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TEXTILE FINISHING

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This invention relates to the finishing of textile fabrics and compositions employed in such processes. A principal object of the invention resides in the provision of a resin finish to textile fabrics which gives them a desirable, full, crisp hand. A further object is the provision of a resin emulsion which will impart the above qualities when applied to textile fabrics.

Cotton textile fabrics such as percales, shirtings, broadcloths, poplins, drills, etc., and to a lesser extent rayon-cotton mixtures and goods made entirely of rayon are frequently treated in the textile art with compositions and by processes intended to impart to the fabric a certain fullness and stiffness of feel, or hand, which is designed to appeal favorably to the trade. Aqueous solutions of starches and gums have been commonly applied to the fabric to obtain the desired hand. The use of such materials however generally entails certain difficulties and disadvantages. The bright hues of dyed as well as printed goods are frequently masked. Such treated fabrics also generally exhibit low degrees of crease-resistance and most of the finish imparted to the goods as a result of the treatment is lost in the first washing.

It has been proposed to apply solutions of synthetic resins in organic solvents and aqueous solutions of urea-formaldehyde resins to textile fabrics as crease-proofing and waterproofing agents. Efforts have also been made to apply phthalic glyceride alkyd resins to textiles by first preparing an alkyd resin of high acid number and neutralizing the acidity with alkali, whereby a water-soluble resin is obtained. Such alkyd resin solutions are suitable for waterproofing, but are not acceptable as a finish for piece goods as they impart a soft greasy feel to the fabric.

We have now discovered that the ethylene glycol phthalate and propylene glycol phthalate alkyd resins when emulsified in the manner hereinafter described and applied to textiles as a finishing composition impart to the textile a very desirable hand characterized by its fullness and crispness. Our resin compositions are easily prepared, safely shipped and stored and conveniently applied to the textile fabric and because of their simplicity are further characterized by their low cost of production.

Our improved textile treating compositions are prepared by emulsifying either ethylene glycol phthalate or propylene glycol phthalate alkyd resins, preferably of low acid number. In preparing our emulsions we liquefy the resin either by heating or by the addition of a solvent, or both, and add thereto with vigorous agitation an aqueous solution of an emulsifying agent. A three-blade propellor mixer of the "Lightnin" type has enabled us to prepare our emulsions with great ease. As the aqueous solution of emulsifying agent is slowly added a thick white emulsion of the wate-in-oil type is first obtained but upon continued addition of the aqueous phase the emulsion inverts to the oil-in-water type generally of a fairly thick consistency. The emulsion is preferably prepared and sold in a form having a solids content of betwen 30 and 60%. The desired solids content for application to the textiles may be readily obtained by the mere addition of water.

Any of the methods now in use in textile finishing may be employed in applying our emulsions to textile fabrics. The emulsion is diluted with water so that the finishing solution contains from about 6 up to about 40 pounds of our emulsion per 100 gallons of treating solution depending upon the type of fabric to be treated and the particular effect desired. Cold, warm or hot water may be used to make the dilution and the treating solution may be used either hot or cold although a temperature of 120–130° F. is recommended for regular plant practice.

The cloth may be run through the liquor by the pad and batch method, or by the use of a pad box at the tenter, or by any other suitable method. The cloth is preferably treated in the dry condition, although fabrics can be readily wet finished. The treated cloth is preferably dried at once but if necessary it may be padded, batched and dried later. The drying can be done on cans, on the tenter frame, or in drying boxes, and at the usual speeds and temperatures. When drying percale on a tenter frame, temperatures of 240-270° F. at a frame speed of about 60–90 yards per minute have been found quite satisfactory. The goods, after drying, may be calendered and otherwise handled in the usual manner. Since our resin emulsions are compatible with most neutral or alkaline materials they may be used with practically all the usual starches, flours, soluble gums,

softening agents such as sulfonated oils and alkaline wax emulsions, blueing, wetting agents, etc. If an acid material is apt to be encountered the addition of ammonia may guard against coagulation of the emulsion.

