

1

2,994,615

LIQUID LAUNDRY STARCH

John W. McDonald, Decatur, Ill., assignor to A. E. Staley Manufacturing Company, Decatur, Ill., a corporation of Delaware

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This invention relates, generally, to improvements and innovations in liquid laundry starch compositions which are stabilized and have prolonged shelf life, and which are characterized by their freedom from corrosive action on garments and fabrics in the presence of metal attachments such as metal zippers, buttons, hooks, and ornaments.

Liquid laundry starches have become increasingly popular, particularly for home laundry use, since starch in this form obviates the need for preparing a starch dispersion each time starch is needed. It is, of course, well known that the ordinary starch dispersions prepared at home do not keep well and therefore it is the practice to prepare only enough for immediate needs and any extra amount is usually discarded. Not only is this practice wasteful of the starch, but in addition there is little uniformity in the starch dispersions prepared under home conditions.

By the designation "liquid laundry starch" as used herein and in the appended claims, it is intended to designate a commercial product of high uniformity which is stable under ordinary conditions encountered in merchandising, storage and transit so as to have a prolonged and good shelf life whereby it will be and remain in excellent condition when it reaches the housewife for use by her over a substantial period of time. An ordinary solution or dispersion of starch consisting only of starch and water will not meet these rigid conditions so as to constitute a liquid laundry starch within the above designation.

Numerous addition agents have from time to time been incorporated in liquid laundry starches with a view of making suitable products. In general, the prior art has suggested addition of various salts, particularly common salt or sodium chloride, to impart many of the desired properties. Major functions of these salts are to stabilize the paste or impart resistance to cold, so that the product will resist freezing or other undesired change during shipment and during storage in unheated warehouses or storage rooms, and to prolong shelf life under normal store conditions.

The stabilizing of the liquid laundry starch products is desirable, not only from a standpoint of providing resistance to freezing and cold, but also in inhibiting and preventing separation of the ingredients in the product if it is exposed to low temperatures. The liquid laundry starch products of this type tend, under low temperature conditions, to lose their original homogeneous character with the result that some of the ingredients may settle out or form layers. Once this occurs, it may not be possible to re-constitute the product to its original condition, even upon vigorous mixing or shaking.

While the electrolyte salts previously used may impart adequate resistance to these undesirable changes or developments in a liquid laundry starch product, a troublesome defect has been traced to the incorporation or presence of these strong electrolyte salts in liquid laundry starch compositions. Thus, it was discovered in connection with the making of the present invention that when clothes or garments having metallic zippers, ornaments, fasteners, etc., are starched with a liquid laundry starch containing a strong electrolyte salt such as ordinary salt, as a winterizing or stabilizing agent, the fabrics often weakened, and were even completely eaten through. Originally, the cause of the damage was obscure, but it was established that it was due to an electro-chemical corrosive action which occurred, particularly during the

2

conditioning, when the damp clothes were rolled up and metallic fasteners or ornaments were in intimate contact with the damp salt-containing starch compositions. The action of the strong acids generated was accentuated when brought into contact with a hot iron, resulting in the formation of many holes and scorching in the fabrics.

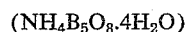
According to United States Patent 2,796,354, the foregoing objectionable behavior is prevented by replacing the strong electrolyte stabilizing salts with a mixture of borax and sodium bicarbonate. These two salts, being salts of weak acids, cannot yield corrosive acids by electrolysis.

According to the present invention, it was discovered that a further substantial improvement in the stabilization and ironing properties of liquid laundry starches was obtained by eliminating the sodium bicarbonate. Sodium bicarbonate catalyzes or enhances the browning or scorching of starch when heated to pyrolyzing temperature. Thus, sodium bicarbonate in a liquid laundry starch contributes to the undesirable yellowing of a starched fabric when ironed at an excessively high temperature. In other words, elimination of bicarbonate makes the liquid laundry starch more "fool-proof" with respect to the scorching problem.

