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PROCESS FOR IMPROVING THE RESISTANCE TO SHRINKING AND FELTING OF FABRICS

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The present invention relates to the treatment of fabrics containing wool or other animal yarns for the purpose among others of improving the resistance to felting and shrinking of such fabrics.

It has been proposed heretofore to treat fabrics containing wool yarns with neutral or mildly alkaline aqueous solutions of melamine-formaldehyde condensation products and then insolubilize the condensation product in the fabric by heating the treated fabric at relatively high temperatures in the presence of a curing catalyst for the condensation product. This process requires high curing temperatures and relatively long curing times and has the disadvantages, among others, of requiring special equipment and of imparting undesirable physical characteristics to the fabrics. These undesirable characteristics include yellowing, tendering, harsh hand etc. It has also been proposed heretofore to treat fabrics with highly acidic aqueous solutions of melamine-formaldehyde condensation products, which solutions are prepared by dissolving a partially polymerized or hydrophobic melamine-formaldehyde condensation product in a concentrated aqueous solution of an organic acid, followed by heating of the fabric to insolubilize the condensation product. This process has the disadvantage, among others, of requiring the use of a treating solution which has insufficient stability for use in commercial mill operations.

Both of the above described processes have the added disadvantage of requiring the deposition of from 8 to 25% of the condensation product on the weight of the fabric, depending on the nature of the fabric treated, for adequate shrinkage and felting control. The use of such large amounts of condensation product is considered objectionable by the trade partly because of the resulting high cost of the finished fabric and partly because of the undesirable drape and handle imparted to the fabric.

In accordance with the present invention it is possible to treat fabrics containing wool or other animal yarns with a relatively stable aqueous bath of a potentially resinous substance which can be insolubilized at low temperatures and applied to the fabric in small concentrations without yellowing or tendering the fabric and without imparting a harsh handle thereto, and at the same time impart exceptional resistance to shrinking and felting.

It is accordingly one object of the present invention to provide an improved process for treating fabrics containing wool or other animal yarns for improving the resistance of such fabrics to shrinking and felting.

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A further object of the present invention is to treat fabrics containing wool or other animal yarns with small amounts of a potentially resinous substance which is insolubilized at relatively low temperatures and which provides a finished fabric which is highly resintant to shrinking and felting while retaining the soft hand of the untreated fabric.

Still further objects and advantages of the present invention will appear in the following description and the appended claims.

The processes of this invention are carried out, in general, by first impregnating a fabric containing wool or other animal yarns with a relatively dilute acidic aqueous colloidal solution of a partially polymerized methylated methylol melamine or methyl ether of a methylol melamine condensation product having a mol ratio of combined formaldehyde to melamine of at least 2.8 to 1 or higher. After the fabric has been impregnated with the colloidal solution, for example, by dipping the fabric in a bath of the colloidal solution, the fabric is then extracted, for example, by passing it through a mangle or pad rolls, the concentration of the colloidal solution and degree of extraction being adjusted so as to deposit from 3.5 to 8% by weight of the condensation product, based on the weight of the fabric. The fabric is then dried and the condensation product insolubilized on the fabric by heating the fabric at relatively low temperatures.

The colloidal solutions employed herein may be prepared in a variety of ways. On suitable method of preparation consists in first forming an aqueous solution of a water-soluble methyl ether of methylol melamine condensation product having a pH between 7 and 11 and containing at least 3.4 mols of combined formaldehyde and preferably at least 2 mols of combined methanol for each mol of melamine in the condensation product. This solution is then mixed with a water-soluble organic acid selected from the group consisting of acetic acid, hydroxy acetic acid and formic acid, and water, if required, to form a solution containing from 6 to 12% by weight of the condensation product. The amount of acid required to form the colloidal solution is primarily dependent on the construction of condensation product in the solution and the particular species of acid used. Satisfactory colloidal solutions are formed, for example, by using from 6 to 8.5% by weight of acetic acid calculated on the basis of a 10% by weight solution of the condensation product, or by using the same amounts of hydroxyacetic (glycollic) acid instead of acetic acid, or by using from 1.2 to 3% by weight of

formic acid calculated on the basis of a 10% by weight solution of the condensation product. The proportions of acid used thus fall within the range of 1.2 to 8.5% by weight of the acid calculated on the basis of a 10% by weight solution of the condensation product, the particular amount of acid used being dependent on the particular species of acid employed.