The invention will now be described in greater detail by the following specific examples of emulsion preparation and by recommended formulae for the treatment of particular classes of textile fabrics. It should be understood, however, that although these examples may illustrate in detail some of the more specific aspects of the invention they are given primarily for purposes of illustration and that the invention in its broader aspects is not limited thereto.

Example 1

325 parts ethylene glycol and 740 parts phthalic anhydride were charged into a heated vessel fitted with an agitator, thermometer, carbon dioxide inlet and outlet tubes and a condenser. Agitation was started as soon as the phthalic anhydride had melted sufficiently. The temperature reached 165° C. in one hour, and was gradually increased to 206° C. at the end of about 22 hours reaction time. The mixture was then blown with carbon dioxide for 1½ hours at 200° C. to volatilize uncombined phthalic anhydride. The product on cooling was found to be a hard, glasslike resin of nearly water-white color, to possess an acid number of 7.9 and an A. S. T. M. ring and ball method softening point of 77° C. The resin was soluble in acetone, ethyl methyl ketone, cyclohexane, ethylene dichloride and dioxane but insoluble in ethanol, benzene, toluene, mineral spirits, carbon tetrachloride and other common organic solvents.

125 parts of the above resin were melted by heating to 130° C. and allowed to cool to 108° C. 125 parts of a solution of ammonium caseinate containing 7.8% casein, 5.3% NH_4OH (28% NH_3). 2.4% of a 12½% solution of sodium pentachlorophenolate, and the balance water, were heated to 70° C. and slowly added to the molten resin while stirring with a "Lightnin" type stirrer. A thick white emulsion of the water-in-oil type first formed but later inverted when most of the aqueous phase had been added to give a thin white emulsion of the oil-in-water type. The average particle size was between 2 and 3 microns. This emulsion was used in treating textiles according to methods described above and imparted to the cloth a full, crisp hand.

Example 2

92.0 parts of the ethylene glycol phthalate described in Example 1 and 12.5 parts of acetone were warmed together until a homogeneous fluid mass was obtained. 104.5 parts of an ammonium caseinate solution as described in Example 1 warmed to 35° C. were slowly added with stirring to the fluid resin. A thick white emulsion of the water-in-oil type was formed which inverted to a thin emulsion of the oil-in-water type just before all of the aqueous phase was added. The particle size of the emulsion ranged from 1 to 3 microns.

Example 3

250 parts of an ethylene glycol phthalate resin similar to the resin described in Example 1 but having an acid number of 8.3 were heated to 120° C. and allowed to cool to 90° C. 250 parts of an ammonium caseinate solution containing 15.6% casein, 10.6% NH_4OH (28% NH_3), 2.4% of a 12.5% solution of sodium pentachlorophenolate were heated to 90° C. and slowly added to the resin phase with vigorous agitation. A white emulsion of the oil-in-water type was obtained which was reduced to 50% solids content by the addition of 68 parts water. The average particle size was about 3 microns but when put through an Abbè homogenizer the average particle size was reduced to about 2 microns. This emulsion was also used to treat textiles according to the procedure described above and gave a full, crisp hand.

Example 4

320 parts of an ethylene glycol phthalate resin were heated with 80 parts of ethylene dichloride to form a resin solution. 400 parts of an ammonium caseinate solution such as used in Example 3 were heated to 85° C. and added slowly with stirring to the resin solution which was at 105° C. The emulsion particles were in general less than one micron in diameter. This emulsion proved to be stable upon standing for several months and gave excellent results in finishing textiles.

Example 5

An ethylene glycol phthalate resin emulsion of fine particle size and excellent stability was prepared exactly as described in Example 4 except that butanol was employed to liquefy the resin instead of ethylene dichloride. Although butanol is not a true solvent for the particular resin employed it nevertheless appears to act as a dispersing medium for it so that the resin may be readily liquefied and worked as a solution. It should be understood, therefore, that dispersing agents of the type of butanol are included as solvents within the scope of the appended claims.

Example 6

230 parts α-propylene glycol and 444 parts phthalic anhydride were heated together in the apparatus described in Example 1 for 23 hours. The temperature was slowly raised to 204° C. in 4½ hours and held between 202–204° C. for the remainder of the heating period. The material was continually agitated mechanically and a slow stream of CO_2 passed through the mixture throughout the reaction period. The resin was found to have an acid value of 27.5 when dissolved and titrated as a dilute solution in a mixture of equal volumes of ethanol and benzene. The softening point was 77° C. when tested by the A. S. T. M. ring and ball method.

