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PROCESS OF FINISHING TEXTILES

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This invention relates to an improvement in the finishing of textiles with resinous materials. It provides a convenient method of modifying and improving the finish obtained by standard resin preparations.

Textile materials are frequently treated or "finished" with synthetic resinous materials for the purpose of improving their appearance, their crush resistance, their feel or "handle," their body, and many of their other properties. To produce these effects the customary procedure is to pad the textile through an aqueous solution or dispersion of the resinous material, squeeze out the excess material absorbed, dry the textile, and give such subsequent treatments as the nature of the resin and the type of finish desired may require. Most of the resins that have been used, namely, urea-formaldehyde condensates, hardenable alkyd resins, cellulose ethers, and acrylate and methacrylate polymers, give to the textile a stiffness and sandy handle that for most finishes is not desirable. To overcome this it has been common practice to add to the finishing bath a resin plasticizer, sulfonated olive oil being one frequently used. The plasticizers that to date have been available in a form that may be incorporated in the finishing bath weaken the resin film and reduce its washfastness. Those plasticizing materials that do not adversely affect the resin film have for the most part been of such a character that it is necessary to mix them with the resin before preparation of the finishing bath. This is undesirable for the reason that different textile materials, of fabrics of different weight made of the same textile material, and even the same fabrics when treated for different purposes or to suit the particular desires of different users, all require a different degree of plasticizing so that different stock finishing preparations are necessary. As the resinous materials are usually supplied the textile mill in a form which requires only dilution with water to make them ready for use, a large variety of stock preparations containing different quantities of plasticizer is impractical.

It is accordingly the object of this invention to provide a washfast material capable of softening a textile finish, in a form in which it may be mixed with standard resinous textile finishing preparations in any desired amount. A further object is to provide a material of the said type in a form that can be supplied the textile mill along with a standard textile finishing preparation so that the finisher can mix the two in whatever

proportions are necessary to meet his particular requirements.

These objects have been accomplished through the discovery that aqueous suspensions of non-hardening alkyd resins when mixed with aqueous suspensions, emulsions or solutions of the commonly used textile finishing resins, give a softness to the finished textile at least equal to the effects produced when plasticizers are added to the resin. The improvement in feel or handle does not, however, appear to be due to the usual action of a plasticizer for it is obtained even when two mutually incompatible resins are used.

The non-hardening alkyd resins that might be used are those prepared from long chain aliphatic polycarboxylic acids, such as sebacic acid, all of which are soft and rubbery resins, and those that contain a sufficient quantity of a non-drying fatty oil acid chemically combined with the polybasic acid and polyhydric alcohol to make a soft resin. Among those that have been successfully used in practicing the invention are resins made from glycerine and sebacic acid; from glycerine, diethylene glycol and sebacic acid; from glycerine, castor oil and sebacic acid; from glycerine, sebacic acid and phthalic acid; from glycerine, castor oil and phthalic acid; and from castor oil, maleic acid and pine oil. In these various resins other non-drying fatty oils may be used in place of the castor oil and other long chain aliphatic polycarboxylic acids such as adipic, pimelic, suberic, and azelaic acids may be used in place of the sebacic acid. The primary requirement of the resin is that it be a permanently soft resin.

Emulsions of these soft resins may be used to improve the effects obtained by such common textile treating resinous materials as the water soluble urea formaldehyde condensates; the organic solvent soluble urea formaldehyde-mono-hydric alcohol condensates; hardenable alkyd resins made from glycerine, phthalic or maleic acid and drying oils; acrylic and methacrylic resins; and cellulose ethers. In each case the addition of the soft resin markedly improves the softness and quality of the finished textile without detracting from the permanency of the finish or the desirable effects that are obtained by the resin treatment.

