liquifying during dryer usage.

75

## SUBSTRATES

The substrates employed herein are solid or substantially solid materials. They can be dense or open in structure, preferably the latter. Examples of suitable materials which can be used as a substrate herein include, among others, paper, woven cloth, and nonwoven cloth. The term "cloth" herein means a woven or nonwoven fabric or cloth used as a substrate, in order to distinguish said components from the term "fabric" which means the textile fabric which is desired to be softened. Absorbent capacity, thickness, or fiber density are not limitations on the substrates which can be used herein. Preferably, the substrates employed herein are paper or nonwoven cloth.

Paper substrates which can be employed herein encompass the broad spectrum of known paper structures and are not limited to any specific papermaking fiber or woodpulp; thus, the fibers can be derived from softwoods, hardwoods or annual plants (e.g., bagasse, cereal straw, and the like), and woodpulps, such as bleached or unbleached kraft, sulfite, soda groundwood, or mixtures thereof, can be used. Moreover, the paper substrates which can be employed herein are not limited to a specific type of paper; thus, tissue paper, toweling paper, toilet paper, wrapping paper, writing paper, newsprint, etc., can be used.

Specific examples of paper substrates preferred herein include a one-ply paper having a basis weight of about 32 pounds per 3,000 square feet made from, for example, a mixture of groundwood and kraft bleached woodpulps. Another example is the absorbent, multi-ply, toweling paper particularly preferred in the above-referenced Morton application and disclosed in Wells, U.S. Pat. No. 3,414,459, said patent being incorporated hereinto by reference.

The preferred nonwoven cloth substrates used in the invention herein can generally be defined as adhesively bonded fibrous products, having a web or corded fiber structure (where the fiber strength is suitable to allow carding) or comprising fibrous mats, in which the fibers are distributed haphazardly or in random array, (i.e., an array of fibers in a carded web wherein partial orientation of the fibers is frequently present as well as a completely haphazard distributional orientation) or substantially aligned. The fibers can be natural (e.g., wool, silk, jute, hemp, cotton, linen, sisal, or ramie) or synthetic (e.g., rayon, cellulose ester, polyvinyl derivatives, polyolefins, polyamides, or polyesters). Any diameter or denier of the fiber (generally up to about 10 denier) can be used.

Methods of making nonwoven cloth suitable for use herein are not a part of this invention, and, being well known in the art, are not described in detail herein. Generally, such cloths are made by dry- (e.g., air-) or water-laying processes in which the fibers are first cut to desired lengths from long strands, passed into a water or airstream, and then deposited onto a screen, through which the fiber-laden air or water is passed. The deposited fibers are then adhesively bonded together, dried, cured, and otherwise treated as desired to form the nonwoven cloth. Nonwoven cloth made of polyesters, polyamides, vinyl resins and other thermoplastic fibers can be spun bonded, i.e., the fibers are spun out onto a flat surface and bonded (melted) together by heat or by chemical reactions.

The binder-resins used in the manufacture of nonwoven cloths can provide substrates possessing a variety of desirable traits. For example, a hydrophobic binder-resin, when used singly or as the predominant compound of a hydrophobic-hydrophilic binder-resin mixture, provides a nonwoven cloth which is especially useful as a substrate when the fabric-softening compositions herein are used in the rinse cycle of an automatic washer. Additionally, a hydrophilic binder-resin and a water-dissolvable fiber can be employed to make a nonwoven cloth substrate which dissolves when a fabric-softening composition employing the substrate is used in the rinse water of an automatic washer.

When the substrate of the fabric-softening compositions herein is a nonwoven cloth made from fibers deposited

haphazardly or in random array on the screen, the compositions exhibit excellent strength in all directions and are not prone to tear or separate when used in the washer or the dryer.

Preferably, the nonwoven cloth is water laid or dry laid and is made from cellulosic fibers, particularly from regenerated cellulose or rayon, which are lubricated with a standard textile lubricant. Preferably, the fibers are from about three-sixteenth inch to about 2 inches in length and are from about 1.5 to about 5 denier. Preferably, the fibers are at least partially oriented haphazardly, particularly substantially haphazardly, and are adhesively bonded together with a hydrophobic or substantially hydrophobic binder-resin, particularly with a nonionic self-cross-linking acrylic polymer or polymers. Preferably, the cloth comprises about 70 percent fiber and about 30 percent binder-resin polymer by weight and has a basis weight of from about 18 to about 30 grams per square yard.

The substrates, which are used in the fabric-softening compositions herein, can take a variety of forms. For example, the substrate can be in the shape of a ball or puff, or it can be a sheet or swatch of woven or nonwoven cloth. When the substrate is paper or nonwoven cloth, individual sheets of desired length and width can be used, or a continuous roll of desired width from which a measured length is torn off can be employed.

The substrates usable herein can be "dense," or they can be open and have a high amount of "free space." Free space, also called "void volume," means that space within a substrate structure that is unoccupied. For example, certain absorbent, multi-ply paper structures comprise plies embossed with protuberances, the ends of which are mated and joined; this paper structure has free space between the unembossed portions of the plies, as well as between the fibers of the paper plies themselves. A nonwoven cloth also has such space among its fibers. The free space of a substrate can be varied by modifying the density of the fibers of the substrate. Substrates with a high amount of free space generally have low fiber density; substrates having high fiber density (i.e., "dense" substrates) generally have a low amount of free space.

The amount of free space of a material is not essential to its employment as a substrate herein; however, the amount of free space in the substrate structure does affect the amount of the substrate coating applied to the substrate to achieve a desired coating effect, as described hereinafter.

## SUBSTRATE COATING

An essential component of the fabric-softening compositions herein is the substantially solid, waxy, substrate coating, which consists essentially of substantially solid, waxy, nonionic or cationic material, preferably having a melting point of at least about 75° F. The term "melting point" (also designated "m.p."), as used herein, means the point below which the substrate coating is substantially solid.

While applicant does not desire to be bound by theory, it is believed that the substrate coating improves the release efficiency of the fabric softener in the outer coating by one or both of two mechanisms: (1) the substrate coating prevents entrapment of the fabric softener in the outer coating within any free space in the substrate (including absorption of the fabric softener in the outer coating into any fibers of the substrate), and/or (2) the substrate coating promotes the release of the softener-containing outer coating during usage.

The temperature in an electric dryer ranges from about 75° F. (room temperature) at startup to about 150°-160° F. at the end of the drying cycle; gas dryers reach even higher temperatures, e.g., about 170° F. Many fabric softeners do not melt or liquify within the temperature range of a gas or electric dryer.

By employing a substrate coating when the substrate in the fabric-softening compositions has an open structure (containing "free space"), the outer softener-containing coating can be prevented from adhering to or being retained by any substrate fibers and from occupying and being retained in any

free space of the substrate. The coating is provided by treating the substrate with a substantially solid, waxy cationic or nonionic material. Thus, the substrate coating can have a melting point as high as desired, generally up to about 200° F. for practicality. However, when the substrate coating has a melting point above the range of the automatic dryer (i.e., above about 170° F.), it is essential that the substantially solid outer coating then have a melting point lower than the maximum temperature of the dryer (e.g., equal to or less than about 170° F.) to obtain satisfactory fabric softening. Preferably the inner coating has a melting point of at least about 75° F. and most preferably within the range from about 75° to about 170° F.

Additionally, a releasing force, promoting the release of the outer coating, is provided when the substrate coating has a melting point within the temperature range of an automatic dryer. As the substrate coating melts or liquifies during the drying cycle, the liquified substrate coating 'releases' the adjacent outer coating, and, as the fabrics in the dryer contact the fabric-softening composition, the outer coating (containing the fabric softener) is absorbed by the fabrics. Thus, when the substrate coating has a melting point within the range of from about 75° to about 170° F., the solid or substantially solid outer coating can have a melting point as high as desired, generally up to about 200° F. for practical purposes.

In this manner, improved (e.g., 80 percent or more) fabric softener release can be obtained when the fabric-softening compositions herein are used in a dryer as compared to 40 percent or less fabric softener release from some prior art compositions; accordingly, the softening of fabrics in a dryer is significantly improved by the compositions herein and/or made more efficient. The manufacturing cost of dryer-added fabric-softening compositions can be reduced since the inner coating can be very inexpensive material and less fabric softener is required.

Moreover, fabric staining can effectively be controlled by the use of the substrate coating in the fabric-softening compositions herein. More specifically, certain fabric softeners (e.g., certain cationic quaternary ammonium compounds), known in the art to be superior fabric softeners when used during the rinse cycle of an automatic washer, can cause some fabric staining when a sufficient amount of said fabric softeners comes in direct contact with the fabrics in an automatic dryer. Other fabric softeners do not cause fabric staining, but have high melting points (e.g., 180° F. or above); such higher melting fabric softeners require mixture with a volatile solvent in order to effect efficient release from substrates which do not contain a substrate coating. By utilizing a substrate coating having a melting point within the range of from about 75° to about 170° F., a high-melting, nonstaining fabric softener can be employed in the outer coating of the instant composition and is aided in its release by the liquification of the inner coating in the dryer. Thus, the selection of the fabric softener used in the outer coating is not limited to one that has a melting point within the range of an automatic dryer; rather, the fabric softener can be selected on the basis of minimizing fabric staining, as well as on other factors, e.g., germicidal or anti-static properties, or cost considerations.

For example, 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, wherein the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms (hereinafter designated C<sub>20-22</sub> HAPS) is a fabric softener which is known to exhibit superior fabric softening when used in aqueous systems; moreover, this compound additionally does not cause fabric staining even when used in dryer-added fabric-softening compositions in high amounts. By utilizing a substrate having a substrate coating as described herein, C<sub>20-22</sub> HAPS can be efficiently used as a fabric softener employed in the outer coating. In a subsequent washing of the treated fabric, the C<sub>20-22</sub> HAPS can act as a detergent.

Accordingly, the term "substrate coating" as used herein means the substantially solid, waxy, nonionic or cationic material applied to the substrate in an amount such that, at

least, any fibers of the substrate are substantially completely coated therewith and, at most, the fibers of the substrate are completely coated and any free space of the substrate is completely filled, thereby achieving a substrate having a film of the nonionic or cationic material on the external surface of the substrate. Preferably, the nonionic or cationic material is applied to the substrate in an amount to substantially completely coat any fibers of the substrate and to substantially completely fill any of the substrate's free space.

10 As disclosed above, it is essential that at least one of the coatings has a melting point equal to or less than about 170° F.; when one of the coatings has a melting point equal to or less than about 170° F., the other coating is limited only in that it should be solid or substantially solid.

15 Preferably, the substrate coating has a melting point within the range of from about 75° to about 170° F., thereby broadening the selection of a fabric softener employed in the outer coating. Thus, a preferred embodiment of the invention herein comprises a substrate coating, having a melting point

20 within the range of from about 75° to about 170° F., and a solid or substantially solid outer coating. Another preferred embodiment comprises a substrate coating and an outer coating having melting points within the range of from about 75° to about 170° F.

25 Particularly preferred compositions herein comprise substrate and outer coatings having melting points of at least about 100° F. to achieve fabric-softening compositions which are solid or substantially solid during seasonal temperatures and storage.

30 Thus, a particularly preferred embodiment of the invention herein comprises a substrate coating having a melting point within the range of from about 100° to about 170° F. and a solid or substantially solid outer coating having a melting point of at least about 100° F. Another particularly preferred embodiment comprises substrate and outer coatings having melting points within the range of from about 100° to about 170° F.

35 Although not essential, it is also desirable that the compositions herein begin to effect fabric softening early in the drying cycle (from 3 to 5 minutes after startup).

40 Thus, a most particularly preferred embodiment of the invention herein comprises a substrate coating having a melting point within the range of from about 100° to about 140° F.; another most particularly preferred embodiment comprises a substrate coating having a melting point within the range of from about 100° to about 140° F. and an outer coating having a melting point of at least about 100° F., preferably within the range of about 100° to about 170° F., particularly from about 100° to about 140° F.

45 50 The above-preferred embodiments utilize a substrate coating having a melting point within the range of an automatic dryer. However, the substrate coating can have a melting point above about 170° F., and in such a case, it is essential that the outer coating have a melting point equal to or less than about 170° F., preferably within the range of from about 75° to about 170° F., particularly from about 100° to about 170° F., and most particularly from about 100° to about 140° F.

