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TREATMENT OF TEXTILES

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The present invention relates to the treatment of textiles and particularly relates to processes and emulsions for improving the properties of textiles and especially for rendering them water proof.

Textiles and textile fabrics have been water proofed by treatment with emulsions of fats, oils, waxes, paraffin, and other water-insoluble materials, and with solutions of aluminum salts, such as aluminum acetate, aluminum formate, alum, and other similar salts. According to one process the fabrics have been treated successively first with the emulsion or colloidal solution and secondly with the solution of the aluminum salt. According to another process they have been treated with both the dispersed water-insoluble material and aluminum salt in a single bath or solution.

These emulsions or colloidal dispersions have usually been negatively charged when prepared with an emulsifying agent and with a protective colloid, such as glue. When a treating solution or dispersion was prepared containing both the aluminum salt and the water proofing material, the aluminum salt was combined with the colloidal dispersion in relatively dilute form.

These baths of the prior art are prepared by first diluting a concentrated emulsion which contains at least 15% of non-aqueous constituents or about 10% to 30% of oily, waxy or fatty materials with 20, 50, or more parts of water, and then after such dilution, adding a corresponding quantity of an aluminum salt solution. For example, the same quantity of aluminum acetate may be utilized as the concentrated emulsion. This mixture is then ready for use.

These impregnating solutions, as above described, are not altogether satisfactory, because of their instability. Under the influence of atmospheric electrical charges, changes would take place in the emulsion which would considerably reduce and even completely arrest the impregnation action. For example, shortly before a thunder storm no impregnating effect would be obtainable with the usual bath or impregnating solutions, whereas after such electrical disturbance the impregnating action would again take place in the desired manner. The fabrics or materials treated during such electrical disturbances would be altogether devoid of water-repelling properties, or on the other hand would possess them to only a slight degree. That external electrical potential discharges have a substantial effect upon emulsions is well known (see Clayton, The Theory of Emulsions and Emulsification, p. 104 and et sequitur), but hitherto no means have been available for overcoming these disturbances in emulsions for the treatment of textiles.

In preparing emulsions for the single bath process above described, considerable difficulty was often experienced in adding the aluminum salt to the dilute emulsion. The addition of the aluminum salt decreases the negative charge of the emulsified particles and frequently they would become altogether discharged at the so-called iso-electrical point. At the iso-electrical point coagulation would often result and when such coagulation ensued, the treating solution would be of no value.

In addition, most of these treating processes above described could not be satisfactorily applied to woolen goods, and in case woolen goods were employed, unsatisfactory impregation usually resulted.

An object of the present invention is to provide an impregnating process for textiles in which the action will be reliable at all times, and will not be particularly affected by external electrical potential or atmospheric charges.

Another object is to provide a textile impregnating process in which the impregnating solutions are of such composition and character that more satisfactory and uniform impregnation will be obtained to produce impregnated fabrics and other textile materials of better quality.

Another object is to provide a process of treating textiles in which colloidal dispersions of water-insoluble materials may be prepared, including aluminum salts, without danger of coagulation and without the need for special precaution in diluting the colloidal dispersion or emulsion with water.

Another object is to provide a process of impregnating woolen goods with emulsions of water-insoluble materials.

Other objects are in part obvious and in part pointed out hereinafter.

In accomplishing the foregoing objects it has been found desirable to treat textile fabrics with colloidal dispersions in which the water-insoluble fatty, waxy, or oily materials and a soluble aluminum salt have been combined in the concentrated dispersions before such dispersion has been diluted to form a suitable treating bath or solution. In preparing these concentrated dispersions, preferably mineral, vegetable and/or animal fats, oils and/or waxes are put into colloidal dispersion in water, preferably by a mechanical homogenizing process. Paraffin, petrolatum or petroleum jelly, mineral oil, stearic acid, neat's foot

oil, benzol, bees wax, paraffin oil, asphalt, caoutchouc, fatty acids, halogen derivatives of hydrocarbon, hydrogenated aromatic compounds and bituminous substances may all be employed singly or in combination. Preferably in making up the emulsion the water-insoluble material or materials are used in such proportion as to make up at least 8 to 10% of the concentrated emulsion. These concentrated emulsions or colloidal dispersions generally should contain more than 15% of non-aqueous material.