Of the organic acids employed to prepare the colloidal solutions acetic acid is the cheapest and the most suitable for this use. It is therefore preferred for use in forming the colloidal solutions of the condensation product. When acetic acid is used it is preferred to use from 6.5 to 8% by weight of acetic acid calculated on the basis of a 10% solution of the condensation product. When using hydroxyacetic acid it is preferred to use from 7 to 8.5% of such acid calculated on the basis of a 10% solution of the condensation product. When using formic acid it is preferred to use from 1.4 to 2% of such acid calculated on the basis of a 10% solution of the condensation product.

After the acid has been added to the 6 to 12% aqueous solution of the condensation product, the resulting solution is aged at least until the particles of condensation product contained therein polymerize sufficiently to attain colloidal size. The formation of the colloidal solution is evidenced in part by a change in the appearance of the original solution. The original solution is water clear but after standing at a temperature, for example, of 70 to 90° F. for about 4 hours it develops a bluish opalescence or haze and gives the characteristic Tyndall effect of colloidal solutions. At these temperatures a 6 hour aging period is generally suitable for developing colloidal sized particles under mill conditions. The colloidal solutions are generally still suitable for use after aging for 72 to 168 hours.

The viscosity of the solution is one criterion for determining its suitability after prolonged periods of aging. A 10% colloid solution of the condensation product, after 4 to 6 hours of aging, has a viscosity of about 3 to 5 centipoises. The viscosity does not change to any appreciable extent during aging until a relatively short period of time prior to the conversion of the colloidal solution to a thick jelly or gel. Then the viscosity rises relatively rapidly and gelation generally takes place within a period of 1 to 5 hours. Generally the colloidal solution is usable until its viscosity rises above 15 centipoises. After that the colloidal solution may become unfit for use during the treatment of the fabric.

The aging temperature and exposure of the solution to air have a marked influence on the rate of formation of the colloidal solution and the rate at which such solution finally converts to a gel. At temperatures below 70° F., that is, between about 40° F. and 70° F., the colloidal solution forms at a relatively slow rate and the original solution may require more than a 6 hour aging period before it is converted to a colloidal solution. At temperatures above 90° F., that is, temperatures of 100 to 200° F. the colloidal solution forms at a relatively rapid rate and the original solution may be satisfactorily converted to a colloidal solution within a 3 hour aging period. Exposure of the colloidal solution to air decreases the time period within which the colloidal solution will be stable to gelation. In general, an aging period of 3 to 72 hours is suitable for the preparation of the colloidal solution using the aging temperatures described above. It is preferred, however, to use an aging period of 6 to 30 hours.

The formation of the colloidal solution of the condensation product is further evidenced by the fact that the condensation product therein becomes substantive to cotton fibers. This is in contrast to the original solution of the condensation product since the condensation product in such solution is not substantive to cotton fibers prior to acidifying and aging. The substantivity of the colloidal particles to cotton fibers is also strong evidence that they are positively charged since it is generally believed that cotton fibers have a negative charge in the presence of water. The colloidal solutions are further characterized by the fact that the particles of condensation product therein are not substantive to wool or other keratinous fibers, that is to say, such particles do not migrate from the colloidal solution to the wool fibers.