55 60 The substrate coating consists essentially of substantially solid, waxy, nonionic or cationic materials, preferably nonionic. A wide variety of such materials are known and selection can be made to achieve desired melting points; specific examples of suitable nonionic materials for use as the substrate (inner) coating in the fabric-softening compositions herein are given in example IX.

65 70 Particularly preferred nonionic materials are the condensation products of 1 mole of tallow alcohol with from 10 to 40 moles of ethylene oxide (m.p. from about 100° to about 150° F.), most particularly with 20 and 30 moles of ethylene oxide (hereinafter designated, respectively, TAE<sub>20</sub> and TAE<sub>30</sub>). The term "tallow," as used herein means an alkyl containing from 16 to 18 carbon atoms.

75 Other particularly preferred nonionic materials herein include polymers of polyethylene glycol having average molecu-

lar weights (A.M.W.) ranging from about 950 to about 7,500. Polymers of polyethylene glycol are commercially available under the trade name "Carbowax." Specific Carbowaxes which are particularly preferred herein include the following:

Trade name	A.M.W.	m.p. (about)
Carbowax 1000	950-1,050	97°-103° F.
Carbowax 1500	500-600	100°-106° F.
Carbowax 1540	1,300-1,600	109°-114° F.
Carbowax 4000	3,000-3,700	128°-134° F.
Carbowax 6000	6,000-7,500	140°-145° F.

Other nonionic materials can be selected from the group consisting of:

- a. the condensation product of 1 mole of a saturated or unsaturated, straight or branched chained aliphatic alcohol having from about 10 to about 24 carbon atoms with from about 10 to about 40 moles of ethylene oxide;
- b. the condensation product of 1 mole of a saturated or unsaturated, straight or branched chain aliphatic carboxylic acid having from about 10 to about 18 carbon atoms with from about 20 to about 50 moles of ethylene oxide;
- c. aliphatic carboxylic acids containing from about 12 to about 30 carbon atoms;
- d. aliphatic alcohols having from about 16 to about 30 carbon atoms;
- e. the condensation product of 1 mole of an alkyl phenol, wherein the alkyl chain has from about eight to about 18 carbon atoms, with from about 25 to about 50 moles of ethylene oxide;
- f. glycerides, selected from the group consisting of monoglycerides, diglycerides, and mixtures thereof;
- g. amides, selected from the group consisting of:
  - i. propyl amid,
  - ii. N-methyl amides having an acyl chain length of from about 10 to about 15 carbon atoms,
  - iii. oleamide,
  - iv. amides of ricinoleic acid,
  - v. N-isobutyl amides of pelargonic, capric, undecanoic, or lauric acids,
  - vi. N-(2-hydroxyethyl) amides having a carbon chain length of from about six to about 10 carbon atoms,
  - vii. pentyl anilide,
  - viii. anilides having a carbon chain length of from about seven to about 12 carbon atoms, and
  - ix. N-cyclopentylauramide and N-cyclo-pentylstearamide; and,
- h. the condensation product of 1 mole of a primary or secondary amine containing at least 12 carbon atoms with from 1 to about 100 moles of ethylene oxide.

It is desirable, although not essential, that the substrate coating contains no volatile solvents; many of the nonionic materials are prepared or formulated without such solvents and, therefore, are particularly useful in this respect. Cationic materials, (e.g., ditallowdimethyl ammonium chloride), which generally are prepared in formulations containing an isopropyl alcohol and water mixture, can be used as the inner coating in the fabric-softening compositions herein to achieve the benefit of additional softening, especially in the rinse cycle. Even though such materials contain volatile solvents, their melting points do not generally rise above about 170° F. when applied to the substrate and cooled. Specific examples of cationic materials, useful in formulating the substrate coatings herein, are given in example IX.

#### OUTER COATING

The fabric-softening compositions herein additionally comprise a third component, which is a substantially solid outer coating comprising from 30 to 100 percent by weight of a fabric softener. The term "fabric softener," as used herein, means either a single fabric softener or an admixture of two or more compatible fabric softeners. When the fabric softener is

less than 100 percent by weight of the outer coating, the balance can comprise other fabric-finishing additives (e.g., antistatic agents, flame retardants, brighteners, fungicides, perfume, etc.), solvents (e.g., isopropyl alcohol, isopropyl alcohol-water mixtures, methanol, ethanol, acetone, etc.), or plasticizers e.g., chlorinated methyl esters, epoxides, or ethoxides, and the like). Thus, the outer coating comprises the fabric softener and other compatible fabric-finishing additives, solvent, etc., if any. By definition of the substrate coating, the outer coating is, at least, substantially in contact with the substrate coating as opposed to the substrate, and, at most, the outer coating is completely in contact only with said substrate (inner) coating.

The melting point of the outer coating is affected by the melting point of the fabric softener employed therein, and, when the outer coating comprises 100 percent by weight fabric softener, it is the same as the melting point of the fabric softener. When the substrate coating employed in a composition herein has a melting point above about 170° F., it is essential that the outer coating then have a melting point equal to or less than about 170° F.; additionally, it may be desirable to employ an outer coating having a melting point below about 170° F. to achieve the preferred embodiments of the invention disclosed above.

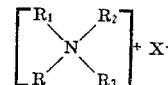
Fabric softeners having melting points above about 170° F. can be utilized in the outer coating, alone or with melting point depressors, e.g., solvents and/or plasticizers. From 10 percent to 300 percent by weight of the high-melting fabric softener of a volatile solvent (e.g., isopropyl alcohol or an isopropyl alcohol-water mixture) can be employed to obtain a substantially solid fabric-softening composition wherein the outer coating has a melting point under 170° F.

The fabric softeners, as more particularly described hereinafter, used in the outer coatings of fabric-softening compositions herein, can be selected from the following broadly denoted classes of compounds which contain at least one long chain group:

1. cationic quaternary ammonium salts and imidazolium salts;
2. nonionic compounds, such as tertiary phosphine oxides, tertiary amine oxides, ethoxylated alcohols and alkyl phenols, and ethoxylated amines;
3. anionic soaps, sulfates and sulfonates, for example, fatty acid soaps, ethoxylated alcohol sulfates, sodium alkyl sulfates, alkyl sulfonates, sodium alkylbenzenesulfonates, and sodium or potassium alkyl glyceryl ether sulfonates;
4. amphoteric tertiary ammonium compounds;
5. Zwitterionic quaternary ammonium compounds; and
6. compatible mixtures of one or more compounds of these classes.

Particularly preferred fabric softeners herein are the cationic quaternary ammonium salts which have the general formula

(1)

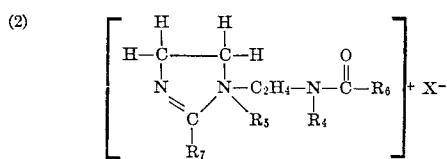


wherein X is an anion, preferably a halide and more particularly, a chloride ion. Suitable other anions can include acetate, phosphate, nitrite, and methyl sulfate radicals. Additionally, in the above formula, R and R<sub>1</sub> represent benzyl or an alkyl radical (hereinafter referred to simply as "alkyl") containing from one to three carbon atoms, R<sub>2</sub> represents benzyl, or an alkyl containing from one to 20 carbon atoms, or alkoxypropyl or hydroxy-substituted alkoxypropyl radicals (hereinafter referred to simply as "alkoxy") wherein the alkoxy contains from 12 to 20 carbon atoms, and R<sub>3</sub> represents an alkyl containing from 12 to 20 carbon atoms. The carbon chains of R<sub>3</sub> and R<sub>2</sub>, whenever R<sub>2</sub> represents a chain of from 12 to 20 carbon atoms, can be straight or branched, and saturated or unsaturated.

Because of their known softening efficacy, the most preferred cationic fabric softeners are dialkyl dimethyl ammonium chloride or alkyl trimethyl ammonium chloride wherein the alkyl contains from 12 to 20 carbon atoms and are derived from long chain fatty acids, especially from hydrogenated tallow. The term "tallowalkoxy," used herein, means an alkyl ether radical wherein the alkyl essentially contains from 16 to 18 carbon atoms. Specific examples of the particularly preferred cationic fabric softeners are given in example IX hereinafter.

Other cationic fabric softeners of formula (1) are known and include variables wherein R and R<sub>1</sub> can also represent a phenyl radical or a hydroxy substituted alkyl of from one to three carbon atoms.

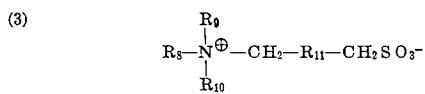
Cationic quaternary imidazolinium compounds are also preferred as fabric softeners in the compositions herein. These compounds conform to the formula:



wherein R<sub>5</sub> is an alkyl containing from one to four, preferably from one to two, carbon atoms, R<sub>6</sub> is an alkyl containing from one to four carbon atoms or a hydrogen radical, R<sub>7</sub> is an alkyl containing from eight to 25, preferably at least 15, carbon atoms, R<sub>4</sub> is hydrogen or an alkyl containing from eight to 25, preferably at least 15, carbon atoms, and X is an anion, preferably methyl sulfate or chloride ions. Other suitable anions include those disclosed with reference to the cationic fabric softeners of formula (1). Particularly preferred are those compounds of formula (2) in which both R<sub>4</sub> and R<sub>7</sub> are alkyls of from 16 to 25, especially 16 to 18 and 20 to 22, carbon atoms.

Many other cationic quaternary ammonium fabric softeners, which are useful herein, are known; for example, alkyl [C<sub>12</sub> to C<sub>20</sub>]-pyridinium chlorides, alkyl [C<sub>12</sub> to C<sub>20</sub>]-alkyl [C<sub>1</sub> to C<sub>3</sub>]-morpholinium chlorides, and quaternary derivatives of amino acids and amino esters.

Other particularly preferred fabric softeners include Zwitterionic quaternary ammonium compounds which have the formula:



wherein R<sub>9</sub> and R<sub>10</sub> are each methyl, ethyl, n-propyl, isopropyl, 2-hydroxyethyl or 2-hydroxypropyl, R<sub>8</sub> is a 20- to 30-carbon-atom alkyl or alkenyl radical (hereinafter referred to simply as "alkyl") and wherein said alkyl or alkenyl contains from zero to two hydroxyl substituents, from zero to five ether linkages, and from zero to one amide linkage, and R<sub>11</sub> is an alkylene group containing from one to four carbon atoms with from zero to one hydroxyl substituents; particularly preferred are compounds wherein R<sub>8</sub> is a carbon chain containing from 20 to 26 carbon atoms selected from the group consisting of alkyls and alkenyls and wherein said alkyls and alkenyls contain zero to two hydroxyl substituents. Specific examples of the particularly preferred compounds of this class are given in example IX hereinafter.

The compounds of formula (3) are disclosed more particularly in a copending application entitled "Textile Treating Compounds, Compositions and Processes for Treating Textiles," by Charles B. McCarty, Ser. No. 648,527, filed June 5, 1967, now abandoned in favor of continuation-in-part Ser. No. 829,093, the disclosure of which provides methods of preparing these compounds and is fully incorporated hereinto.

Other Zwitterionic compounds useful as fabric softeners in the compositions herein are known and include Zwitterionic synthetic detergents as represented by derivatives of aliphatic quaternary ammonium compounds wherein one of the four aliphatic groups has about eight to 20 carbon atoms (particularly 16 to 18 carbon atoms), another contains a water-solubilizing group (e.g., carboxy, sulfato or sulfo groups). Each aliphatic group can be either straight chain or branched chain, preferably straight. A more detailed disclosure of these compounds can be found in U.S. Pat. No. 3,213,030, (Francis Diehl) issued Oct. 19, 1965, the disclosure of which is incorporated by reference herein.

Nonionic tertiary phosphine oxide compounds are also preferred fabric softeners for use in the novel fabric-softening compositions herein. These compounds have the generic formula



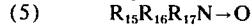
wherein R<sub>12</sub> is alkyl, alkenyl, or monohydroxyalkyl having a chain length of from 20 to 30 carbon atoms, and wherein R<sub>13</sub> and R<sub>14</sub> are each alkyl or monohydroxyalkyl containing from one to four carbon atoms; particularly preferred are tertiary phosphine oxides in which R<sub>12</sub> is alkyl, alkenyl, or monohydroxyalkyl having a chain length of from 20 to 26 carbon atoms, and wherein R<sub>13</sub> and R<sub>14</sub> are each methyl, ethyl, or hydroxyethyl groups.

