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FABRIC SOFTENER

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5 Claims

ABSTRACT OF THE DISCLOSURE

A dry, powdered, freeflowing, dispersible fabric softener composition free from objectionable odor which is a mixture of a cationic quaternary softening agent and a boric acid.

This invention relates generally to fabric softeners, and more particularly to an improved dry, powdered, free-flowing, fabric softener composition which is free from objectionable odor.

Fabric softeners have two principal uses, as textile finishing agents, and as conditioning agents in commercial and home laundering processes, and the powdered fabric softener of the present invention has utility in both of these end use fields. However, the principal use of the powdered fabric softener of the present invention is as a conditioning agent in laundering processes, and accordingly, the description herein will be limited to this use.

Several types of fabric softeners, in both liquid and powder form, are available for use in laundering processes to provide improved softness or "hand" to clothes, draperies, towels, and other fabrics which are repeatedly laundered. In commercial laundering processes the fabric softener, in addition to providing a soft "hand," also reduces extraction time, makes large pieces easier to shake out, and greatly reduces the amount of static electricity in the washed goods.

The fabric softener is added to the rinse bath or "sour" step in the laundering process. In some instances the fabric softener is added to a separate soaking or rinse bath following the regular rinse bath. The active ingredient, i.e., the softening agent, in most fabric softener compositions is either a fatty quaternary ammonium salt, e.g., a mono- or dialkyl quaternary ammonium salt, or a fatty imidazolinium salt. The fatty radical in the softening agent is a long chain aliphatic alkyl radical which is conventionally derived from a fatty acid containing from 8 to 20 carbon atoms. The softening agents which may be utilized as fabric softeners are well known and do not form a part of this invention. For purposes of description, the term "softening agent" is intended to include all quaternary ammonium compounds useful as fabric softeners. When dissolved in an aqueous solution, the softening agent ionizes, yielding a cationic long chain alkyl ammonium radical which is attracted to the negatively charged surface of the fabric, forming a lubricating surface which gives the fabric the desired soft "hand."

Although liquid fabric softeners are generally acceptable for use in home laundering where the volume of clothes handled is relatively small, liquid fabric softeners are less desirable than powdered fabric softeners in commercial laundering. The mechanics of storage, handling and adding the fabric softener to the rinse bath are greatly facilitated in commercial laundering processes when the fabric softener is in powdered form.

The softening agents are generally solid at ambient conditions. Since the levels of use of the one hundred percent active softening agent is relatively low, for example, about 0.0025 percent to about 0.1 percent by weight of the rinse bath, the powdered fabric softener composition generally includes additional materials, referred to as fillers

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since they do not provide any softening effect, in order to provide a composition having sufficient bulk that it has convenient use level. The filler, however, is an important ingredient of the powdered fabric softener composition, and is selected to improve the physical properties of the softener composition and also to improve the softening action. Although the softening agents are readily ionizable in an aqueous solution, some softening agents which are good fabric softeners are not easily dispersible in the relatively cool rinse water. Powdered softening agents also have a tendency to cake when stored at ambient conditions, and some fatty quaternary ammonium compounds have a characteristic unpleasant amine odor.

The filler is selected to improve or enhance these and other properties of the powdered fabric softener composition. Examples of fillers which have been employed heretofore in powdered laundry softeners include sodium chloride, clay and diatomaceous earth, silica containing compounds, and borax (sodium borate). It is also known to complex the softening agent with urea in order to provide a powdered fabric softener composition having desired physical properties. Although fabric softener compositions containing complexed softening agents have desirable physical properties, and provide good softening characteristics, they are more difficult and expensive to manufacture, and are not as dispersible in the rinse bath as would be desired. The present application is directed to fabric softener compositions which are a mixture of a softening agent and a filler, as opposed to a urea complex, and all reference to fabric softeners and to fabric softener compositions are to this type of product.

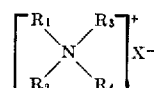
Although each of the fillers which has been heretofore employed in powdered fabric softener compositions has improved to some extent one or more of the physical characteristics and properties of the powdered laundry softener composition, the known fillers are generally deficient in one or more respects. For example, the known fillers are not capable of forming softener compositions which have the combined features of being rapidly dispersible in the rinse bath, free flowing at conditions of temperature and humidity prevalent in the areas where the powdered laundry softener compositions are used, and having a pleasant odor.

It is, therefore, a principal object of the present invention to provide a dry, powdered, free flowing, dispersible fabric softener composition which is free from objectionable odor. It is another object to provide a dry, powdered free flowing fabric softener composition having good odor which is readily dispersible in the rinse bath of a commercial or home laundering process, and which provides good softening characteristics.