The condensation product in the colloidal solution is characterized by the fact that it contains at least 2.8 mols of combined formaldehyde for each mol of melamine therein. The ratio of combined formaldehyde to melamine is higher than 2.8 to 1 in those instances where the original methyl ether of methylol melamine condensation product contains from 3.5 to 6 mols of combined formaldehyde and more than 2.5 mols of combined methanol for each mol of melamine. Methyl ethers containing 6 mols of combined formaldehyde and from 5 to 6 mols of combined methanol may also be used to prepare the colloidal solutions employed herein. However, such products are quite expensive to prepare. Moreover, they do not show any advantage and are not as stable in colloidal form, in most instances, as the lower methylated products described above. Best results are obtained by using colloidal solutions which are prepared from methyl ethers of methylol melamine condensation products which contain originally from 3.4 to 5.5 mols of combined formaldehyde and from 2 to 3 mols of combined methanol for each mol of melamine and these products are, accordingly, preferred.

The methyl ethers of methylol melamines employed in this invention are commercially available products and may be prepared in various ways. A suitable method for their preparation consists in first reacting melamine and formaldehyde, as formalin, in mol ratios of about 1:3.5 to about 1:8 in an alkaline reacting solution at a temperature between about 60 and 90° C. until the melamine is substantially dissolved. Methanol is then added to this solution for the purpose of forming the methyl ether. In general, from about 10 to 30 mols of methanol are employed for each mol of melamine used. The solution is then acidified to a pH between about 2 and 5 with a strong mineral acid such as phosphoric acid, hydrochloric acid and the like. This mixture is heated to a temperature between about 30 and 60° C. until a homogeneous solution is obtained and the condensation product contains at least 3.4 mols of combined formaldehyde and at least 2 mols of combined methanol for each mol of melamine used. The reaction is discontinued, however, before the degree of polymerization is such that the condensation product is precipitated on dilution of the solution with water. This solution is then neutralized with a fixed alkali such as caustic potash, caustic soda and the like and then cooled. Precipitated salts formed by the neutralization of the excess mineral acid with the fixed alkali may be removed, if desired, by

filtering, centrifuging or the like. The solution is now ready for use in the preparation of the colloidal solution of the condensation product.

A further understanding of this invention will be obtained from the following specific examples which are intended to further illustrate the invention, but not to limit the scope thereof, parts and percentages being by weight unless otherwise specified.

Example I

A. *Preparation of a water solution of a water-soluble methyl ether of methylol melamine.*—One hundred and twenty-seven parts (approximately 1 mol) of melamine were mixed with 365 parts of a 37% aqueous solution of formaldehyde (4.5 mols HCHO). The resulting mixture was adjusted to a pH of 8.6 (glass electrode) with NaOH and then heated at a temperature of 70° C. until the melamine was substantially dissolved. After a further reaction of about 5 minutes, 640 parts (20 mols) of methanol were added to the solution and the pH was adjusted to 4.0 (glass electrode) with phosphoric acid. The reaction was then continued for an additional 15 minutes at a temperature of approximately 40° C. The pH of the solution was then adjusted to 10.5 (glass electrode) with NaOH. The resulting solution was then concentrated by subjecting it to a vacuum of 10 millimeters of mercury at a temperature of 60° C. until it contained 60% Condensation product. The solution was then cooled rapidly to 20° C. The resulting solution was infinitely dilutable with water. The condensation product in the solution was analyzed and was found to contain 3.5 mols of combined formaldehyde and 2.2 mols of combined methanol for each mol of melamine used.

B. *Preparation of acidic aqueous colloidal solution of methyl ether of methylol melamine.*—One hundred and forty parts of the 60% solution, as prepared above, were stirred together with 593 parts of water and 109 parts of 56% acetic acid. The resulting solution contained about 10% of the methyl ether of methylol melamine condensation product and about 7.2% of acetic acid and had a pH of 3.9. The solution was allowed to age for 6 hours at 85° F. During this aging the particles of the condensation product became colloidal in size as evidenced by the bluish haziness of the solution and by the fact that it gave the Tyndall effect which is characteristic of colloidal solutions. The colloidal particles of partially polymerized condensation product were substantive to cotton fibers but were not substantive to wool fibers or other animal fibers. This colloidal solution had a pH of 3.7. The condensation product was analyzed and contained 2.9 mols of combined formaldehyde for each mol of melamine.