Specific examples of particularly preferred fabric softeners of this class are given in example IX hereinafter.

The C<sub>20</sub> to C<sub>30</sub> nonionic tertiary phosphine oxides are disclosed more particularly in the aforementioned McCarty application, wherein methods of preparing these compounds are also given.

Other nonionic tertiary phosphine oxides useful herein are known and include the nonionic synthetic detergents having the same formula as that of formula (4) above wherein R<sub>12</sub> is an alkyl, alkenyl, or monohydroxyalkyl or from 10 to 20 carbon atoms, and wherein R<sub>13</sub> and R<sub>14</sub> are each alkyl or monohydroxyalkyl of from one to three carbon atoms. The C<sub>10</sub> to C<sub>20</sub> tertiary phosphine oxides are more particularly described in the aforementioned Diehl patent.

Nonionic tertiary amine oxides are also useful as fabric softeners and can be utilized in the compositions of the present invention. These nonionic compounds have the formula:



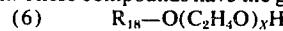
wherein R<sub>15</sub> represents a straight or branched chain alkyl or alkenyl containing from 20 to 30 carbon atoms and from zero to two hydroxyl substituents, from zero to five ether linkages, there being at least one moiety of at least 20 carbon atoms containing no ether linkages, and zero to one amide linkage, and wherein R<sub>16</sub> and R<sub>17</sub> are each alkyl or monohydroxyalkyl groups containing from one to four carbon atoms and wherein R<sub>16</sub> and R<sub>17</sub> can be joined to form a heterocyclic group containing from four to six carbon atoms; particularly preferred are those wherein R<sub>15</sub> is a straight or branched alkyl, alkenyl, or monohydroxyalkyl containing 20 to 26 carbon atoms and wherein R<sub>16</sub> and R<sub>17</sub> are each methyl, ethyl, or hydroxyethyl groups.

Specific examples of the particularly preferred compounds of this class are given in example IX.

The tertiary amine oxides of this class and methods of their preparation are also disclosed more particularly in the aforementioned McCarty application.

Other tertiary amine oxides useful herein are known and include compounds corresponding to formula (5) above wherein R<sub>15</sub> is an alkyl of eight to 20, particularly 16 to 18, carbon atoms, and R<sub>16</sub> and R<sub>17</sub> are methyl or ethyl radicals; the C<sub>8</sub> to C<sub>20</sub> nonionic tertiary amine oxides are disclosed in more detail in the above-referenced Diehl patent.

Nonionic ethoxylated alcohol compounds are also useful as fabric softeners and are preferred in the fabric-softening compositions herein. These compounds have the generic formula:



wherein R<sub>18</sub> represents an alkyl of from 20 to 30 carbon atoms, and X is an integer of from 3 to 45.

The particularly preferred ethoxylated alcohol compounds of this class are the condensation products of reacting from 3 moles to 45 moles of ethylene oxide with 1 mole of eicosyl alcohol, heneicosyl alcohol, tricosyl alcohol, tetracosyl alcohol, pentacosyl alcohol, or hexacosyl alcohol. Specific examples of the particularly preferred ethoxylated alcohols are given in example IX hereinafter. Other preferred ethoxylated alcohols are the condensation products of from 3 moles to 45 moles of ethylene oxide and 1 mole of heptacosyl, octacosyl, nonacosyl, or triacontyl alcohols. Specific examples are listed in example IX.

These compounds and methods of their preparation are more particularly disclosed in the above-mentioned McCarty application.

Also suitable for use as fabric softeners in the compositions herein are nonionic synthetic detergents as represented by the polyethylene oxide condensates of aliphatic alcohols containing from eight to 20 carbon atoms and alkylphenols wherein the alkyl contains from eight to 20 carbon atoms. Particularly preferred are the condensation products of 1 mole of tallow alcohol with 20 moles and with 30 moles of ethylene oxide. The Diehl patent discloses these compounds in more detail.

Other preferred fabric softeners for use in the outer coatings of the compositions herein are ethoxylated amines of the general formula

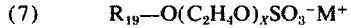
(11)



wherein Y is an ethoxylated group of the type  $-(C_2H_4O)_xH$ , wherein X is an integer of from 1 to 50, wherein  $R_{23}$  is hydrogen, Y, or an alkyl having from one to about four carbon atoms, and wherein  $R_{24}$  is an alkyl having from about 12 to about 30 carbon atoms.

Also preferred as fabric softeners in the compositions herein are anionic ethoxylated alcohol sulfates and anionic sulfonates.

The preferred ethoxylated alcohol sulfates have the generic formula

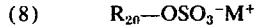


wherein X is an integer of from 1 to 20, M is an alkali metal (e.g., Na, K, Li), ammonium or substituted ammonium cations, and wherein  $R_{19}$  is an alkyl containing from 20 to 30 carbon atoms.

The particularly preferred anionic ethoxylated alcohol sulfate fabric softeners are the sodium and potassium salts or the monoethanol, diethanol, or triethanol ammonium salts of the sulfated condensation product of from 1 to about 20 moles of ethylene oxide with 1 mole of eicosyl alcohol, heneicosyl alcohol, tricosyl alcohol, tetracosyl alcohol, pentacosyl alcohol, or hexacosyl alcohol. Specific examples of these particularly preferred anionic softening compounds are given in example IX.

Other preferred anionic ethoxylated sulfate compounds are the sodium or potassium salts or monoethanol, diethanol, or triethanol ammonium cations of the sulfated condensation products of from 1 to 20 moles of ethylene oxide with 1 mole of heptacosyl alcohol, octacosyl alcohol, nonacosyl alcohol, and triacontyl alcohol.

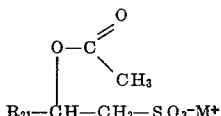
Anionic synthetic detergents as represented by alkyl sulfates of the formula



wherein M is an alkali metal and  $R_{20}$  is an alkyl of from eight to 20 carbon atoms are useful as fabric softeners herein. These compounds are disclosed in detail in the above-referenced Diehl patent.

The preferred anionic sulfonates have the general formula

(9)



wherein M is an alkali metal or a substituted ammonium cation, and  $R_{21}$  is an alkyl containing from 20 to 30 carbon atoms. The particularly preferred anionic sulfonates are those in which  $R_{21}$  is an alkyl containing from 20 to 26 carbon atoms. Examples of the particularly preferred compounds are given in example IX.

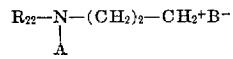
The anionic ethoxylated alcohol sulfates and the anionic sulfonates mentioned above can be prepared by the method disclosed in the aforementioned McCarty application, wherein said compounds are more particularly disclosed.

Other anionic sulfonates useful as fabric softeners herein are the synthetic detergents as represented by, among others, sodium or potassium alkylbenzenesulfonates and sodium alkylglycerylethersulfonates having the configuration of formula (9) above, wherein  $R_{21}$  is an alkylbenzene of alkylglycerylether with the alkyl containing from 10 to 20 carbon atoms. These compounds are more particularly described in the above-mentioned Diehl patent.

Anionic soaps, i.e., the sodium salts of long chain fatty acids, such as lauric, myristic, palmitic, stearic, and arachidonic acids, can also be used as the fabric softener in the compositions herein, and many such compounds are known in the art.

Additionally, amphoteric synthetic detergents of the formula

(10)



wherein  $R_{22}$  is an alkyl of from eight to 28 carbon atoms, A is the same as  $R_{22}$  or hydrogen, and B is a water-solubilizing group (particularly  $SO_3^-$ ), can be used as fabric softeners in the compositions herein. These compounds are more particularly disclosed in the above-referenced Diehl patent.

Other fabric softeners are known in the art and can be used herein. For example, guanidines and guanidine salts are useful fabric softeners; betaines and substituted betaines are similarly useful fabric softeners.

The admixture of one or more fabric softeners of one class with one or more compatible fabric softeners of another class can be used in the compositions herein; when such admixtures are used herein, the amount of fabric softener of any one class can range from 1 percent to 99 percent, as desired, by weight of the admixture. Examples of admixtures suitable for use herein are given in example IX.

The fabric softener used in the outer coating is a compound or an admixture of compounds having a different composition than that of the substrate coating. That is, when the substrate coating consists essentially of a nonionic material, the outer coating can contain a single fabric softener which is one other than the nonionic material of the substrate coating, or it can contain an admixture of two or more compatible fabric softeners, which admixture can include the nonionic material of the substrate coating; further, when the substrate coating consists essentially of a cationic material, the outer coating can contain a single fabric softener which is other than the cationic material of the substrate coating, or it can contain an admixture of two or more compatible fabric softeners, which admixture can include a cationic material of the substrate coating.

Other fabric-finishing additives can also be used in combination with the fabric softeners herein. Although not essential to the invention herein, certain of these additives are particularly desirable and useful, e.g., perfumes, brightening agents, shrinkage controllers, antistatic agents, and spotting agents. Other additives can include anticreasing agents, soil-releasing agents, fumigants, lubricants, fungicides, and sizing agents. Specific examples of possible additives disclosed herein can be found in any current Year Book of the American Association of Textile Chemists and Colorists. Any additive used should be compatible with the fabric softener.

The amounts of many fabric-finishing additives (e.g., perfume and brighteners) that can be used on combination with the fabric softener generally range from 0.01 percent to 3 per-

cent by weight of the outer coating. Other additives (e.g., anti-static agents, anticreasing agents, sizing agents, and soil releasants) can be used in amounts ranging from 0.01 percent to 40 percent, preferably from 5 percent to 25 percent, by weight of the outer coating.

The fabric-softening compositions herein comprise a coated substrate having an outer coating. Treatment of the substrate can be done in any convenient manner and many methods are known in the art.

In a preferred method of making the fabric-softening compositions herein, the substrate coating is applied to the substrate by a method generally known as padding; more specifically, a roll of the substrate is unwound and passed through a trough, containing the substrate coating in liquid state and is then passed through "squeeze rollers" to remove excess substrate coating. The substrate is then cooled until the substrate coating is substantially solid and is then passed through a series of "transfer rolls," the bottom rollers of which sit in a trough which contains the liquefied outer coating. This method can provide compositions herein having either one or both sides containing an outer coating; preferably, the outer coating is applied to both sides. This procedure involves the application of the substrate and outer coatings to the substrate in liquid form; thus, the cationic or nonionic materials used in the substrate coating, and the fabric softener used in the outer coating, which are normally solid or substantially solid at room temperatures, should first be melted and/or solvent treated. Methods of melting and/or solvent treating the substrate or outer coatings are known and can easily be done to provide a satisfactory treated substrate.

In another preferred method, the substrate and outer coatings, in liquid form, are placed into separate pans or troughs which can be heated, if necessary, to maintain the coatings in liquid form. To the liquefied outer coating is then added any desired fabric-finishing additives. The substrate is unrolled and passed, first, through the pan containing the liquefied substrate coating; the substrate is then solidified by cooling and passed through the trough containing the liquefied outer coating. The substrate can then be passed through squeeze rollers to remove excess outer coating and provide the substrate with a desired amount of the outer coating per given area of substrate. The treated substrate is then cooled to room temperature, after which it can be folded, cut or perforated at uniform lengths, and subsequently packaged and/or used.

The squeeze rollers and transfer rolls used herein are those in similar use in the paper and papermaking art. They can be made of hard rubber or steel. Preferably, the rollers are adjustable, so that the orifice between their respective surfaces can be regulated to control the amount of both inner and outer coatings applied to the paper.

In another method, the substrate coating (in liquid form) is sprayed onto the substrate as it unrolls and excess substrate coating is then removed by squeeze rollers or by a doctor knife; after solidifying the substrate coating, the outer coating (in liquid form) can then be applied by the same technique.

Other variations of manufacturing the compositions herein include the use of metal "nip" rollers, onto the leading or entering surfaces, on which the liquefied substrate or outer coating is sprayed; this variation additionally involves the use of metal rollers which can be heated to maintain the substrate or outer coating in the liquid phase. When the substrate in the fabric-softening compositions herein is a multi-ply paper, a further method is to separately treat the individual plies of the paper with the substrate coating and adhesively join the treated plies with a known adhesive-joiner compound; the outer coating can then be applied to the paper structure.