To obtain maximum miscibility of the dispersion of soft resin with the various hard resin preparations, it is desirable to have the soft resin very finely dispersed. If the particle size in the dispersion is too large, the soft resin will coat the particles of hardenable resin when the two

dispersions are mixed and cause the latter to settle out. For general use the particle size should be below 0.5 micron but in some instances, particularly where the dispersion is to be used immediately and precautions taken to keep the treating bath in constant agitation, emulsions having larger particles may be used. It is also desirable to have the pH of the dispersion of soft resin at about the neutral point, preferably within the range of from pH 6.6 to pH 8.2. When substantially neutral, the dispersion of soft resin is miscible with the usual dispersions of hard resin. Otherwise, special precautions are needed to prevent one dispersion from causing the other to separate from the aqueous phase.

A dispersion of soft resin having these preferred qualities may conveniently be prepared by utilizing the strong internal cohesion that they possess. It has been found that satisfactory dispersions may be made by first thoroughly mixing the resin with a wetting agent, then adding sufficient alkali to make the mixture slightly alkaline, and then slowly mixing in the water. As the water is added a water-in-resin type emulsion is first formed which soon loses the characteristic stickiness of these resins and becomes creamy. On the further addition of water, the phases reverse and a very fine solvent free dispersion of resin in water is formed. To illustrate this method of preparing the dispersion, the following example is given—

Example 1.—25 parts by weight of castor oil modified glycerol-sebacic acid resin are mixed with 7.5 parts by weight of a 20% solution of sodium diisobutyl phenoxyethyl sulfate until a thoroughly homogeneous mixture is obtained. 7.5 parts by weight of a 2% sodium hydroxide solution and 60 parts by weight of water are then successively mixed into the mass. The water is added with constant mixing at a rate sufficiently slow to prevent the formation of lumps or strings and a very stable emulsion is produced.

The emulsions or solutions of hardenable resin with which the dispersions of non-hardenable resin are to be used are those that are commercially available. The dispersions of soft resin are miscible with these commercially available emulsions and solutions in diluted or undiluted form and in all proportions. The quantity that should be added is dependent, among other things, on the type of fabric, the type of finish to be produced, and the particular desire of the manufacturer. Ordinarily when the dispersions of soft resin are used with materials which form very hard films, such as those produced by urea-formaldehyde condensates, the quantity of non-hardenable resin is between two and three times that of the hardenable. When the material to be modified forms a relatively soft film, such as the acrylates, the amount of non-hardenable resin is usually less than one-third of the hardenable. Except when a water soluble urea-formaldehyde resin is used to obtain crush resistance, the total resin content of the treating bath will not exceed 5% by weight and generally is between 1 and 3%. For a crush-resistant finish using a soluble resin, the total resin in the bath is usually in the range of from 20% to 30%.

The following examples are given to show how the invention is applied—

Example 2.—2 parts by weight of the castor oil modified glycerol-sebacic acid resin emulsion prepared as in Example 1 are mixed with 1 part by weight of a 25% emulsion of a urea formaldehyde-butanol condensate prepared by the process

disclosed in my copending application Serial No. 179,865 filed December 15, 1937, and the mixture is diluted with 60 parts by weight of water. A small amount of an acid reacting condensing agent may be added to accelerate the subsequent curing of the urea resin. A 136 x 60 broadcloth is padded through the emulsion, dried, and given a two-minute cure at about 280° F. The resulting fabric has a soft, full, mellow hand and a silky touch, whereas the same cloth treated only with the urea resin emulsion is firm, wiry, thin, and sandy.

Example 3.—An 80 x 80 carded cotton percale is padded through a bath prepared by mixing 2 parts by weight of a 25% emulsion of a copolymer 90% methyl acrylate and 10% ethyl acrylate, 1 part by weight of emulsion prepared in Example 1, and 150 parts of water. The treated fabric has a soft, full, oily hand, and the usual thickness or bulkiness produced by such treatment.

Example 4.—4 parts by weight of a castor oil-glycerol-sebacic acid resin emulsion prepared as in Example 1 is added to 96 parts of a 25% aqueous solution of a urea formaldehyde reaction product. A small amount of an acid reacting condensing agent is added. A men's suiting fabric made from spun rayon and cotton is padded through the mixture, dried, and the urea resin cured. The resulting fabric has a soft, full, and woolly hand, whereas the same material similarly treated with the urea formaldehyde solution alone has a cold, thin, and sandy hand.