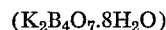
It was also discovered that any of the soluble borates, including the free boric acids, are satisfactory stabilizing agents and incapable of producing the objectionable behavior traced to strong electrolytes, as mentioned above. Satisfactory protection against damage by low temperature storage is obtained by the use of 1 to 4 parts by weight of the borates and boric acid, or mixtures thereof (calculated as anhydrous material) per 100 parts by weight of a liquid laundry starch. It is to be understood that the product may also contain relatively minor proportions of additives such as water softeners, soaps, dyes, perfumes, and optical whitening and brightening agents.

The preferred stabilizing agent is a mixture of two parts by weight of borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) to one part by weight of ortho-boric acid (H_3BO_3) added in the proportion of 3% of the weight of the finished liquid laundry starch product. Use of the preferred kind and proportion of stabilizing agents imparts a pH of about 8 to the product. At this pH value, there is little, if any, adverse effect due to pH alone on viscosity of the product or its tendency to cause yellowing of the ironed fabrics.

Many other soluble borates and boric acids, either singly or in combination, are suitable stabilizing agents in accordance with my invention. Among them are the following: ortho-boric acid (H_3BO_3), metaboric acid (HBO_2), tetraboric acid ($\text{H}_2\text{B}_4\text{O}_7$), ammonium tetraborate [$(\text{NH}_4)_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$], ammonium pentaborate



sodium tetraborate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$), sodium metaborate ($\text{NaBO}_2 \cdot 2\text{H}_2\text{O}$), lithium metaborate ($\text{Li}_2\text{B}_2\text{O}_4 \cdot 8\text{H}_2\text{O}$), potassium pentaborate ($\text{KB}_5\text{O}_8 \cdot 4\text{H}_2\text{O}$), potassium metaborate ($\text{K}_2\text{B}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$), potassium tetraborate



and sodium orthoborate (Na_3BO_3). In general, any boric acid and water soluble borate, or mixture thereof, is a suitable stabilizing agent for liquid laundry starches according to my invention.

The pH of the finished product will depend largely upon the amount and kind of stabilizer used. If alkali metal borates predominate, the pH will be higher than if the stabilizing agent consists mostly of boric acids. An acceptable range of pH is about 7 to about 10. Above 10 pH, there is increased tendency of the hot iron to yellow the starched fabric, and below 7 pH, the product may thicken too much.

Accordingly, the principal object of the invention is the provision of an improved liquid laundry starch sta-

bilized with suitable proportions of borates and/or boric acids, which stabilizing ingredients do not lead to the production of corrosive acids during use of the starch, and which liquid laundry starch may also contain relatively minor amounts of additives such as water softeners, soaps, ironing aids, preservatives, dyes, fluorescent whitening agents, and perfumes.

Certain other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

For a more complete understanding of the nature and scope of the invention, reference may now be had to the following detailed description thereof wherein certain presently preferred formulations are set forth in the examples not only for the purpose of instructing those skilled in the art as to the manner in which the invention may be practiced but also to suggest to them other embodiments of a similar nature coming within the scope of the claims.

Various types of starch may be used in accordance with the present invention to prepare liquid laundry starch compositions. The starch may be obtained from corn, potatoes, rice, waxy maize, sorghum, and other sources. In general, corn starch is preferable. While raw starch may be used satisfactorily, improved results are obtained by using starch which has been suitably modified or converted by chemical or enzymatic action as is well known in the art. For example, hypochlorite oxidized starches and acid treated starches may be used to advantage. It has been found that a satisfactory range for a starch concentration is from about 5 to 15% by weight.

In preparing the liquid laundry starch product, the following procedure is preferred: Mix the starch with water until the desired starch concentration is obtained. Then stir in the water softener, soap and ironing aid (such as sulfonated castor oil) if any of these ingredients are used. Thoroughly paste the starch by heating the mixture to its boiling point at atmospheric pressure (200–215° F.) and hold it at the boiling point for thirty minutes. Then cool the cooked mixture to about 140° F., stir in the borates and/or boric acid, also the preservative and perfume if they are used.