The amount of the substrate coating which is used to treat the substrate varies depending upon the substrate. Generally, enough substrate coating is applied to the substrate such that any fibers of the substrate are substantially completely coated; at most, the substrate coating is applied to the substrate in an amount which will completely coat any fibers of the substrate

and completely fill any free space of the substrate, whereby a film of the substrate coating along the surfaces of the substrate is achieved. Substrate characteristics, which affect the amount of substrate coating to be applied to the substrate, are absorbent capacity, thickness, fiber density, and free space.

5 The amount of the substrate coating necessary to achieve the desired level of substrate treatment increases or decreases proportionally with an increase or decrease in the absorbent capacity, thickness, and any free space of the substrate; the amount of substrate coating applied to the substrate increases or decreases inversely proportionally with an increase or decrease in any fiber density. Preferably, the substrate coating is applied to the substrate in an amount sufficient to substantially completely coat any fibers of the substrate and to substantially completely fill any free space among the fibers of the substrate; for example, when a nonwoven cloth having a basis weight of 1.5 to 3 grams per 100 square inches is used as a substrate herein, about 2 to 3 grams of the substrate coating per 100 square inches of the substrate are required to achieve the preferred level of substrate treatment.

In applying the coatings to the substrate, the total amount of the substrate and outer coatings applied to the substrate is in the ratio range of 10:1 to 1:2 by weight of the dry substrate.

25 Preferably, the total amount of the coatings is from about 5:1 to about 1:1, particularly 4:1, by weight of the substrate. Generally, the amount of the total substrate and outer coating ranges from about 0.5 grams to about 40 grams per 100 square inches of the substrate, with small amounts of the coatings being used on lightweight substrates, such as nonwoven cloths, and large amounts on heavy substrates, such as heavy paper.

The following examples will serve to further illustrate the preparation of the fabric-softening compositions of the invention herein:

35 In examples I, II, III, IV, V, and VI, the substrate is a nonwoven cloth designated Stock A. More particularly, Stock A is a dry-laid, nonwoven cloth comprising about 70 percent regenerated cellulose (American Viscose Corporation) and about 30 percent hydrophobic binder-resins (Rhoplex HA-8 on one side of the cloth, Rhoplex HA-16 on the other; Rohm & Haas, Inc.). The cloth has a thickness of about 4 to 5 mills, a basis weight of about 26 grams per square yard, and weighs about 2 grams per 100 square inches. The fibers are about 1/4 inch in length, about 1.5 denier and are oriented substantially haphazardly. The fibers were lubricated with sodium oleate.

40 Stock B is a water-laid nonwoven cloth which has a basis weight of about 18 grams per square yard. The fibers are regenerated cellulose, about 2 inches in length, about 1.5 denier, and are lubricated with a standard textile lubricant. The fibers comprise about 70 percent of the nonwoven cloth by weight. The fibers, which are substantially aligned are bound by HA-8 as the binder-resin, which comprises about 30 percent by weight of the cloth. The cloth weighs about 1.8 grams per 100 square inches.

45 The brightening agent employed in example VI was 4,4'-bis(4-anilino-6-dihydroxyethylamino-s-triazin-2-yl amino)-2,2'-stilbenedisulfonic acid.

The antistatic agent employed in examples I, II, IV, V, VI, and VII is an ethoxylated amine trade-named "J-S Antistat;" the antistatic agent employed in example VIII is an ethoxylated amine trade-named "Scotch Antistat."

55 The trade-named fabric softener used in the examples herein is used as commercially obtained. "Adogen 448" is a substantially solid formulation consisting essentially of, in parts by weight, 75 parts cationic fabric softener (ditallow-dimethylammonium chloride), 18 parts isopropyl alcohol, and 7 parts water.

The paper substrate, used in example VII is a high-density one-ply paper having a basis weight of about 32 pounds per 3,000 square feet and being formed from a mixture of ground-wood and kraft bleached woodpulps.

60 In all examples, the compositions and softening formulations are expressed in parts or percentages by weight unless otherwise noted.

## EXAMPLE I

A nonwoven cloth substrate, Stock A, is wrapped about a hollow, tubular cardboard core, and a rod is passed through the core and held so as to allow the substrate to easily unroll.

A nonionic substrate coating, having a melting point of about 114° F., is prepared by melting 200 grams of substantially solid, waxy, polymer of ethylene glycol (Carbowax 1,540; m.p. about 114° F.) in a container set into a water bath heated to 150° F.

The substrate coating is applied to the substrate by means of a padding machine. This machine, "Atlas Laboratory Wringer" (Model No. LW-391, Type 11W-1) made by Atlas Electrical Devices Company, Chicago, Illinois, is commercially available and is especially adaptable to small scale use. The machine basically comprises two hard rubber rollers mounted so that their surfaces touch (fit flush together). Pressure can be exerted onto the rollers and adjusted by means of weights. A troughlike pan under the rollers is so constructed as to provide guiding members along its length for feeding or leading the substrate into the rollers. The liquefied substrate coating is then placed into the pan, and the pan is heated to about 150° F. to keep the substrate coating in a liquid state. The substrate is unrolled and passed submerged through the substrate coating in the pan. The substrate, traveling at a rate of 5 to 6 feet per minute, is then directed upward and through the turning rollers onto which no weights are exerted and which squeezes off excess substrate coating. The turning rollers continuously pull the substrate through the rollers and, after solidifying (or substantially solidifying) the treated substrate, provides a substrate having its fibers substantially completely coated and its free space substantially completely filled and having about 2 grams of Carbowax 1,540 per 100 square inches of the substrate.

The substrate, containing the solidified substrate coating, is then passed through a pair of transfer rollers which consists essentially of a pair of hard rubber rollers, the bottom roller sitting in a trough which contains the liquified outer coating which is a formulation (m.p. 155° F.) consisting of:

60 percent  $C_{20-22}$  HAPS  
15 percent nonionic antistatic agent  
23.5 percent isopropyl alcohol  
01.5 percent perfume.

As the treated substrate passes through the turning rollers, the outer coating formulation adheres to the bottom roller and is brought into contact with the face down side of the passing substrate, thereby achieving a fabric-softening composition having an outer coating on only one of its sides. After solidifying, the opposite side of the substrate is then passed face down through a second pair of transfer rollers and solidified to achieve a fabric-softening composition having an outer coating on both sides.

This latter composition is substantially solid, stable to decomposition, not "runny" or dripping, and which, although waxy to the touch, does not cause the composition to stock together when folded. The fabric-softening composition has an outer coating of about 6 grams per 100 square inches of substrate. The total amount of inner and outer coatings is about 8 grams per 100 square inches of substrate, and results in a weight ratio of 4:1 by weight of the substrate.

Prior to rerolling, the fabric-softening composition can be perforated at desired uniform lengths, or instead of rerolling, the composition can be cut at desired lengths and packaged as individual sheets.

A 12 inch by 8½-inch sheet of this composition is tested for softening performance in an automatic "Kenmore 800," electric clothes dryer; satisfactory fabric-softening and fabric-softener release are achieved and there is no staining of the fabrics, which are left with a pleasant perfume odor and no static cling.

A similar fabric-softening composition is obtained when Adogen 448 is substituted for the outer coating formulation used above and results in a fabric-softening composition having an outer coating with a melting point of about 140° F.

## EXAMPLE II

Following the procedure in example I and substituting the substantially solid, waxy nonionic TAE<sub>20</sub> (m.p. about 115° F.) for the Carbowax 1,540 therein, a fabric-softening composition is obtained in which the total amount of the coatings is about 8 grams per 100 square inches of substrate, providing about a 4:1 weight ratio by weight of the substrate. This composition contains about 1.65 grams of inner coating and about 6.35 grams of outer coating per 100 square inches of substrate.

A 12 inch by 8½-inch sheet of this composition is tested for softening performance in an automatic clothes dryer and achieves results similar to those achieved in example I.

15 A similar composition can be made by substituting eicosyl-trimethylammonium chloride for the C<sub>20-22</sub> HAPS used in the outer coating above.

## EXAMPLE III

20 The procedures of example I are repeated, substituting the following formulation (m.p. about 155° F.) for the outer coating therein:

48%  $C_{20-22}$  HAPS  
37% Adogen 448  
25 13.5% isopropyl alcohol  
1.5% perfume

by weight 1.3:1  $C_{20-22}$  HAPS  
to Adogen 448 respectively

30 Following the procedures of example I, a fabric-softening composition is prepared having 2 grams of the substrate coating per 100 square inches of substrate and 7.3 grams of the outer coating per 100 square inches of the substrate; the composition has a total substrate and outer coating weight ratio of about 5:1 by weight of the substrate.

35 The fabric-softening composition is tested in an automatic dryer for softening performance. Fabric staining does occur but is significantly less than the fabric staining caused by any of the earlier referenced prior art compositions; it is believed that less staining is observed in the compositions herein (as opposed to prior art compositions) which employ an admixture of fabric softeners in which one of the fabric softeners is a cationic quaternary ammonium compound, because of the 'dilution' effect of the admixture. The treated fabrics, however, exhibit a pleasant perfume odor and no static cling.

40 Similar compositions can be achieved by substituting for the outer coating used above, fabric softener admixtures (m.p. about 120° F.) of Adogen 448 and TAE<sub>20</sub> wherein the Adogen 448 is present in a weight ratio of 3:1 and 2:1 by weight of the TAE<sub>20</sub>.

## EXAMPLE IV

50 The procedures of example II are repeated substituting the following formulation (m.p. about 155° F.) for the outer coating therein:

55 55 percent 3-(N-alkyl-N,N-dimethylammonio)-propane-1-sulfonate\*  
20 percent antistatic agent  
23.5 percent isopropyl alcohol  
1.5 percent perfume \*(wherein the alkyl contains a mixture of from 30 to 22 carbon atoms; this compound is hereinafter designated C<sub>20-22</sub> APS)

60 The fabric-softening composition prepared has a substrate coating of about 2 grams per 100 square inches of substrate and an outer coating of about 5.2 grams per 100 square inches of substrate, providing a total substrate and outer coating weight ratio of about 3.5:1 by weight of the substrate.

65 When this composition is tested for softening performance in an automatic clothes dryer, results similar to that of example I are achieved.

## EXAMPLE V

70 The procedures of example IV are repeated substituting Carbowax 1,540 for the TAE<sub>20</sub>. The resulting fabric-softening composition contains about 2 grams of the substrate coating per 100 square inches of substrate and about 5.9 grams of the

outer coating per 100 square inches of the substrate, thereby providing a total substrate and outer coating weight ratio of about 4:1 by weight of the substrate.

#### EXAMPLE VI

The procedures of example III are repeated substituting the following formulation (m.p. about 155° F.) for the outer coating formulation therein:

- 62 percent C<sub>20-22</sub> HAPS
- 19 percent antistatic agent
- 18 percent isopropyl alcohol
- 0.7 percent perfume
- 0.3 percent optical brightener

The fabric-softening composition prepared contains about 2.7 grams of the substrate coating and about 5.2 grams of the outer coating per 100 square inches of the substrate, thereby resulting in a total substrate and outer coating weight ratio of about 4:1 by weight of the substrate.

This composition is tested in an automatic dryer for softening performance and achieves results similar to that of example I; in addition, examination of the treated fabrics under a fluoroscope reveals excellent dispersion of the optical brightening agent and results in additional fabric-finishing advantages.

#### EXAMPLE VII

Utilizing the procedure of example I, a paper substrate is substituted for the nonwoven Stock A used therein and the following formulation (m.p. about 155° F.) is substituted for the outer coating therein:

- 60 percent C<sub>20-22</sub> HAPS
- 15 percent antistatic agent
- 24 percent isopropyl alcohol
- 1 percent perfume

The fabric-softening composition prepared contains about 4.6 grams of the substrate coating per 100 square inches of the substrate and about 8 grams of the outer coating per 100 square inches of the substrate, thereby providing a total substrate and outer coating weight ratio of about 4:1 by weight of the substrate.

The fabric-softening composition tested for softening performance in an automatic dryer and achieves results similar to that of example I.