C. *Treatment of all wool fabric.*—Three hundred parts of the colloidal solution, prepared as described in paragraph B above, were diluted with 200 parts of water. The resulting colloidal solution contained 6% condensation product. A piece of essentially neutral and substantially oil-free all wool plaid fabric was wetted out in this colloidal solution and then extracted by passing it between pad rolls set at a pressure of 40 pounds per linear inch. This gave a pick-up of 70% of solution on the weight of the fabric. About 4% of the condensation product on the weight of the fabric was deposited. The fabric was dried for 10 minutes at 200° F. and then heated for an additional 10 minutes at 250° F. to insolubilize the condensation product. The fabric was next rinsed for 5 minutes in water at a temperature of 110° F., scoured for 10 minutes in a 0.1% water solution of dodecyl benzene sodium sulfonate at a temperature of 110° F. and finally rinsed in water at 110° F. The fabric exhibited no yellowing or tendering and had an exceptionally soft hand.

D. *Shrinkage and felting results.*—The treated fabric, as prepared according to paragraph C above, was first measured along the warp and filling dimensions and was then washed for 60 minutes in water adjusted to a pH between 5 and 7 with a buffer and at a temperature of 140° F. This wash is equivalent to 10 standard AATCC (American Association of Textile Chemists and Colorists) wool washes. The fabric was again measured along the warp and filling dimensions.

A piece of neutral oil-free all wool plaid fabric from the same roll was processed in exactly the same manner except that it was not treated with the colloid solution of the condensation product.

The following table shows the percent total shrinkage and the percent felting shrinkage of the treated and untreated fabric along the warp and filling dimensions.

	Percent Total Shrinkage		Percent Felting Shrinkage	
	Warp	Filling	Warp	Filling
Treated Fabric	8.0	1.0	6.1	0.7
Untreated Fabric	22.1	16.0	18.6	14.2

Example II

A. *Preparation of acidic aqueous colloidal solution of methyl ether of methylol melamine.*—Two hundred and eighty parts of the 60% solution prepared in accordance with paragraph A of Example I, were stirred together with 1376 parts of water and 28 parts of 100% formic acid. The resulting solution contained about 10% of the methyl ether of methylol melamine condensation product and 1.6% formic acid and had a pH of 5.5. This solution was allowed to age for 6 hours at 85° F. for a period of 6 hours. After this period of aging the solution was converted to a colloidal solution having a bluish hazy appearance and a viscosity of 4 centipoises. The colloidal particles of partially polymerized condensation product were substantive to cotton fibers, but were not substantive to wool fibers. This colloidal solution had a pH of 5.3. Analysis showed that the condensation product therein contained 2.95 mols of combined formaldehyde for each mol of melamine.

B. *Treatment of all wool fabric.*—Six hundred parts of the colloidal solution, prepared as described immediately above, were diluted with 400 parts of water. The resulting solution contained 6% condensation product. A piece of essentially neutral and substantially oil-free all wool plaid fabric was wetted out in this colloidal solution and then extracted by passing it between pad rolls adjusted to give a pick-up of 86% of solution on the weight of the fabric. About 5.1% of the condensation product was thereby deposited on the fabric. The fabric was dried for 10 minutes at 180° F. and then heated for an additional 10 minutes at 250° F. to insolubilize the condensation product. The fabric was next rinsed for 5 minutes in water at 110° F., scoured for 10 minutes in an 0.1% water solution of dodecyl benzene

sodium sulfonate at a temperature of 110° F. and finally rinsed in water at 110° F. The resulting fabric exhibited no signs of yellowing or tendering, and had an exceptionally soft touch or hand.

C. *Shrinkage and felting results.*—The treated fabric, as prepared immediately above, was first measured along the warp and filling and was then washed for 60 minutes in water adjusted between a pH of 5 and 7 with a buffer and at a temperature of 140° F. The fabric was again measured along the warp and filling dimensions.

A piece of neutral, oil-free, all wool plaid fabric from the same roll was processed in exactly the same manner except that it was not treated with the colloidal solution of the condensation product.

The following table shows the percent total shrinkage and the percent felting shrinkage of the treated and untreated fabric along the warp and filling dimensions.