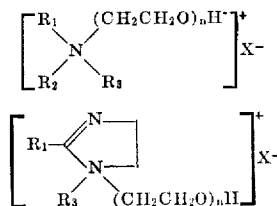
Other objects and advantages of the invention may be seen from the following detailed description.

In general, the present invention is directed to a dry, powdered, free flowing, dispersible fabric softener composition which includes a powdered cationic quaternary ammonium softening agent, and between about 1 percent and about 90 percent by weight of the softener composition of powdered boric acid. The softener composition may also include usual germicides, anticaking agents, whiteners, rewetting agents, dyes and perfumes.

The present invention contemplates the use of any of the known cationic fatty quaternary ammonium softening agents which have utility as softening agents. Quaternary ammonium fabric softeners contemplated by the invention have the following general formulas:



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where:

R_1 is a long chain aliphatic alkyl radical having from 8 to 20 carbon atoms,

R_2 is a long chain aliphatic alkyl radical having from 8 to 20 carbon atoms, or a methyl radical,

R_3 and R_4 are methyl or ethyl radicals,

n is between 1 and about 9, and

X is a water soluble salt forming anion.

Examples of softening agents of these types include fatty quaternary ammonium salts e.g., mono- and difatty quaternary ammonium salts, mono- and difatty ethoxylated quaternary ammonium salts and fatty imidazolinium salts. The long chain fatty alkyl radicals in the softening agent may be derived from any fatty acid containing between about 8 and about 20 carbon atoms, preferably at least 16 carbon atoms, and may be a mixture of fatty radicals. Any water soluble salt forming anion may be used to form the salt, for example, chloride, acetate, or methosulfate. Examples of specific salts which are useful as fabric softeners include hydrogenated ditallow dimethyl ammonium chloride, ethoxylated distearyl dimethyl ammonium chloride, and 1-hydroxyethyl-1-methyl-2-heptadecyl imidazolinium chloride. One of the principal softening agents which is used commercially in the manufacture of fabric softener compositions is hydrogenated ditallow dimethyl ammonium chloride. Mixtures of softening agents are also contemplated by the invention.

The softening agent may be prepared in powdered form by beading, spray drying, or flaking in accordance with known procedures. It has been determined that for best results, and best dispersibility of the softener composition in the rinse bath, the powdered softening agent should have an average particle size of less than about 150 microns. Experience has shown that when the powdered softening agent has an average particle size in excess of 150 microns the dispersibility of the softening agent in a cool rinse bath is diminished. Also, when the powdered softening agent has an average particle size below about 100 microns, the particles tend to agglomerate upon addition to the rinse bath, which also results in somewhat slower dispersibility. Accordingly, a preferred softener composition contains a powdered softening agent having an average particle size of between about 100 microns and about 150 microns. It should be understood, however, that the softener composition may contain a powdered softening agent having an average particle size lesser than about 100 microns or greater than about 150 microns, so long as sufficient precaution is taken to insure that the softening composition is adequately dispersed in the rinse bath.

In accordance with the present invention, the fabric softener composition contains boric acid as a filler in an amount between about 1 percent and about 90 percent by weight of the softener composition. A preferred softener composition may contain between about 50 percent and about 80 percent by weight of boric acid.

It has been discovered that boric acid is an excellent filler for powdered laundry softener compositions. Boric acid improves several of the physical properties of the fabric softener composition without detracting from or impeding the softening properties of the softening agent. A powdered fabric softener which contains a boric acid

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filler has good dispersibility in the rinse bath. The softener composition also is free flowing and has good anti-caking properties. Further, the presence of the boric acid as a filler in the softener composition eliminates the unpleasant odors which are associated with many fatty quaternary ammonium salts.

In addition to enhancing the physical characteristics of the softener composition, the use of boric acid as a filler is desirable because boric acid is a mild bacteriostat. Boric acid also aids in reducing the pH of the rinse bath to between 4 and 6.5, which is desirable since it has been shown that best softening is obtained when the rinse bath is maintained at a pH of about 5. When boric acid filled softener compositions are employed, less acidulating material, known as "sour" is required in the sour rinse.

The boric acid filler, which is commercially available in powdered form, is physically blended with the powdered fatty quaternary ammonium salt in the desired amount. In order to provide a softening composition which has the most desirable anti-caking properties, it has been determined that the boric acid should have an average particle size of between about 40 and about 110 microns. Experience has determined that the free flowing characteristics of the softener composition and its dispersibility in water are diminished when the boric acid has an average particle size outside this range.