#### EXAMPLE VIII

The procedure of example I are repeated, substituting for the substrate, the substrate coating, and the outer coating therein, the following:

1. a water "dissolvable" paper ("Dissolvo Paper");
2. Adogen 448 (m.p. about 140° F.) as the substrate coating; and
3. an outer coating having the following formulation (m.p. about 150° F.):

- 57 percent C<sub>20-22</sub> HAPS
- 22 percent isopropyl alcohol
- 20 percent antistatic agent
- 1 percent perfume

The fabric-softening composition prepared essentially consists of a substrate having a weight of about 3 grams per 100 square inches, a substrate coating of about 1.85 grams per 100 square inches of substrate, and an outer coating of about 1.4 grams per 100 square inches of substrate, thereby providing a total substrate and outer coating weight ratio of about 1:1 by weight of the substrate.

The above procedures are repeated and a fabric-softening composition is obtained which has a substrate of about 3 grams per 100 square inches, a substrate coating of about 2.1 grams per 100 square inches of substrate, and an outer coating of about 2 grams per 100 square inches of substrate, thereby providing a total amount of substrate and outer coatings in a weight ratio of about 1.4:1 by weight of the substrate.

When a 12 inch by 8½-inch sheet of each of the above two compositions is added to the final rinse cycle of an automatic washer, the fabrics loaded therein absorb the substrate and outer coating which disperse into the rinse water, and the substrate dissolves. The fabrics are soft and exhibit no static cling.

Nonwoven cloth Stock B can be substituted for nonwoven cloth Stock A in examples I through VI above to achieve fabric-softening compositions equivalent to those of said examples.

- 10 Similarly, woven cloth (e.g., terry cloth) and multiply absorbent toweling paper toweling paper can be substituted for the nonwoven cloth Stock A of the above examples and, when provided with a substrate and outer coating having a weight ratio within the range of from 2:1 to 1:10 by weight of the woven cloth or multi-ply absorbent paper, provide fabric softening compositions equivalent to those of said examples.
- 15

By repeating the above examples and using a padding machine having tape wrapped about both ends of one roller so

- 20 as to increase the orifice between the rollers, the substrate coating of the above examples can be applied to the substrates in an amount to achieve a substrate having its fibers completely coated and its free space completely filled with the substrate coating, whereby a film of the substrate coating is present on the surfaces of the substrate. Additionally, when a 5 or 10 pound weight is exerted onto the rollers of the padding machine, the orifice between the rollers is decreased, resulting in a substrate having additional amounts of the substrate coating squeezed out and providing a substrate having its fibers substantially completely coated.
- 25

#### EXAMPLE IX

The following fabric-softening compositions are prepared as follows:

- 35 A roll of the substrate is set up so that it can easily unroll.
- 40 The substrate coating is melted or solvent treated and placed into a trough which is heated to maintain the substrate coating in a liquid state. The substrate, at a rate of 5 to 6 feet per minute, is passed submersed through the liquified substrate coating in the trough and then through the squeeze rollers of a padding machine of the type described in example I. The rollers are adjusted to squeeze out excess substrate coating and to provide the substrate with sufficient substrate coating to substantially completely coat the fibers of the substrate and to substantially completely fill the free space of the substrate. The treated substrate is then solidified (i.e., cooled).
- 45

The outer coating is prepared by liquifying (e.g., melting or solvent treating) the fabric softener and is applied to the substrate containing the inner coating by means of transfer rollers, the outer coating being applied to both sides of the treated substrate. The resulting composition is solidified (e.g., by cooling to room temperature or below or by evaporating off a substantial amount of the solvent); when tested for softening performance in an automatic clothes dryer, the fabric-softening composition provides satisfactory fabric softening and exhibits satisfactory fabric softener release.

- 50 In the table below, the substrate employed in Compositions 1-25 and 126-150 is nonwoven cloth Stock A; the substrate utilized in Compositions 26-50 and 151-199 is nonwoven cloth Stock B; Compositions 51 through 75 employ the paper substrates of example VII above; Compositions 76 through 100 use an 8 inch by 10-½-inch woven cloth ("Cannon" terry-cloth washcloth), weighing 22.8 grams, as the substrate; and Compositions 101 through 125 employ, as the substrate, a two-ply toweling paper having a basis weight of about 32 pounds per 3,000 square feet (the weight of 100 square inches of the toweling paper is about 2.8 grams) taught in the aforementioned Wells patent. Except for the woven cloth substrates, the substrates employed in the Compositions are sheets of about 100 square inches in area (about 12 inches × 8-½ inches in dimensions).
- 60
- 65
- 70
- 75

In the table, the ratio of the substrate to the total amount of substrate and outer coatings is by weight, and the substrate

and outer coating amounts are expressed as grams. The melting points of the substrate and outer coatings are all about 75° F. or above; an asterisk (\*) refers to a cationic or nonionic substrate coating or to an outer coating that melts within the range of from about 100° F. to about 170° F. A double-asterisk (\*\*) refers to a cationic or nonionic substrate coating or to an

outer coating which has been admixed with a sufficient amount of isopropyl alcohol or an isopropyl alcohol water mixture to achieve a melting point within the range of from about 100° F. to about 170° F. The term "inner coating" used in the table refers to the substrate coating.

TABLE

Composition	Inner coating (nonionic)	Inner coating (cationic)	Inner coating amount	Outer coating fabric softener	Outer coating amount	Ratio of substrate to inner and outer coatings
1.....	Carbowax 1540*		2	Tallowtrimethyl ammonium chloride...	4	1:3
2.....	Carbowax 1000*		1.5	Tallowdimethyl (3-tallowalkoxypropyl) ammonium chloride.	8	~1:5
3.....	Carbowax 1500*		2	Tallowdimethyl (3-tallowalkoxy-2-hydroxypropyl) ammonium chloride.	10	1:6
4.....	Carbowax 4000*		3	Ditallowdimethyl ammonium chloride...	5	1:4
5.....	Carbowax 6000*		2	Ditallowdimethyl ammonium methyl sulfate.	8.5	~1:5
6.....	Condensation product of 1 mole stearic acid and 20 moles ethylene oxide.*		1	Eicosyltrimethyl ammonium chloride...	3.5	~1:2
7.....	Condensation product of 1 mole stearic acid and 30 moles ethylene oxide.*		4	Dieicosyldimethyl ammonium chloride...	5	1:4.5
8.....	Condensation product of 1 mole palmitic acid and 40 moles ethylene oxide.*		2	Dodecyltrimethyl ammonium chloride...	6	1:4
9.....	Condensation product of 1 mole myristic acid and 35 moles ethylene oxide.		1.8	Didodecyldimethyl ammonium chloride**	4.3	1:2.5
10.....	Condensation product of one mole oleic acid and 45 moles ethylene oxide.		2	Tetradecyltrimethyl ammonium chloride**.	3.7	1:2.0
11.....	Condensation product of one mole palmitic acid and 20 moles ethylene oxide.*		2.3	Ditetradecyltrimethyl ammonium chloride.	8.5	1:4.4
12.....	Condensation product of one mole stearic acid and 50 moles ethylene oxide.*		1.5	Pentadecyltrimethyl ammonium chloride.	3.5	1:2.5
13.....	Condensation product of one mole tallow alcohol and 10 moles of ethylene oxide.*		2	Dipentadecyltrimethyl ammonium chloride.	6.7	1:4.3
14.....	Condensation product of one mole eicosyl alcohol and 50 moles ethylene oxide.		2	Didodecylidethyl ammonium chloride**.	5.4	1:3.7
15.....	Condensation product of one mole lauryl alcohol and 35 moles of ethylene oxide.*		1.5	Didodecylpropyl ammonium chloride.	4	1:2.7
16.....	Condensation product of one mole coconut fatty acid and 35 moles of ethylene oxide.		2	Ditetradecylidethyl ammonium chloride**.	6	1:4
17.....	Condensation product of one mole stearic acid and 25 moles ethylene oxide.*		2	Ditetradecylpropyl ammonium chloride.	8	1:5
18.....	Condensation product of one mole stearic acid and 30 moles ethylene oxide.*		1.7	Ditallowdiethyl ammonium chloride...	7	~1:4.4
19.....	Condensation product of one mole stearic acid and 40 moles ethylene oxide.*		2	Ditallowdipropyl ammonium chloride...	10	1:6
20.....	Condensation product of one mole stearic acid and 45 moles ethylene oxide.*		2.3	Tallowdimethyl benzyl ammonium chloride.	8.8	1:5.5
21.....	Carbowax 4000*		1.9	Tallowdiethyl benzyl ammonium chloride.	6.7	1:4.3
22.....	Condensation product of one mole stearic acid and 50 moles ethylene oxide.*		1.9	Dodecyltrimethyl ammonium methyl sulfate.	8.7	1:5.3
23.....	Condensation product of one mole tallow fatty acid and 60 moles ethylene oxide.*		2.2	Didodecylidethyl ammonium acetate...	9	1:5.6
24.....	Condensation product of one mole palmitic acid and 35 moles ethylene oxide.*		2.1	Tallowtrimethyl ammonium acetate...	12	1:7
25.....	Condensation product of one mole palmitic acid and 33 moles of ethylene oxide.*		2	Tallowdimethyl benzyl ammonium nitrite	5.6	1:3.8
26.....	Condensation product of one mole palmitic acid and 25 moles ethylene oxide.*		1.7	Ditallowdipropyl ammonium	6	1:4.3
27.....	Condensation product of one mole palmitic acid and 30 moles ethylene oxide.*		2	3-(n-eicosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	7	1:5
28.....	Carbowax 1540*		1.5	3-(N-eicosyl-N,N-dimethylammonio)-propane-1-sulfonate.	9	~1:6
29.....		Ditallowdimethyl ammonium chloride**	1.8	3-[N-eicosyl-N,N-di(2-hydroxyethyl)ammonio]2-hydroxypropane-1-sulfonate.	12	1:7.6
30.....	TAE <sub>20</sub> *		2	3-(N-docosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	9.9	1:6.6
31.....	Condensation product of one mole lauryl alcohol and 50 moles ethylene oxide.*		1.3	3-(N-docosyl-N,N-dimethylammonio)-propane-1-sulfonate.	16	1:9.6
32.....	Condensation product of 1 mole lauryl alcohol and 40 moles ethylene oxide.*		2	3-[N-docosyl-N,N-bis(2-hydroxyethyl)ammonio]2-hydroxypropane-1-sulfonate.	6	1:4.4
33.....	TAE <sub>20</sub> *		1.6	3-(N-tetracosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	13	1:8.1
34.....	Condensation product of 1 mole lauryl alcohol and 25 moles ethylene oxide.*		2.2	3-(N-tetracosyl-N,N-dimethylammonio)-propane-1-sulfonate.	9.2	1:6.3