	Percent Total Shrinkage		Percent Felting Shrinkage	
	Warp	Filling	Warp	Filling
Treated Fabric	7.1	1.3	5.2	0.7
Untreated Fabric	22.0	16.0	18.5	14.1

Example III

A. *Preparation of acidic aqueous colloidal solution of methyl ether of methylol melamine.*—Two hundred and eighty parts of the 60% solution prepared in accordance with paragraph A of Example I were stirred together with 122 parts of 100% hydroxy acetic acid and 1282 parts of water. The resulting solution contained about 10% of the methyl ether of methylol melamine condensation product and about 7.2% of hydroxy acetic acid. The solution was allowed to age for 30 hours at a temperature of 80° F. At the end of the aging period the solution had a bluish opalescent appearance and the particles of partially polymerized condensation product were substantive to cotton fibers, but not to wool fibers. The solution was analyzed and it was found that the condensation product therein comprised 2.9 mols of combined formaldehyde per mol of melamine.

B. *Treatment of all wool fabric.*—Three hundred and sixty parts of the colloidal solution, prepared as described immediately above, were diluted with 240 parts of water. The resulting solution contained 6% condensation product. A piece of essentially neutral and substantially oil-free all wool plaid fabric and wetted out in this colloidal solution and then extracted by passing it between pad rolls adjusted to give a pick-up of 88% of solution on the weight of the fabric. About 5.3% of the condensation product was thereby deposited on the fabric. The fabric was dried for 10 minutes at 180° F. and then heated for an additional period of 10 minutes at 250° F. to insolubilize the condensation product. This was followed by rinsing the fabric for 5 minutes in water at 110° F., scouring the fabric for 10 minutes in a 0.1% water solution of dodecyl benzene sodium sulfonate at a temperature of 110° F. and finally rinsing the fabric in water at 110° F. The treated fabric exhibited no signs of yellowing or tendering and possessed an exceptionally soft hand.

The following table illustrates the percent shrinkage and percent felting shrinkage of the treated fabric and a control fabric after 1 wash such as that described in paragraph C of Example II.

	Percent Total Shrinkage		Percent Felting Shrinkage	
	Warp	Filling	Warp	Filling
Treated Fabric	6.7	1.3	5.1	0.4
Control	22.1	16.0	18.6	14.2

Example IV

A. *Preparation of methyl ether of methylol melamine.*—One hundred and twenty-seven parts (approximately 1 mol) of melamine were mixed with 485 parts parts of a 37% aqueous solution of formaldehyde (6 mols HCHO). The resulting mixture was adjusted to a pH of 8.5 (glass electrode) with NaOH and then heated at a temperature of 70° C. until the melamine was substantially dissolved. After a further reaction of about 5 minutes, 640 parts (20 mols) of methanol were added to the solution and the pH was adjusted to 4.0 (glass electrode) with hydrochloric acid. The reaction was then continued for an additional 20 minutes at a temperature of approximately 40° C. The pH of the solution was then adjusted to 10.5 (glass electrode) with NaOH. The resulting solution was then concentrated by subjecting it to a vacuum of 5 millimeters of mercury at a temperature of 60° C. until it contained 50% condensation product. The solution was then cooled rapidly to 25° C. It was infinitely dilutable with water. The condensation product in the solution was analyzed and was found to contain 5.3 mols of combined formaldehyde and 2.9 mols of combined methanol for each mol of melamine used.

B. *Preparation of acidic aqueous colloidal solution of methyl ether of methylol melamine.*—One hundred and sixty-eight parts of the 50% solution, as prepared immediately above, were stirred with 565 parts of water and 109 parts of acetic acid (56%). The resulting solution contained about 10% of the methyl ether of methylol melamine condensation product and about 7.3% of acetic acid. The solution was allowed to age for 6 hours at 85° F. during which time it developed a bluish opalescent appearance and the particles of partially polymerized condensation product became substantive to cotton fibers, but not to wool fibers. The condensation product in this colloidal solution was analyzed and was found to comprise 3.1 mols of combined formaldehyde per mol of melamine.