The softener composition, in addition to the powdered softening agent and boric acid, may contain other usual additives conventionally employed in softener compositions. Such additives may include re-wetting aids such as ethoxylated nonylphenols, ethoxylated aliphatic alcohols or ethoxylated difatty methyl ammonium halides, germicides, such as those sold under the tradename Onyx BTC-2125 and BTC-2125P-40, whiteners, dyes and perfumes.

The present invention contemplates that the boric acid filler may be mixed with other fillers. Such additional fillers include anticaking agents such as silica containing compounds and diatomaceous earth, and clay and bentonite to improve the evenness of deposition and rate of deposition of the softening agent on the fabric. Other usual fillers, such as sodium acetate, sodium chloride, sodium bicarbonate, or calcium silicate, may also be employed. In instances where the boric acid is admixed with other fillers and/or additives the boric acid is preferably between about 1 percent and about 70 percent of the total filler fraction of the softener composition. When mixtures of fillers are employed, for best results each of the filler materials should have an average particle size between about 40 and about 110 microns.

As indicated above, boric acid has been found to be a superior filler for powdered fabric softener compositions because it improves each of the most critical physical properties of the fabric softener composition. In this connection, it is generally recognized that the three most important characteristics of a powdered fabric softener composition are the rate of dispersibility of the powdered fabric softener composition in the rinse bath, the evenness of deposition of the softening agent on the fabric, and the flowability of the powdered composition after storage, i.e., the anti-caking characteristics of the fabric softener in order to provide a free flowing product.

Substantially all available powdered fabric softeners, whether a physical mixture of a quaternary ammonium softening agent and a filler or a urea complex of a quaternary ammonium compound, show fairly even deposition of the softening agent upon the surface of the fabric. A powdered fabric softener composition containing 30 percent softening agent and 70 percent boric acid has been found to have as good or better uniformity of deposition as other commercially available powdered fabric softeners when tested using a bromophenol blue indicator bath to determine the uniformity and concentration of the softening agent upon the fabric after immersion in a standardized rinse bath containing the softener composition.

The dispersibility and flowability of known fabric softeners which are mixtures of a fatty quaternary ammonium compound and a filler are not as good as would be desired for most uses. The anticaking characteristics of a powdered softener composition containing a boric acid filler are considered to be better than known powdered fabric softener compositions. In addition, a powdered fabric softener composition containing a boric acid filler has improved dispersibility in the rinse bath, as compared to the previously known fabric softeners. It will be seen that the powdered fabric softener composition containing a boric acid filler provides an improved result as compared to previously known powdered fabric softeners.

It has also been discovered that a powdered fabric softener composition containing a boric acid filler is substantially free of objectionable odor, which is a most desirable characteristic of a powdered fabric softener. Many of the fatty quaternary ammonium salts which are used as softening agents have a typical soapy odor, and in addition have an objectionable odor which is generally referred to as an amine odor. This objectionable odor is normally covered up by the addition of suitable perfumes since the characteristic amine odor is not removed by the presence of any of the previously known fillers. However, it has been found that the addition of as little as 1 percent of boric acid as a filler in the powdered fabric softener composition substantially reduces or eliminates the characteristic amine odor of a fatty quaternary ammonium salt softening agent, whereby the amount of perfume added to the softener composition may be correspondingly reduced or eliminated.

The powdered fabric softener is added to the rinse bath in the laundering process in accordance with usual practices. In commercial laundering processes the fabric softener may be added to the "sour" rinse. The rinse bath generally has a temperature within the range of 70° F. to 110° F. The pH, particularly in commercial processes, is maintained between 4.0 and 6.5. This pH is also advantageous in order to improve the evenness of deposition of the softener upon the fabric. As indicated above, the boric acid aids in attaining this desired pH and decreases the need for "sour."

The fabric softener is added to the rinse bath in an amount sufficient to provide the desired softening properties. Only a small amount of the softening agent, for example, between about 0.025 percent and about 0.5 percent by weight, and desirably between about 0.05 and about 0.1 percent by weight, of the dry fabric to be treated is necessary to obtain good softening. Increasing the concentration of the softening agent does not appear to provide any improvement in the softening, and in some instances may detract from the softening.

EXAMPLE I

A powdered fabric softener was formulated by physically mixing together 30 percent by weight of a beaded hydrogenated ditallow dimethyl ammonium chloride having a particle size range of between about 100 microns and 150 microns with about 70 percent of powdered technical grade boric acid in which 75 percent of the particles are less than about 75 microns. 0.5 gram of the fabric softener was added to 2000 grams of water at 80° F. and mixed under mild agitation. The softener composition was completely dispersed within four minutes. Another sample of the fabric softener was stored in an oven at 105° F. overnight. Upon removal from the oven the powdered fabric softener composition had excellent flowability and exhibited substantially no caking. Another sample of the powdered fabric softener stored overnight at 115° F. was also found to be free flowing.