Table - Continued

Compo- sition	Inner coating (nonionic)	Inner coating (cationic)	Inner coating amount	Outer coating fabric softener	Outer coating amount	Ratio of substrate to inner and outer coatings
35.....	Condensation product of 1 mole lauryl alcohol and 20 moles ethylene oxide.*		1.4	3-[N-tetracosyl-N,N-bis-(2-hydroxyethyl)ammonio]-2-hydroxypropane-1-sulfonate.	9	~1:6
36.....	Carbowax 1000*		1.8	3-(N-hexacosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	6	1:4.3
37.....	Condensation product of 1 mole lauryl alcohol and 29 moles ethylene oxide.*		1.8	3-(N-hexacosyl-N,N-dimethylammonio)-propane-1-sulfonate.	6	1:4.3
38.....		Ditallowdimethyl ammonium chloride.**	2.1	3-(N-eicosyl-N-ethyl-N-methylammonio)-2-hydroxypropane-1-sulfonate.	8	1:5.6
39.....	Condensation product of one mole myristyl alcohol and 30 moles ethylene oxide.		1.8	3-(N-docosyl-N-ethyl-N-methylammonio)-2-hydroxypropane-1-sulfonate.**	7.2	1:5
40.....	Condensation product of 1 mole oleyl alcohol and 40 moles ethylene oxide.*		2.2	3-(N-tetracosyl-N-ethyl-N-methylammonio)-2-hydroxypropane-1-sulfonate.	9	1:6.2
41.....	Condensation product of 1 mole stearyl alcohol and 10 moles ethylene oxide.*		1.7	3-(N-heneicosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	12	1:7.6
42.....	Condensation product of 1 mole stearyl alcohol and 40 moles ethylene oxide.*		2.1	3-(N-tricosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	8.7	1:4.9
43.....		Tallowdimethyl (3-tallowalkoxy-propyl) ammonium chloride.**	1.7	3-(N-tricosyl-N-ethyl-N-methylammonio)-2-hydroxypropane-1-sulfonate.	6.7	1:4.7
44.....		Tallowdimethyl (3-tallowalkoxy-2-hydroxypropyl) ammonium chloride.**	2	3-(N-tricosyl-N,N-dimethylammonio)-propane-1-sulfonate.	7	1:5
45.....	Condensation product of 1 mole tallow alcohol and 25 moles ethylene oxide.*		1.8	3-(N-pentacosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	8.4	1:5.7
46.....	Condensation product of 1 mole stearyl alcohol and 47 moles ethylene oxide.*		1.8	3-[N-(2-methoxydocosyl)-N,N-dimethylammonio]-2-hydroxypropane-1-sulfonate.	7.2	1:5
47.....	Carbowax 6000 *		1.3	3-(N-heptacosyl-N,N-dimethylammonio)-propane-1-sulfonate.	6	1:4
48.....	Condensation product of 1 mole tallow alcohol and 40 moles ethylene oxide.*		2	3-(N-octacosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	6.7	1:4.8
49.....	Condensation product of 1 mole tallow alcohol and 35 moles ethylene oxide.*		1.6	3-(N-nonacosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	5.4	1:3.9
50.....	Condensation product of 1 mole tallow alcohol and 15 moles ethylene oxide.*		1.6	3-(N-triacontyl-N,N-dimethylammonio)-propane-1-sulfonate.	8.1	1:5.4
51.....	TA E <sub>20</sub> *		1.4	3-[N-(3,5-dioxatetacosyl)-N,N-dimethylammonio]-2-hydroxypropane-1-sulfonate.	6	1:2.5
52.....	Carbowax 1540 *		2	Eicosyldimethylphosphine oxide.	8.1	1:3.4
53.....	Condensation product of 1 mole cetyl alcohol and 40 moles ethylene oxide.*		1.8	Eicosyldi(2-hydroxyethyl)phosphine oxide.	6.4	1:2.7
54.....		Ditallowdimethyl ammonium chloride.**	2.4	Docosyldimethylphosphine oxide.	6.7	1:3
55.....	Condensation product of 1 mole cetyl alcohol and 10 moles ethylene oxide.*		1.4	Docosyldi(2-hydroxyethyl)phosphine oxide.	8	1:3.1
56.....	Condensation product of 1 mole coconut alcohol and 45 moles ethylene oxide.		1.7	Tetracosyldimethylphosphine oxide**...	6.4	1:2.7
57.....		Ditallowdimethyl ammonium sulfate.**	2	Hexacosyldimethylphosphine oxide.	4.8	1:2.3
58.....	Condensation product of 1 mole of lauric acid and 50 moles ethylene oxide.*		1.9	Eicosyldiethylphosphine oxide.	5.6	1:2.5
59.....	Condensation product of 1 mole lauric acid and 20 moles of ethylene oxide.*		1.9	Docosyldiethylphosphine oxide.	7.8	1:3.2
60.....	Condensation product of 1 mole lauric acid and 30 moles ethylene oxide.*		2.6	Tetracosyldi(2-hydroxyethyl)phosphine oxide.	9	1:3.9
61.....	TA E <sub>30</sub> *		3	Eicosyldiethylphosphine oxide.	8	1:3.7
62.....	Carbowax 1540*		2.1	Heneicosyldiethylphosphine oxide.	5.3	1:2.5
63.....		Ditallowdimethyl ammonium chloride.**	2.7	$\beta$ -Hydroxyeicosyldimethylphosphine oxide.	6.7	1:3.1
64.....	Condensation product of 1 mole lauric acid and 35 moles ethylene oxide.		1.9	$\beta$ -Hydroxydocosyldimethylphosphine oxide**.	6	1:2.6
65.....	Condensation product of 1 mole lauric acid and 25 moles ethylene oxide.		1.4	Heneicosyldiethylphosphine oxide**.	7.6	1:3
66.....	TA E <sub>20</sub> *		2.5	Docosyldiethylphosphine oxide.	9.7	1:4.1
67.....	Condensation product of 1 mole myristic acid and 50 moles ethylene oxide.		2.5	Tricosyldiethylphosphine oxide.	9	1:3.8
68.....	Condensation product of 1 mole myristic acid and 20 moles ethylene oxide.		3	Tricosyldimethylphosphine oxide**.	8	1:3.6
69.....	Condensation product of 1 mole tetraicosyl alcohol and 50 moles ethylene oxide.		2.2	Tetracosyldi(2-hydroxyethyl) phosphine oxide**.	6.9	1:3
70.....	Condensation product of 1 mole tetraicosyl alcohol and 10 moles ethylene oxide*.		1.9	Pentacosyldimethylphosphine oxide.	9.9	1:3.9
71.....	Condensation product of 1 mole tetraicosyl alcohol and 35 moles ethylene oxide*.		2.2	Eicosyldiethylphosphine oxide.	7	1:3
72.....	Condensation product of eicosyl alcohol and 50 moles ethylene oxide*.		2.9	Eicosyldiethylphosphine oxide.	8.3	1:3.7
73.....	Condensation product of eicosyl alcohol and 10 moles ethylene oxide*.		2.6	Docosyldimethyl-3-hydroxybutylphosphine oxide.	6.9	1:3.2
74.....	Condensation product of 1 mole eicosyl alcohol and 30 moles ethylene oxide*.		2.1	Hexacosyldiethylphosphine oxide.	7.1	1:3.1
75.....	TA E <sub>20</sub> *		2.7	Heptacosyldimethylphosphine oxide.	8.9	1:3.9
76.....	TA E <sub>20</sub> *		30	Octacosyldiethylphosphine oxide.	67	1:4.2
77.....	Carbowax 1540*		33	Triacentyldimethylphosphine oxide.	79	~1:5

Table - Continued

Composition	Inner coating (nonionic)	Inner coating (cationic)	Inner coating amount	Outer coating fabric softener	Outer coating amount	Ratio of substrate to inner and outer coatings
78		Ditallowdimethyl ammonium chloride**.	54	Eicosyl-bis-( $\beta$ -hydroxyethyl) amine oxide.	115	1:7.4
79	Condensation product of 1 mole myristic alcohol and 50 moles ethylene oxide.		28	Eicosyldimethylamine oxide**	70	1:4.3
80	Condensation product of 1 mole myristic alcohol and 10 moles ethylene oxide.		40	Docosyldimethylamine oxide**	101	1:6.2
81	Carbowax 6000*		21	Docosyl-bis-( $\beta$ -hydroxyethyl)amine oxide.	54	1:3.3
82	Condensation product of 1 mole lauryl alcohol and 50 moles ethylene oxide.		27	Tetracosyldimethylamine oxide**	54	1:3.6
83		Tallowdimethyl (3-tallowalkoxy-2-hydroxypropyl) ammonium chloride**.	20	Tetracosyl-bis-( $\beta$ -hydroxyethyl)amine oxide.	68	1:3.9
84	Condensation product of tallow alcohol and 40 moles ethylene oxide*.		35	Hexacosyldimethylamine oxide	94	1:5.7
85	Propyl amide*		22	Hexacosyl-bis-( $\beta$ -hydroxyethyl)amine oxide.	44	1:2.9
86	Beef marrow wax*		22	2-hydroxyeicosyldimethylamine oxide	70	1:4
87	Beef tallow wax*		43	Eicosylmethylethylamine oxide.	91	1:5.9
88	Beeswax*		31	Eicosyldiethylamine oxide.	81	1:5
89		Ditallowdimethyl ammonium chloride**.	18	2-hydroxyeicosyldiethylamine oxide.	31	1:2.1
90	Candelilla wax*		25	Heneicosyldimethylamine oxide	30	1:3.2
91	Chinese vegetable tallow*		19	Heneicosyldiethylamine oxide	62	1:3.5
92	Horse fat*		21	Docosyldiethylamine oxide	51	1:3.4
93	Japan wax*		33	Tricosyldimethylamine oxide	74	1:4.7
94	Myrtle wax*		20	Tricosyldiethylamine oxide	50	1:3.1
95	Palm wax*		39	Tetracosyldiethylamine oxide	81	1:5.3
96	Wool fat*		16	$\beta$ -Hydroxytetraicosyldimethylamine oxide.	46	1:2.7
97	Butter fat*		16	Pentacosyldimethylamine oxide	50	1:2.9
98	Chicken fat*		20	Hexacosyldiethylamine oxide	51	1:3.1
99	Fatty tissue lard oil*		30	Eicosylmethyl (2-hydroxypropyl)amine oxide.	60	1:3.9
100	1-monostearin*		25	Docosylbutyldimethylamine oxide	38	1:2.8
101	Condensation product of 1 mole decyl phenol and 40 moles ethylene oxide.		4	2-docosyldimethylamine oxide**	10	1:5
102	Condensation product of 1 mole decyl phenol and 25 moles ethylene oxide.		2.8	2-methoxydocosyldimethylamine oxide**	5.6	1:3
103	Condensation product of 1 mole octyl phenol and 50 moles ethylene oxide.		3	Heptacosyldimethylamine oxide**	7	1:3.6
104	Condensation product of 1 mole octyl phenol and 25 moles ethylene oxide.		1.9	Octacosylmethylethylamine oxide**	9	1:3.9
105	Condensation product of 1 mole dodecyl phenol and 35 moles ethylene oxide.		2.5	Octacosyldiethylamine oxide**	11	1:4.8
106		Ditallowdimethyl ammonium sulfate**.	3	Nonacosyldimethylamine oxide	8	1:3.9
107	TAE <sub>20</sub> *		2.8	Triacentyldiethylamine oxide	6	1:3.1
108	Condensation product of 1 mole tetradecyl phenol and 35 moles ethylene oxide.		2.8	3,6-dioxaoctacosyldimethylamine oxide**	6	1:3.1
109	Condensation product of 1 mole hexadecyl phenol and 30 moles ethylene oxide.		3.2	2-hydroxy-4-oxatetraacosyldimethylamine oxide**	5.4	1:3.9
110	Condensation product of 1 mole of octadecyl phenol and 50 moles ethylene oxide.		3	6-stearamidoxyldimethylamine oxide**	7.9	1:3.9
111	Condensation product of 1 mole of octadecyl phenol and 25 moles ethylene oxide.		4.5	Hexacosyldiethylamine oxide**	6.3	1:3.9
112	Carbowax 1540*		5	Eicosylmethyl (2-hydroxypropyl)amine oxide.	11	1:5.9
113		{TAE <sub>20</sub> , 30%*} {Adogen 448, 70%*}	4	Docosylbutyldimethylamine oxide	8	1:4.3
114	Hexadecanal*	{Adogen 448, 40%*}	3	2-docosyldimethylamine oxide	6	1:3.2
115		{TAE <sub>20</sub> , 60%*}	2.8	2-methoxydocosyldimethylamine oxide	7	1:3.5
116	1,3-distearin*		3	Heptacosyldimethylamine oxide	8.4	1:4.1
117	Glyceryl monolaurate*		2	Octacosylmethylethylamine oxide	6.9	1:3.2
118	1,3-dicaprin*		4	Octacosyldiethylamine oxide**	6.9	1:3.9
119	1-monocaprin*		3	Nonacosyldimethylamine oxide	10.1	1:4.7
120	1-monoarachidin*		2	Triacetyldiethylamine oxide	8	1:3.6
121	1-monopalmitin*		3	3,6-dioxaoctacosyldimethylamine oxide	8	1:3.9
122	1-dimyristin		4.2	2-hydroxy-4-oxatetraacosyldimethylamine oxide**	7.9	1:4.3
123	1,3-distearin		3.4	6-stearamidoxyldimethylamine oxide**	7.4	1:4.2
124	Dodecanal *		2.4	C <sub>26-22</sub> HAPS	8	1:3.7
125		Hexadecyldimethyl benzyl ammonium chloride.	2.3	Tallowdimethyl (3-tallow) alkoxy-2-hydroxypropyl ammonium chloride,**	9.3	1:4.1
126	Carbowax 1000 *		3	C <sub>26-22</sub> APS	6.7	1:4.9
127		Ditallow dimethyl ammonium chloride.**	3	Condensation product of 3 moles ethylene oxide plus 1 mole of heneicosyl alcohol.	7.2	1:5.1
128		Tallowdimethyl (3-tallowalkoxy-propyl) ammonium chloride.**	2.4	Condensation product of 9 moles ethylene oxide plus 1 mole eicosyl alcohol.	8.1	1:5.3
129		Hexadecyldimethyl ammonium chloride.**	3.4	Condensation product of 12 moles ethylene oxide plus 1 mole hexacosyl alcohol.	8.4	1:5.9
130	TAE <sub>20</sub> *		2.7	Condensation product of 15 moles ethylene oxide plus 1 mole tetracosyl alcohol.	6.6	1:4.7