In preparing these emulsions, protective colloids, such as glue, albumin, gelatine, casein, starch, gums, dimethyl-cellulose, protalbic acid, carbohydrates, sulphite waste liquors and other similar materials may be employed, preferably in amount ranging from 10 to 100% in parts by weight of the water insoluble material.

In preparing certain emulsions according to the present invention it is sometimes desirable to use emulsifying agents, such as soap, sulphonated oils, aromatic sulphonic acids, and so forth, but frequently the addition of such emulsifying agents is not necessary.

A particular feature of the present invention resides in the incorporation in these concentrated emulsions of soluble aluminum salts, such as aluminum acetate, aluminum formate, aluminum sulphate, alum, and so forth. It is, however, contemplated that the aluminum salt may in part or whole be replaced by other polyvalent salts, such as copper sulphate, lead acetate, ferric sulphate, thorium nitrate, as well as acids, such as sulphuric acid, hydrochloric acid, acetic acid and formic acid. These aluminum salts, or other polyvalent salts, or acids are preferably used in a quantity varying between 5 to 100% or more of the water insoluble colloidal material.

In preparing these emulsions or colloidal dispersions the aluminum salt may be conveniently added to the aqueous glue or protective colloid solution and the paraffin or other water-insoluble substance may be emulsified into or homogenized with the aluminum salt and glue solution. Paraffin and/or other water insoluble materials may also be prepared in the form of an emulsion with a solution of glue or other protective colloid and preferably with the utilization of emulsifying agents as soap, sulphonated oils, aromatic sulphonic acids, and so forth. To this concentrated emulsion after it has been homogenized, may then be added aluminum salts and/or other charge reversing materials. These concentrated emulsions which usually become solid or semi-solid upon cooling, are then diluted with 20 to 50 or more parts by weight of water for each part by weight of emulsion to obtain the desired treating solution or bath which is contacted with the fabric or other textile material.

Colloidal solutions or dispersions prepared in this manner appear to be positively charged instead of negatively charged, and they are extremely stable and will give very impregnating effects substantially regardless of atmospheric electrical conditions. The concentrated emulsions may be diluted merely by the addition of water without special precaution to prevent coagulation and the impregnating process proceeds with great expedition and with more efficient utilization of the water-insoluble impregnating materials which are most effectively removed from a treating bath by the textile material or fabric. The treating solutions of the present invention are particularly adapted to woolen goods which are very satisfactorily treated therewith.

Although the present invention is particularly applicable to the impregnation and especially the water proofing of woolen materials, it is also broadly applicable to the treatment of other textile materials, to the treatment of artificial or natural silk, to the treatment of paper and paper pulp, to the treatment of furs, leather and skins, and other materials.

The following are a few illustrative examples of different embodiments of the present invention, to which the invention is not to be restricted.

Example 1.—300 parts of paraffin are homogenized with a solution of 100 parts of glue and 50 parts of an emulsifying agent as a sulphonated oil or the sodium salt of an aromatic sulphonated acid in 500 parts of water. 100 parts of the emulsion so prepared are then heated to 40 to 50° C. and 15 parts of pulverized solid aluminum acetate are stirred into the emulsion. The product obtained forms a stable plastic mass when cold.

This emulsion may also be prepared by first adding the aluminum acetate to an aqueous glue solution and then emulsifying the paraffin in this aqueous glue solution in which case the emulsifying agent may be omitted. 5 kilograms of the final emulsion may then be dissolved in from 3 to 4 times this quantity of warm water and added to a bath for treating textiles, the total volume of the bath being preferably 100 liters.

A woolen material may then either be milled in this liquor, or be treated on a broad washing machine, or simply be immersed in the liquor until uniformly impregnated. After centrifuging or wringing out of the woolen goods, they are dried as usual. The dried materials will possess very high water-repellant properties without their feel, color or permeability being at all modified.