Example 5.—A spun silk and acetate rayon shantung dress fabric was padded through a bath prepared by mixing together ½ part by weight of the emulsion prepared as in Example 1, and 2½ parts by weight of a 15% emulsion of an organic solvent soluble ethyl cellulose plasticized by hydrogenated rosin ester and diluting with 36 parts of water. The treated fabric has a firm, silky hand.

Example 6.—A 25% emulsion of a phthalic anhydride-glycerol-sebacic acid resin was prepared by the procedure illustrated in Example 1. 1 part of this emulsion was mixed with 4 parts of a 25% emulsion of polyethylacrylate and 150 parts of water. A carded cotton 80 x 80 percale was padded through the mixture and dried. It had a soft, full, slightly oily hand, whereas a leathery hand is produced by the unmodified acrylate emulsion.

Example 7.—A 25% emulsion of diethylene glycol-glycerol-sebacic acid resin was prepared by the procedure of Example 1. 1 part by weight of this emulsion was mixed with 2 parts by weight of a 25% emulsion of polyethylmethacrylate and 100 parts of water. Silk treated with the mixture was very effectively delustered but was still soft and silky.

Example 8.—3½ parts by weight of a 25% emulsion of a drying oil modified glycerol phthalate resin, and ½ part by weight of a 25% aqueous emulsion of a terpeneol-pine oil-glycerol-maleic anhydride resin prepared by the process of Example 1, are mixed and diluted with 100 parts of water. Yarn dyed cotton suiting treated with this solution has a woolly, oily softness whereas identical fabric treated in the same manner with a liquid containing only a drying oil modified glycerol phthalate resin has an artificial, disagreeable leatheriness.

While the effects produced by the mixture of soft resin and hardenable resin obtained in the foregoing examples may be duplicated by plasticizing the hardenable resin, the effects of the

plasticizer are lost when the fabric is washed, whereas the same effects when produced by the herein disclosed process are retained even after repeated laundering. This is true not only of the feel produced by the resin itself, but also of the hand produced by mechanical finishes such as calendering or "button breaking."

I claim:

1. The process of finishing textiles which comprises padding a textile material through an aqueous finishing bath having suspended therein emulsified particles of a resinous material selected from organic solvent-soluble urea-formaldehyde monohydric aliphatic alcohol condensates and polymers of methyl and ethyl esters of acrylic and methacrylic acids and having also suspended therein discrete particles of a soft, non-hardening, non-drying resin containing sebacic acid reacted with glycerine, which non-hardening resin is separately emulsified in a particle size of less than 0.5 micron in a medium of a pH between 6.6 and 8.2, said finishing bath having a total resin content of less than 5% by weight, and thereafter drying said padded textile material.

2. The process of finishing textiles which comprises padding a textile material through an

aqueous finishing bath having suspended therein emulsified particles of an organic solvent-soluble urea-formaldehyde-butanol condensate and having also suspended therein discrete particles of a soft, non-hardening, non-drying resin containing sebacic acid reacted with glycerine, which non-hardening resin is separately emulsified in a particle size of less than 0.5 micron in a medium of a pH between 6.6 and 8.2, said finishing bath having a total resin content of less than 5% by weight, and thereafter drying said padded textile material.

3. The process of finishing textiles which comprises padding a textile material through an aqueous finishing bath having suspended therein emulsified particles of a polymer of ethyl acrylate and having also suspended therein discrete particles of a soft, non-hardening, non-drying resin containing sebacic acid reacted with glycerine, which non-hardening resin is separately emulsified in a particle size of less than 0.5 micron in a medium of a pH between 6.6 and 8.2, said finishing bath having a total resin content of less than 5% by weight, and thereafter drying said padded textile material.

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