Reference may now be had to the following examples for more detailed information as to preferred and illustrative embodiments of the invention.

Example 1

	Grams
Water	1000
Starch (e.g., cornstarch)	101
Borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$)	20
Ortho-boric acid (H_3BO_3)	10
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Monastral Blue BWD dye	0.005

In general, in Example 1, the mixture of borax and ortho-boric acid may be replaced by one or more of the following:

Ortho-boric acid (H_3BO_3)
 Metaboric acid (HBO_2)
 Tetraboric acid ($\text{H}_2\text{B}_4\text{O}_7$)
 Ammonium tetraborate [$(\text{NH}_4)_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$]
 Ammonium pentaborate ($\text{NH}_4\text{B}_5\text{O}_8 \cdot 4\text{H}_2\text{O}$)
 Sodium tetraborate ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$)
 Sodium metaborate ($\text{NaBO}_2 \cdot 2\text{H}_2\text{O}$)
 Lithium metaborate ($\text{Li}_2\text{B}_2\text{O}_4 \cdot 8\text{H}_2\text{O}$)
 Potassium metaborate ($\text{K}_2\text{B}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$)
 Potassium pentaborate ($\text{KB}_5\text{O}_8 \cdot 4\text{H}_2\text{O}$)
 Potassium tetraborate ($\text{K}_2\text{B}_4\text{O}_7 \cdot 8\text{H}_2\text{O}$)
 Sodium orthoborate (Na_3BO_3)

The starch is added to the water at sub-pasting tem-

perature with stirring to form a thin slurry. The water softener (sodium hexametaphosphate), sulfonated castor oil, soap, and dye are stirred in and the mixture is heated to boiling and maintained at that temperature with gentle agitation for thirty minutes. The cooked mixture is then cooled to 140° F. and the remaining ingredients are stirred in. The resulting homogeneous product is then ready to be packaged in containers of desired construction and size.

The purpose of the thirty minute boiling period is to paste the starch thoroughly and thus yield a stable paste or dispersion, one that will not deposit an observable layer of swollen starch granule fragments at the bottom of the container on standing. Less vigorous pasting procedures will yield products with satisfactory starching and ironing qualities, particularly if the product is stirred or shaken in the container before it is applied to the fabric.

Example 2

	Grams
Water	1000
Starch (e.g., cornstarch)	55
Borax	10
Ortho-boric acid	6
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonate castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients may be mixed and processed as described in Example 1.

Example 3

	Grams
Water	1000
Starch (e.g., cornstarch)	150
Borax	40
Ortho-boric acid	20
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients may be mixed and processed as described in Example 1.

Example 4

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Borax	10
Ortho-boric acid	15
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients may be mixed and processed as described in Example 1.

Example 5

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Borax	40
Ortho-boric acid	20

The starch is cooked with the water as described in Example 1. The borax and boric acid are added to the starch paste after it has been cooled to about 140° F.

Although the liquid laundry starch of Example 5 is inferior to those of Examples 1–4 with respect to appearance, shelf life (i.e., resistance to separation into

5

visible layers and to spoilage with yeasts and molds), and ironing qualities, it is an example of a useful liquid laundry starch stabilized against deterioration during cold weather storage with ingredients which do not produce corrosive acids during use of the product.

Example 6

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Borax	20
Orthoboric acid	10
Sodium hexametaphosphate	10
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients are mixed and processed as described in Example 1.

Example 7

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Sodium metaborate ($\text{NaBO}_2 \cdot 2\text{H}_2\text{O}$)	10
Ortho-boric acid	10
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The above ingredients are mixed and processed as described in Example 1.

Example 8

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Sodium orthoborate (Na_3BO_3)	10
Orthoboric acid	10
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients are mixed and processed as described in Example 1.

Example 9

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Borax	25
Sodium hexametaphosphate	5
Sulfonated castor oil	0.2
Neutral soap	0.3
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

The foregoing ingredients are mixed and processed as described in Example 1.