Example 2.—To a solution of 80 parts of gelatine in 700 parts of water are added 100 parts of solid aluminum acetate. The mixture is warmed at 60° until a uniform solution is obtained. This solution is used to emulsify a melted mixture of 125 parts of petroleum jelly and 125 parts of paraffin. The resultant product will also be a stable plastic mass when cooled.

Finished paper or paper pulp is then treated with a bath containing 3 to 5% of this solid product. After this treatment the paper material will possess excellent water-repelling properties which can not be disturbed by the addition of substances increasing the stiffness of the paper, such as glue or rosin soaps, and so forth.

Example 3.—In 1,000 parts of water, 80 parts of gelatine are dissolved. To this warm solution 50 parts of aluminum sulphate are added and the solution is then stirred until it becomes homogeneous. In this resultant solution then 40 parts of mineral oil and 120 parts of stearic acid are emulsified. A similar product is obtained as in Examples 1 and 2.

A bath containing 3 to 5% of this emulsified product may be utilized for the water proofing of chamois leather.

Example 4.—A bath containing 1 to 1½% of the concentrated emulsions prepared according to Examples 1, 2 and 3, may be utilized to give water-repellant properties to artificial silk. The silk so treated will be completely resistant to the influence of atmospheric moisture.

The following are a series of examples of the composition of other emulsions which may be conveniently prepared and utilized as above described, these emulsions being preferably pre-

pared by mechanical homogenization of the insoluble material with an aqueous solution of glue or gelatine and of the soluble polyvalent salt or acid.

Example 5.—20.5 kilograms of paraffin, 2.5 kilograms of glue from hides, 6 kilograms of aluminum sulphate and 71 liters of water.

Example 6.—20.5 kilograms of neat's foot oil, 5.6 kilograms of bone glue, 17.3 kilograms of aluminum sulphate and 56.5 liters of water.

Example 7.—24.4 kilograms of paraffin, 6.7 kilograms of glue, 1 liter of 50% acetic acid, and 67.9 liters of water.

Example 8.—17 kilograms of paraffin, 5 kilograms of glue, 5 liters of 30% acetic acid, and 34 liters of aluminum acetate solution (25 grams AL_2O_3 per liter) and 36 liters of water.

Example 9.—19 kilograms of paraffin, 5.3 kilograms of glue, 23 kilograms of crystallized copper sulphate and 52.7 liters of water.

Example 10.—17.3 kilograms of paraffin, 4.9 kilograms of glue, 27.8 kilograms of sugar of lead, and 50 liters of water.

Example 11.—12.4 kilograms of paraffin, 6.2 kilograms of gelatine, 3.2 kilograms of ferric sulphate, and 78.2 liters of water.

Example 12.—23 kilograms of paraffin oil, 4.1 kilograms of glue, 4.1 kilograms of dimethylcellulose, 3.6 kilograms of thorium nitrate (crystallized), and 65.2 liters of water.

All of the emulsions according to the above description have positively charged dispersed phases and when they are subjected to electrical currents the dispersed particles will tend to move to the cathode. These emulsions are all perfectly stable in the concentrated form in which they are prepared. The non-aqueous content of these concentrated emulsions average usually substantially above 15%.

These emulsions will remain unchanged even after they have been kept for days at temperatures of zero to 10° F. At high temperatures of about 100° F. for example, these emulsions will remain completely stable, as contrasted to the usual negatively charged emulsions, which contain no aluminum salts or similar electrolytes. These latter emulsions will be destroyed if they are allowed to stand for a length of time at this temperature. It is obvious therefore that one of the advantages of the present invention resides in the fact that the emulsion produced will remain in stable condition in summer or in winter over long periods of time. This is requisite in commercial practice since these emulsions may be held in storage or in transport for days or weeks and they should not have undergone any change during this period.

Further they will not decompose even though an antiseptic is not added to preserve the organic protective colloid, since the protective charging electrolyte, as for example the aluminum salt, prevents a destruction of the protective colloid through fermentation or other deteriorating influences.

The present application is a continuation in part of my application Serial No. 562,608 filed September 12, 1931.