Each of the samples tested for caking tendencies was also checked for the presence of amine odor. In each instance the powdered fabric softener was found to be substantially free of undesirable amine odor. Similar powdered fabric softener compositions employing con-

ventional fillers such as sodium chloride and clay were found to have a strong amine odor after storage overnight in an oven at 105° F. and 115° F.

EXAMPLE II

A powdered fabric softener composition was formulated by blending 30 percent by weight of a powdered 1-hydroxyethyl-1-methyl-2-heptadecyl imidazolinium chloride softening agent having an average particle size between 100 microns and 150 microns and 70 percent by weight of powdered technical grade boric acid. The powdered fabric softener composition was tested in accordance with Example 1 and substantially identical results were obtained.

EXAMPLE III

A powdered fabric softener composition was prepared by physically blending 20 percent by weight of powdered hydrogenated ditallow ethoxyethylhydroxymethyl ammonium chloride and 80 percent by weight of powdered technical grade boric acid. This powdered fabric softener composition was tested in accordance with Example I and equivalent results were obtained.

EXAMPLE IV

A powdered germicidal fabric softener composition was prepared by physically blending 30 percent by weight of powdered hydrogenated ditallow dimethyl ammonium chloride, 4 percent by weight of powdered dodecyl dimethyl naphthylmethyl ammonium chloride monohydrate and 66 percent by weight of powdered technical grade boric acid. The powdered fabric softener was tested in accordance with Example I and was found to have similar properties.

EXAMPLE V

A powdered fabric softener composition was prepared by physically blending 50 percent by weight of hydrogenated ditallow dimethyl ammonium chloride, 35 percent by weight of technical grade powdered boric acid and 15 percent by weight of diatomaceous earth. The softener composition was tested in accordance with Example I and it was found that the softening properties and the dispersibility of the powdered softener fabric composition were excellent.

Other powdered fabric softener compositions were prepared containing various rewetting agents, fabric brighteners, dyes, and perfumes, all in accordance with well established principles. In each instance the powdered fabric softener composition was found to have good dispersibility, even deposition of the softening agent upon the fabric being treated, and good anticaking properties. In each instance the fabric softener composition was free of undesirable odor, even when the boric acid content of the composition was as low as one percent by weight.

It will be seen that an improved powdered fabric softener composition has been disclosed which has good dispersibility in the rinse bath, good anticaking properties, excellent flowability under the normal conditions, and which substantially eliminates the characteristic amine odor normally encountered when utilizing some softening agents. A boric acid filler provides a powdered fabric softener composition which has better characteristics than previously known powdered fabric softener compositions. The boric acid filler is compatible with the various additives and fillers normally utilized in formulating softener compositions.

Although certain features of the invention have been described with particularity, various alternatives, within the skill of the art, are contemplated.

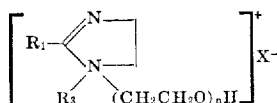
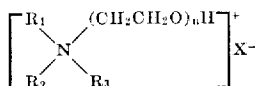
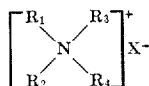
Various of the features of the invention are set forth in the following claims.

What is claimed is:

1. A dry powdered, free flowing, dispersible fabric softener composition which is free from objectionable

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odor consisting essentially of, a softening agent selected from the group consisting of cationic quaternary ammonium compounds of the formulae:



where R_1 is a long chain aliphatic alkyl radical having from 8 to 20 carbon atoms, R_2 is a long chain aliphatic alkyl radical having from 8 to 20 carbon atoms, or a methyl radical, R_3 and R_4 are methyl or ethyl radicals, n is between 1 and about 9, and X is a water soluble salt forming anion, and mixtures thereof, and between about 1 percent and about 90 percent by weight of the softener composition of boric acid.

2. A fabric softener composition in accordance with claim 1 wherein the softening agent has an average particle size below about 150 microns.

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3. A fabric softener composition in accordance with claim 1 wherein the softening agent has an average particle size of between about 100 microns and about 150 microns.

5 4. A fabric softener composition in accordance with claim 2 wherein the boric acid has an average particle size between about 40 microns and about 110 microns.

10 5. A fabric softener composition in accordance with claim 4 containing about 30 percent softening agent and about 70 percent boric acid.

References Cited

UNITED STATES PATENTS

15	2,875,154	2/1959	Lewis	252—385X
	3,044,962	7/1962	Brunt et al.	252—8.8X
	3,256,180	6/1966	Weiss et al.	252—8.8
	3,329,609	7/1967	Blomfield	252—8.8
	3,356,526	12/1967	Waldman et al.	252—8.8X
20	3,360,470	12/1967	Wixon	252—137X

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