Example 10

	Grams
Water	1000
Starch (e.g., cornstarch)	100
Ortho-boric acid	12
Sodium hexametaphosphate	2
Neutral soap	0.3
Sulfonated castor oil	0.2
Perfume	0.125
Phenyl mercuric acetate	0.02
Dye (Monastral Blue BWD)	0.005

6

The foregoing ingredients are mixed and processed as described in Example 1.

It will be noted that in the foregoing examples the starch concentration varies from 5.1% to 12.4% of the total composition, and that the concentration of combined borates and boric acid, calculated as anhydrous materials, varies from 1.1% to 3.5%.

The use of sodium hexametaphosphate, or equivalent sequestering agent, is desirable where there is need to inhibit the formation of objectionable precipitates, particularly when the product is made with hard water. Thus the sequestering agent in such instance will prolong the shelf life of the product.

The use of minor quantities of sulfonated castor oil, or equivalent material, is desirable because the oil functions as an ironing aid or lubricant, and because it frequently contributes to shelf life of the product.

A preservative such as phenyl mercuric acetate is useful because otherwise the product is subject to erratic spoilage by microorganisms, yeasts and molds in particular.

Suitable dyes and perfumes are added as desired.

In the appended claims, the concentration of stabilizing agent in the finished product refers to parts by weight of anhydrous agent per 100 parts by weight of finished liquid product.

Having fully described my invention, what I claim as new is:

1. A scorch-resistant freeze-thaw stable liquid laundry starch composition that consists essentially of an aqueous starch paste of about 5% to about 15% of starch by weight and dissolved therein as stabilizing ingredient about 1% to about 4% (by weight of the paste) of a material selected from the group consisting of boric acids, water-soluble salts of boric acids and mixtures thereof, said composition having a pH within the range of about 7 to 10.

2. A scorch-resistant freeze-thaw stable liquid laundry starch composition that consists essentially of an aqueous starch paste of about 5% to about 15% starch by weight and dissolved therein (1) up to about 1% by weight of sodium hexametaphosphate and (2) as stabilizing ingredient about 1% to about 4% (by weight of the paste) of a material selected from the group consisting of boric acids, water-soluble salts of boric acids and mixtures thereof, said composition having a pH within the range of about 7 to 10.

3. The laundry starch composition of claim 1 in which the material is a mixture of a boric acid and a water-soluble salt of a boric acid.

4. A scorch-resistant freeze-thaw stable liquid laundry starch composition that consists essentially of an aqueous starch paste of about 5% to about 15% starch by weight and dissolved therein about 1% to about 4% by weight of a mixture of about two parts borax to about one part orthoboric acid, said composition having a pH within the range of about 7 to 10.

5. The method of preparing a liquid-laundry-starch, freeze-thaw-stabilized composition comprising heating starch with water to form a starch paste and dissolving in the paste thus formed as the stabilizing ingredient a material selected from the group consisting of the boric acids, their water-soluble salts, and mixtures thereof, the weight concentration of starch being from about 5% to about 15% of said composition and the weight concentration of said material being from about 1% to about 4% of said composition, and adjusting the pH of said composition, as necessary, to a value in the range of 7 to 10.

6. The method of preparing a freeze-thaw-stabilized, liquid-laundry-starch composition comprising heating starch with water to form a starch paste and dissolving in the paste (1) sodium hexametaphosphate and (2) as the stabilizing ingredient a material selected from the group consisting of the boric acids, water-soluble salts

of the boric acids and mixtures thereof, the weight concentration of starch ranging from about 5% to about 15% of said composition, the weight concentration of sodium hexametaphosphate ranging from about 0.01% to about 1% of said composition and the weight concentration of said material ranging from about 1% to about 4% of said composition, and adjusting the pH of said composition, as necessary, to a value in the range of 7 to 10.

7. The method of claim 6 in which the material is a mixture of borax and orthoboric acid in a weight ratio of about 2:1.

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