320 parts of the above resin were heated with 80 parts butanol to form a resin solution. 400 parts of an ammonium caseinate solution containing 15.6% casein and 10.6% ammonia were heated to 60° C. and added slowly with stirring to the resin solution which was at 90° C. The emulsion thus formed was diluted with water and used to finish textile fabrics as described. A good stiff hand was obtained very similar to that when using the ethylene glycol phthalate resin.

In using our emulsions in the treatment of textiles due regard is given to the type of fabric to be treated, the condition of the fabric prior to finishing and the stiffness of hand required. In finishing 80x80 four-yard percales it has been found that 1½ gallons of our resin emulsion, containing approximately 50% total solids, when diluted with water to 100 gallons will provide a finishing solution which will give the necessary hand to this fabric.

In finishing a dyed broadcloth, count 128x64,

the following formulation was found to be very satisfactory.

Resin emulsion (50% solids)	gallons	2
Sulfonated olive oil 30%	pints	4
Ammonia 28%	do	1
Water to	gallons	100

A printed poplin was finished with the following:

Resin emulsion (50% solids)	gallons	3
Sulfonated peanut oil 50%	pints	2
Ammonia 28%	do	1
Water to	gallons	100

The sulfonated vegetable oils may be omitted or replaced with other types of conventional softeners such as sulfated alcohols, emulsified waxes and fats, depending upon the degree of softness desired in the finished goods.

What we claim is:

1. A method of finishing textile fabrics to give them a full, crisp hand which comprises impregnating said textile fabrics with an aqueous dispersion containing in each 100 gallons thereof 6 to 40 pounds of an aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of an alkyd resin selected from the group consisting of ethylene glycol phthalate and propylene glycol phthalate and thereafter drying the impregnated fabric.

2. A method of finishing textile fabrics to give them a full, crisp hand which comprises impregnating said textile fabrics with an aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of ethylene glycol phthalate and thereafter drying the impregnated fabric.

3. A method of finishing textile fabrics to give them a full, crisp hand which comprises impregnating said textile fabrics with an aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of propylene glycol phthalate and thereafter drying the impregnated fabric.

4. A method of finishing percale to give it a full, crisp hand which comprises impregnating said percale with an aqueous dispersion containing in each 100 gallons thereof 6 to 40 pounds of an aqueous emulsion containing an aqueous solution of ammonium caseinate and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of alkyd resins selected from the group of ethylene glycol phthalate and propylene glycol phthalate and thereafter drying the impregnated percale.

5. A textile finishing composition capable of imparting a full, crisp hand to textile fabrics when applied thereto comprising a water-dilutable aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of an alkyd resin selected from the group consisting of ethylene glycol phthalate and propylene glycol phthalate.

6. A textile finishing composition capable of imparting a full, crisp hand to textile fabrics when applied thereto comprising a water-dilutable aqueous emulsion of the oil-in-water type containing water, an organic solvent, an emulsifying agent, and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of an alkyd resin selected from the group consisting of ethylene glycol phthalate and propylene glycol phthalate.

7. A textile finishing composition capable of imparting a full, crisp hand to textile fabrics when applied thereto comprising a water-dilutable aqueous emulsion of the oil-in-water type containing water, ammonium caseinate, and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of an alkyd resin selected from the group consisting of ethylene glycol phthalate and propylene glycol phthalate.

8. A textile finishing composition capable of imparting a full, crisp hand to textile fabrics when applied thereto comprising a water-dilutable aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of ethylene glycol phthalate.

9. A textile finishing composition capable of imparting a full, crisp hand to textile fabrics when applied thereto comprising a water-dilutable aqueous emulsion of the oil-in-water type containing water, an emulsifying agent and 30 to 60% by weight of a water-insoluble, fusible alkyd resin having an acid number not greater than about 27.5 said resin consisting essentially of propylene glycol phthalate.

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