The present application is similar in subject matter to co-pending application, Serial No. 562,608 filed September 12, 1931, for Stable emulsions and processes for their production, and is also similar in subject matter to co-pending applications Serial Nos. 638,345 filed October 18, 1932, and 745,755, filed September 27, 1934.

The present application is particularly directed to waterproofing and negatively charged fabric to a positively charged disperse phase which process is conveniently carried out in a single bath eliminating the need of two baths with the resultant disadvantages thereof.

The subject matter disclosed in the present application which is not specifically claimed herein is covered in said co-pending or other applications.

It is to be understood that the various examples given in this application have been supplied by way of example and illustration and not by way of limitation and it is intended to include in the scope of the present application, all of the various modifications and changes which may be made without departing from the essence of the invention.

I claim:—

1. A process of waterproofing negatively charged textile materials which comprises subjecting them to a dilute aqueous bath containing a positively charged colloidally dispersed water insoluble fatty, waxy or oily material, a protective non-alkaline organic water soluble colloid and a soluble polyvalent metallic salt, said bath having been prepared by the addition of a relatively large quantity of water to a relatively small quantity of a concentrated emulsion containing said water-insoluble material, said protective colloid and said polyvalent salt.

2. A process of waterproofing negatively charged textile materials, which comprises impregnating the textile with a mixture of a relatively large quantity of water and a relatively small quantity of a concentrated emulsion containing a protective non-alkaline organic water soluble colloid, a polyvalent water soluble metal salt and a water-insoluble fatty, waxy or oily material, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

3. A process of waterproofing negatively charged textile materials, which comprises immersing such textiles in a bath containing a relatively large quantity of water and a relatively small quantity of a concentrated emulsion containing glue, aluminum salt and paraffin, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

4. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing a relatively large quantity of water and a relatively small quantity of a concentrated emulsion containing paraffin, aluminum acetate, and glue, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

5. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing a relatively large quantity of water and a relatively small quantity of a concentrated emulsion containing gelatine, aluminum acetate, petroleum jelly and paraffin, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material

in the disperse phase from said bath by reason of its opposite electric charge.

6. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing a relatively large quantity of water and a relatively small quantity of a concentrated emulsion containing gelatine, aluminum sulphate, mineral oil and stearic acid, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

7. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing 20 to 100 parts of water and 1 part of a concentrated emulsion, said emulsion consisting of a mixture of a protective non-alkaline organic water soluble colloid, a polyvalent water soluble metal salt and a water-insoluble fatty, waxy or oily material, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

8. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing 20 to 100 parts of water and 1 part of a concentrated emulsion, said emulsion consisting of a mixture of 300 parts of paraffin, 100 parts of glue, 500 parts of water and 140 parts of aluminum acetate, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

9. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing 20 to 100 parts of water and 1 part of a concentrated emulsion said emulsion consisting of a mixture of 80 parts of gelatine, 700 parts of water, 100 parts of aluminum acetate, 125 parts of petroleum jelly and 125 parts of paraffin, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

10. A process of waterproofing negatively charged textile materials, which comprises immersing them in a bath containing 20 to 100 parts of water and 1 part of a concentrated emulsion, said emulsion consisting of a mixture of 1000 parts of water, 80 parts of gelatine, 50 parts of aluminum sulphate, 40 parts of mineral oil and 120 parts of stearic acid, the disperse phase of said emulsion being positively charged and said textile absorbing said oppositely charged waterproofing material in the disperse phase from said bath by reason of its opposite electric charge.

11. The process of waterproofing textiles with diluted aqueous emulsions of water insoluble oil, waxy and fatty materials as the positively charged disperse phase, said textiles being negatively charged, which comprises providing a concentrated emulsion with a positively charged disperse phase having a solid content of at least 15%, said solid content including the positively charged disperse phase constituting at least 8 to 10% of the emulsion, a protective colloid in amount from 10 to 100% of the disperse phase and a water soluble polyvalent metal salt in an amount ranging from 5 to 100% of the disperse phase and then diluting with at least 20 to 50 parts by weight of water per part of emulsion to form the bath and immersing textile materials in the bath to absorb the oppositely charged waterproofing material in the disperse phase therefrom.

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