Table - Continued

Composition	Inner coating (nonionic)	Inner coating (cationic)	Inner coating amount	Outer coating fabric softener	Outer coating amount	Ratio of substrate to inner and outer coatings
131	Carbowax 1540*		2.1	Condensation product of 20 moles of ethylene oxide plus 1 mole pentacosyl alcohol.	7.9	1:5
132	Pentyl analide		2	Condensation product of 30 moles of ethylene oxide plus 1 mole tricosyl alcohol.**	8.1	1:5.1
133	Carbowax 6000*		1.8	Condensation product of 5 moles of ethylene oxide plus 1 mole of nonacosyl alcohol.	7.9	1:4.8
134	Oleamide		1.3	Condensation product of 6 moles of ethylene oxide and 1 mole of heptacosyl alcohol.**	8.9	1:5.1
135	N-isobutyl amide of pelargonic acid		1.7	Condensation product of 9 moles of ethylene oxide plus 1 mole of octacosyl alcohol.**	7.3	1:4.5
136	N-isobutyl amide of capric acid		2.1	Condensation product of 20 moles of ethylene oxide plus 1 mole of heptacosyl alcohol.**	8.1	1:5.1
137	N-isobutyl amide of undecanoic acid		1.8	Condensation product of 30 moles ethylene oxide plus 1 mole elicosyl alcohol.**	6.9	1:4.4
138	N-isobutyl amide of lauric acid		2.4	Condensation product of 20 moles of ethylene oxide plus 1 mole hexacosyl alcohol.**	8.7	1:5.6
139	N-cyclopentylauramide		2.4	Condensation product of 30 moles of ethylene oxide plus 1 mole of triacontyl alcohol.**	5.6	1:4
140	N-cyclopentyl stearamide		3	Condensation product of 40 moles of ethylene oxide plus 1 mole of nonacosyl alcohol.**	5.4	1:4.2
141	TAE <sub>20</sub> *		2.8	Sulfated condensation product of 1 mole of ethylene oxide plus 1 mole of tetraicosyl alcohol.	6.3	1:4.6
142	N-methyl pentadecylamide		2	Sulfated condensation product of 3 moles ethylene oxide plus 1 mole of hexacosyl alcohol.**	6	1:4
143	N-methyl decylamide		2.1	Sulfated condensation product of 9 moles of ethylene oxide plus 1 mole of tricosyl alcohol.**	5.7	1:3.9
144	N-methyl dodecylamide		2.4	Sulfated condensation product of 12 moles of ethylene oxide plus 1 mole of elicosyl alcohol.**	6.9	1:4.7
145	N-methyl tetradecylamide		1.7	Sulfated condensation product of 16 moles of ethylene oxide plus 1 mole of pentacosyl alcohol.**	6	1:3.9
146	Dodecyl anilide		2	Sulfated condensation product of 20 moles of ethylene oxide plus 1 mole of hexacosyl alcohol.**	5.4	1:3.7
147		Ditallowdimethylammonium chloride.**	2.3	Sodium or potassium 2-acetoxydocosylsulfonate.	6.7	1:4.5
148	Decyl anilide		2.3	Ammonium 2-acetoxydocosylsulfonate**.	4.1	1:3.2
149	Octyl anilide		1.8	Diethanolammonium 2-acetoxydocosylsulfonate.**	6	1:3.9
150	TAE <sub>10</sub> *		2.1	Sodium or potassium 2-acetoxytricosylsulfonate.	7.7	1:4.9
151	TAE <sub>20</sub> *		1.5	Sodium or potassium 2-acetoxytetracosylsulfonate.	7	1:4.7
152	Carbowax 4000*		1.3	Sodium or potassium 2-acetoxypentacosylsulfonate.	8	1:5.1
153	N-(2-hydroxyethyl)decylamide		1.7	Sodium or potassium 2-acetoxyhexacosylsulfonate.**	6.7	1:4.7
154	N-(2-hydroxyethyl)octylamide		2	Sodium or potassium 2-acetoxyheptacosylsulfonate.**	5.4	1:4.1
155	N-(2-hydroxyethyl)hexylamide		2.4	Sodium or potassium 2-acetoxyoctacosylsulfonate.**	6	1:4.7
156		Tallowdimethyl(3-tallowalkoxy-2-hydroxypropyl)ammonium chloride.**	2	2-acetoxynonacosylsulfonate. ....	8	1:5.6
157		Tallowdimethyl(3-tallowalkoxypropyl)ammonium chloride.**	2.4	2-acetoxytriacontylsulfonate. ....	6.3	1:4.8
158	Condensation product of 1 mole stearyl alcohol and 35 moles ethylene oxide.*		2.1	2-acetoxyheneitriacontylsulfonate. ....	7.4	1:5.3
159	TAE <sub>30</sub> *		1.4	2-acetoxydotriacontylsulfonate. ....	6.4	1:4.3
160	TAE <sub>30</sub> *		2.8	Sodium or potassium 2-acetoxydocosylsulfonate.	8.1	1:6.1
161		Ditallowdimethylammonium chloride, 65%; tallowdimethyl phosphine oxide, 35%.	1.8	Ditallowdimethyl ammonium chloride, 65%; tallowdimethyl phosphine oxide, 35%.	7	1:4.9
162	Carbowax 1540*	Ditallowdimethylammonium chloride.**	2	Eicosyltrimethyl ammonium chloride, 30%; hexacosyldimethyl amine oxide, 70%.	6.6	1:4.8
163	TAE <sub>20</sub> *		2	Eicosyltrimethyl ammonium chloride, 60%; TAE <sub>30</sub> , 40%.	7	1:5
164		Ditallowdimethylammonium chloride.**	1.8	Ditallowdimethyl ammonium chloride, 45%; 3(N-tallow-N, N-dimethylammonio)-2-hydroxypropane-1-sulfonate, 55%.	6.2	1:4.4
165	C <sub>20</sub> -C <sub>22</sub> alkyldimethyl amine oxide**		2	Ditallowdimethyl ammonium chloride, 60%; eicosyltrimethylamine oxide, 40%.	7.4	1:5.2
166	Carbowax 1000*		1.4	Ditallowdimethyl ammonium chloride, 75%; C <sub>20</sub> -2, HAPS, 25%.	7.9	1:5.2
167	Condensation product of 1 mole of tallow alcohol and 40 moles of ethylene oxide.*		2.1	Eicosyltrimethyl ammonium chloride, 50%; 3-(N-docosyl-N-ethyl-N-methylammonio)-2-hydroxypropane-1-sulfonate, 50%.	7.9	1:5.6

Table - Continued

Composition	Inner coating (nonionic)	Inner coating (cationic)	Inner coating amount	Outer coating fabric softener	Outer coating amount	Ratio of substrate to inner and outer coatings
168.....	TAE <sub>20</sub> *			1. 1 Sulfated condensation product of 9 moles of ethylene oxide plus 1 mole of eicosyl alcohol, 50%; condensation product of 9 moles of ethylene oxide plus 1 mole eicosyl alcohol, 50%.	6.1	1:4
169.....	TAE <sub>20</sub> *			1. 9 Sodium 2-acetoxydocosylsulfonate, 40%; TAE <sub>20</sub> , 60%.	4.1	1:3.3
170.....	Condensation product of 1 mole of stearic acid and 50 moles ethylene oxide.*			2 Sodium 2-acetoxydocosylsulfonate, 60%; tetracosyldimethylphosphine oxide, 40%.	8	1:5.6
171.....		Tallowdimethyl(3-tallowalkoxy-propyl) ammonium chloride.**		1. 5 Diethanolammonium 2-acetoxydocosylsulfonate, 75%; dodecyldimethylamine oxide, 25%.	65	1:4.4
172.....	Carbowax 1540*			1. 8 Dodecylbenzenesulfonate, 45%; TAE <sub>30</sub> , 55%.	9.3	1:6.2
173.....	Condensation product of 1 mole lauryl alcohol and 20 moles ethylene oxide.*			1. 7 3-(N-eicosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, 70%; condensation product of 30 moles of ethylene oxide plus 1 mole tricosylalcohol, 30%.	8.7	1:5.8
174.....	Carbowax 6000*			2 3-(N-docosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, 65%; TAE <sub>30</sub> , 35%.	4	1:3.3
175.....	C <sub>20-22</sub> alkylidimethylamine oxide**			2. 1 3-(N-tetracosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, 75%; tallowdimethylamine oxide, 25%.	6.9	1:5
176.....	Palmitic acid*			1. 5 C <sub>20-22</sub> HAPS.	5.3	1:3.8
177.....	Lauric acid			2 C <sub>20-22</sub> HAPS**	4.9	1:3.8
178.....	Myristic acid*			1. 5 C <sub>20-22</sub> APS	6.1	1:4.2
179.....	Stearic acid*			1. 6 Tallowdimethyl(3-tallowalkoxy-2-hydroxypropane) ammonium chloride.	8.3	1:5.5
180.....	Arachidic acid*			1. 9 Ditalowdimethylammonium chloride..	7.1	1:
181.....	Nonadecyl acid*			1. 4 TAE <sub>30</sub>	6.7	1:4.5
182.....	Eicosyl alcohol*			2. 2 Eicosyldimethylamine oxide	4.7	1:3.8
183.....	Heneicosyl alcohol*			1. 8 TAE <sub>20</sub>	6	1:3.8
184.....	Heptadecyl alcohol*			1. 8 Tallowtrimethyl ammonium chloride	6.2	1:4.4
185.....	Docosyl alcohol*			1. 5 C <sub>20-22</sub> HAPS	7.8	1:5.2
186.....	Tridecyclic acid*			1. 8 3-(N-docosyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate.	7.2	1:5
187.....	Pentadecyclic acid*			2 Eicosyldimethylphosphine oxide.	6	1:4.4
188.....	Oleic acid			1. 4 Ditalowdimethylammonium chloride.**	7	1:4.7
189.....	Octadecyl alcohol*			1. 3 C <sub>20-22</sub> HAPS	7	1:4.7
190.....	Cetyl alcohol			2 C <sub>20-22</sub> APS**	6.3	1:4.6
191.....	Heptadecanoic acid*			1. 8 Condensation product of 1 mole of eicosyl alcohol with 30 moles of ethylene oxide.	5.4	1:4
192.....	Heneicosanoic acid*			2 Condensation product of 1 mole of hexacosyl alcohol with 20 moles ethylene oxide.	7.2	1:5.1
193.....	Melissic acid			1. 7 C <sub>20-22</sub> HAPS**	7.3	1:5
194.....	1-triacontanol			1. 6 TAE <sub>30</sub> *	6.1	1:4.3
195.....	Behenic acid			1. 5 Tallowdimethyl(3-tallow alkoxo-2-hydroxypropane) ammonium chloride.**	7.1	1:4.8
196.....	Lignoceric acid			1. 6 C <sub>20-22</sub> APS**	6	1:4.2
197.....	Hyenic acid			2 TAE <sub>20</sub> *	7	1:5
198.....	Cerotic acid			1. 8 TAE <sub>30</sub> *	6	1:4.3
199.....	Ceryl alcohol			1. 7 Condensation product of 1 mole of tallow alcohol with 40 moles of ethylene oxide.*	5.2	1:3.8

The compositions herein can additionally be used in a variety of other ways. For example, the sheet or length of a composition herein can be used to manually wipe off fabrics which are prone to exhibit static electricity (e.g., the polymeric vinyl fabrics used generally in automobile upholstery and cushions and in simulated leather coats or other wearing apparel); the composition can be used as it is formulated or can first be moistened with ordinary tap water (i.e., from a faucet) before wiping, and this method is generally suitable for other synthetic fabrics, such as is often found on furniture. After wiping with the compositions herein, it is desirable to wipe off the upholstery or other substance treated with a dry, ordinary wiping cloth, rag, or the like to remove excess or undried fabric softening left on the upholstery.

Moreover, compositions herein can be used in a dryer for the purpose of imparting antistatic properties to such items as socks, ladies stockings, sweaters and other items made of synthetic fabrics. When so used, it is not necessary that the clothes be first wetted; thus, the garments can be treated without the 'tuffing' or 'balling-up' of the fabric fibers that often occurs when such fabrics are wetted.

Further, the fabric softeners (especially the cationic quaternary ammonium compounds and the nonionics, anionics, and Zwitterionics of C<sub>10</sub> to C<sub>26</sub> alkyl range) used in the compositions herein exhibit surfactant properties which make the compositions herein very useful, for example, in cleaning

metallic surfaces and leather in wearing apparel, shoes and other objects. For this purpose the composition is preferably wetted before application and the cleansed surface or leather wiped dry.

All of the above examples are intended to illustrate particular embodiments of the invention herein, and it is understood that they do not limit said invention. Further, other embodiments within the scope of the invention herein will be obvious to those skilled in the art.

Having particularly described the invention in detail, what I now claim is:

1. A fabric-softening composition consisting essentially of:
  - a paper, woven clot, or nonwoven cloth substrate;
  - a substantially solid, waxy substrate coating, which consists essentially of a substantially solid, waxy, cationic or nonionic material; and
  - a substantially solid outer coating in contact with the substrate coating, which comprises from about 30 to 100 percent by weight of a fabric softener;
2. Wherein said fabric softener is a compound or an admixture of two or more compounds having a different composition than the substrate coating material; wherein at least one of the substrate and outer coatings has a melting point of no more than about 170° F.; and, wherein the weight ratio of the substrate to the total amount of the substrate coating and outer coating ranges from 2:1 to 1:10.

2. The composition of claim 1 wherein the substrate is paper.

3. The composition of claim 2 wherein the substrate is a one-ply paper having a basis weight of about 32 pounds per 3,000 square feet.

4. The composition of claim 1 wherein the substrate is a nonwoven cloth.

5. The composition of claim 4 wherein the nonwoven cloth is a water-laid or dry-laid nonwoven cloth and consists essentially of lubricated cellulosic fibers, said fibers having a length of from about 3/16 inch to about 2 inches and a denier of from about 1.5 to about 5 and being partially oriented haphazardly, adhesively bonded together with binder-resin which is at least substantially hydrophobic, wherein said fiber and said binder-resin respectively constitute about 70 percent and about 30 percent by weight of the nonwoven cloth, said cloth having a basis weight of from about 18 to about 30 grams per square yard.

6. The composition of claim 5 wherein the nonwoven cloth is dry-laid and the fibers are regenerated cellulose which are about  $\frac{1}{4}$  inch in length with a denier of about 1.5 and are adhesively bonded together with a nonionic self-crosslinking acrylic polymer, said nonwoven cloth having a basis weight of about 26 grams per square yard.

7. The composition of claim 1 wherein the substrate coating consists essentially of a substantially solid, waxy nonionic material.

8. The composition of claim 7 wherein the nonionic material is selected from the group consisting of:

- polymers of polyethylene glycol having an average molecular weight of from about 950 to about 7,500;
- the condensation product of 1 mole of an aliphatic alcohol having from about 10 to about 24 carbon atoms with from about 10 to about 40 moles of ethylene oxide;
- the condensation product of 1 mole of an aliphatic carboxylic acid having from about 10 to about 18 carbon atoms with from about 20 to about 50 moles of ethylene oxide;
- aliphatic carboxylic acids having from about 12 to about 30 carbon atoms;
- aliphatic alcohols having from about 16 to about 30 carbon atoms;
- the condensation product of 1 mole of an alkyl phenol, wherein the alkyl chain has from about eight to about 18 carbon atoms, with from about 25 to about 50 moles of ethylene oxide;
- glycerides, selected from the group consisting of monoglycerides, diglycerides, and mixtures thereof;
- amides, selected from the group consisting of:
  - propyl amide,
  - N-methyl amides having an acyl chain length of from about 10 to about 15 carbon atoms,
  - oleamide,
  - amides of ricinoleic acid,
  - N-isobutyl amides of pelargonic, capric, undecanoic, or lauric acids,
  - N-(2-hydroxyethyl) amides having a carbon chain length of from about six to about 10 carbon atoms,
  - pentyl anilide,
  - anilides having a carbon chain length of from about seven to about 12 carbon atoms, and
  - N-cyclo pentyl lauramide and N-cyclopentyl-stearamide; and,
- the condensation product of 1 mole of a primary or secondary amine having at least about 12 carbon atoms with from 1 to about 100 moles of ethylene oxide.

9. The composition of claim 1 wherein the substrate coating consists essentially of a substantially solid, waxy cationic material.

10. The composition of claim 9 wherein the cationic material is ditallowdimethylammonium chloride.

11. The composition of claim 1 wherein the substrate coating has a melting point within the range of from about 75° F. to about 170° F.

12. The composition of claim 11 wherein the substrate coating has a melting point within the range of from about 100° F. to about 170° F.

13. The composition of claim 12 wherein the substrate coating has a melting point within the range of from about 100° F. to about 140° F.

14. The composition of claim 12 wherein the substrate coating substantially completely coats the fibers of the substrate and substantially completely fills the free space of said substrate.

15. The composition of claim 1 wherein the fabric softener is selected from the group consisting of:

- quaternary ammonium and imidazolium salts;
- Zwitterionic quaternary ammonium compounds;
- amphoteric tertiary ammonium compounds;
- anionic soaps;
- alkyl sulfates;
- alkyl sulfonates;
- alkyl benzene sulfates;
- alkyl benzene sulfonates;
- ethoxylated alcohol sulfates;
- alkyl glyceryl ether sulfonates;
- nonionic tertiary amine oxides;
- tertiary phosphine oxides;
- ethoxylated alcohols;
- ethoxylated alkyl phenols;
- ethoxylated amines; and
- compatible mixtures thereof.

16. The composition of claim 15 wherein the fabric softener is selected from the group consisting of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate and 3-(N-alkyl-N,N-dimethylammonio)-propane-1-sulfonate, wherein the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms.

17. The composition of claim 15 wherein the fabric softener is an admixture of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, wherein the alkyl is a mixture of alkyl groups having from 20 to 22 carbon atoms, and ditallowdimethylammonium chloride.

18. The composition of claim 15 wherein the outer coating has a melting point of not more than about 170° F.

19. The composition of claim 18 wherein the outer coating has a melting point within the range of from about 100° F. to about 170° F.

20. The fabric-softening composition of claim 1 wherein the substrate comprises a dry-laid, nonwoven cloth substrate comprising about 70 percent regenerated cellulosic fibers and about 30 percent hydrophobic binder-resins, said fibers having a denier of about 1.5 and a length of about  $\frac{1}{4}$  inch and being oriented substantially haphazardly and lubricated with sodium oleate, said nonwoven cloth substrate having a thickness of about 4 to 5 mills and a basis weight of about 26 grams per square yard; wherein the substrate coating consists essentially of a substantially solid, waxy, nonionic condensation product of one mole of tallow alcohol with 20 moles of ethylene oxide, having a melting point of about 115° F., said substrate coating substantially completely coating the fibers of said substrate and substantially completely filling the free space of said substrate; wherein the substantially solid outer coating has a melting point below about 170° F. and comprises 60 percent by weight of 3-N,alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, where said alkyl is a mixture of alkyls having from 20 to 22 carbon atoms; and wherein the weight ratio of said nonwoven cloth substrate to the total amount of said substrate coating and outer coating is about 1:4.

21. The fabric-softening composition of claim 1 wherein the substrate comprises a dry-laid nonwoven cloth substrate comprising about 70 percent regenerated cellulosic fibers and about 30 percent hydrophobic binder-resins, said fibers having a denier of about 1.5 and a length of about  $\frac{1}{4}$  inch and being oriented substantially haphazardly and lubricated with sodium oleate, said nonwoven cloth substrate having a thickness of about 4 to 5 mills and a basis weight of about 26

grams per square yard; wherein the substrate coating consists essentially of a substantially solid, waxy, nonionic polymer of polyethylene glycol having an average molecular weight of from about 1,300 to about 1,600 and having a melting point of about 114° F., said substrate coating substantially completely coating the fibers of said substrate and substantially completely filling the free space of said substrate; wherein the substantially solid outer coating has a melting point below about 170° F. and comprises 60 percent by weight of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, where the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms; and wherein the weight ratio of said nonwoven cloth substrate to the total amount of said substrate coating and outer coating is about 1:4.

22. The fabric-softening composition of claim 1 wherein the substrate comprises a dry-laid, nonwoven cloth substrate, comprising about 70 percent regenerated cellulosic fibers and about 30 percent hydrophobic binder-resins, said fibers having a denier of about 1.5 and a length of about  $\frac{1}{4}$  inch and being oriented substantially haphazardly and lubricated with sodium oleate, said nonwoven cloth substrate having a thickness of about 4 to 5 mills and a basis weight of about 26 grams per square yard; wherein the substrate coating consists essentially of a substantially solid, waxy, nonionic polymer of polyethylene glycol having an average molecular weight of from 1,300 to about 1,600 and having a melting point of about 114° F., said substrate coating substantially completely coating the fibers of said substrate and substantially completely filling the free space of said substrate; wherein the substantially solid outer coating has a melting point below about 170° F. and comprises 85 percent by weight of a fabric softener admixture consisting of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, where the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms, and ditallow-dimethylammonium chloride in a weight ratio of about 1.3:1, respectively; and wherein the weight ratio of said nonwoven

cloth substrate to the total amount of said substrate coating and outer coating is about 1:5.

23. The fabric-softening composition of claim 1 wherein the substrate comprises a paper substrate, said paper being a one-ply paper made from a mixture of groundwood and kraft bleached woodpulps and having a basis weight of 32 pounds per 3,000 square feet; wherein the substrate coating consists essentially of a substantially solid, waxy nonionic polymer of polyethylene glycol having an average molecular weight of from about 1,300 to about 1,600 and having a melting point of about 114° F., said substrate coating substantially completely coating the fibers of said substrate and substantially completely filling the free space of said substrate; wherein the substantially solid outer coating has a melting point below about 170° F. and comprises 60 percent by weight of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, where the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms; and wherein the weight ratio of said nonwoven cloth substrate to the total amount of said inner and outer coatings is about 1:4.

24. The fabric-softening composition of claim 1 wherein the substrate comprises a paper substrate, said paper being a dissolvable paper; wherein the substrate coating consists essentially of substantially solid, waxy, cationic ditallow-dimethylammonium chloride, having a melting point of about 140° F., said substrate coating substantially completely coating the fibers of the substrate and substantially completely filling the free space of said substrate; wherein the substantially solid outer coating has a melting point below about 170° F. and comprises 57 percent by weight of 3-(N-alkyl-N,N-dimethylammonio)-2-hydroxypropane-1-sulfonate, where the alkyl is a mixture of alkyls having from 20 to 22 carbon atoms; and wherein the weight ratio of said paper substrate to the total amount of said substrate coating and outer coating is about 1:1.

\* \* \* \* \*

40

45

50

55

60

65

70

75

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,632,396 Dated January 4, 1972

Inventor(s) Pablo O. Perez-Zamora

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 7, after the word "over" delete -- The invention herein represents a significant improvement over --.

Col. 7, line 35, "amid" should be -- amide --.

Col. 8, line 6, before "e.g., " insert -- ( --.

Col. 15, line 56, "stock" should be -- stick --.

Col. 16, line 8, "ky" should be -- by --.

Col. 16, line 23, before "by" insert -- ratio --.

Col. 20, Composition 26, after "ammonium" insert -- phosphate --.

Col. 28, Composition 180, "1:" should read -- 1:5 --.

Signed and sealed this 22nd day of August 1972.

(SEAL)

Attest:

EDWARD M.FLETCHER,JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Commissioner of Patents