C. *Treatment of all wool flannel.*—Three hundred and sixty parts of the colloidal solution as prepared immediately above, were mixed with 240 parts of water to form a colloidal solution containing 6% of the condensation product. A piece of essentially neutral and substantially oil-free all wool 8½ ounce flannel fabric was wetted out in this colloidal solution and then extracted by passing it through pad rolls adjusted to give a pick-up of 70% of solution on the fabric weight. Approximately 4% of the condensation product, on the weight of the fabric, was thereby deposited. The fabric was next dried at 190° F. for 10 minutes and heated for an additional 12 minutes at 250° F. to insolubilize the condensation product. After this the fabric was rinsed for 10 minutes in water at 110° F., scoured for 10 minutes in a 0.2% water solution of dodecyl benzene sodium sulfonate at a temperature of 110° F. and finally rinsed in water at 110° F. The

fabric was then dried at 180° F. The treated fabric had an excellent handle and drape and excellent resistance to shrinking and felting. It exhibited no signs of yellowing or tendering.

The invention illustrated in the examples is not limited to the treatment of fabrics containing all wool or other animal yarns, for it is equally applicable to the treatment of fabrics containing various amounts of other yarns containing cotton, linen, regenerated cellulose, cellulose acetate, nylon, vinyl chloride-vinyl acetate copolymer, polyacrylonitrile or acrylonitrile copolymer fibers or filaments or the like. The fabric should, however, contain at least 50% by weight of wool or other animal yarns. The fabric to be treated is preferably dyed prior to the treatment with the colloidal solution.

The amount of colloidal solution picked up by the fabric after wetting out or impregnating by dipping may be varied to some extent depending upon the extracting equipment used and the amount of condensation product which it is desired to apply to the fabric. The pick-up of solution preferably should not exceed about 110% by weight based on the fabric as dusting of the cured resin becomes noticeable and oftentimes undesirable at higher pick-ups. It was pointed out earlier in the description of this invention that 3.5 to 8% by weight of the condensation product is applied to the fabric. This amount is readily applied to the fabric by using colloidal solutions containing from 3.5 to 12% by weight of the condensation product and then extracting the fabric until the desired weight of condensation product is deposited thereon.

The drying and curing conditions set forth in the examples and elsewhere in this description may be varied considerably. For example, it is possible to dry the fabrics at other temperatures, for instance, at temperatures of 120 to 200° F. and it is also possible to cure the fabrics, that is, insolubilize the condensation product at temperatures of 200 to 325° F. It is also possible to dry the fabric and insolubilize the condensation product in one operation, for example, by heating the extracted fabric after the treatment with the colloidal solution to a temperature of 200 to 325° F. A preliminary drying prior to insolubilization of the condensation product is preferable, however, since this reduces the tendency of the condensation product to migrate to the fabric surface, thereby imparting a somewhat harsh handle.

The duration of drying or curing may also be varied considerably. In general, the fabric is dried for a period of 5 to 25 minutes. The time required for curing depends primarily on the temperature used, lower temperatures requiring longer curing periods. In general, the condensation product is insolubilized or cured satisfactorily within a period of from 5 to 15 minutes at temperatures of from 325 to 200° F.

Various modifications and changes may be made in the processes and compositions of this invention as will be apparent to those skilled in the art to which it appertains without departing from the spirit and intent of the present invention. Accordingly, it is intended that this invention be limited only by the scope of the appended claims.

What is claimed is:

1. A process of improving the resistance to shrinking and felting of fabrics comprising animal yarns which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) a partially polymerized positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde per mol of melamine and (2) a water-soluble organic acid selected from the group consisting of acetic acid, hydroxyacetic acid and formic acid; extracting the fabric to deposit from 3.5 to 8% by weight, based on the fabric, of said condensation product; and heating said fabric at temperatures between 200 and 325° F. to insolubilize said condensation product.

2. A process of improving the resistance to shrinking and felting of fabrics comprising animal fibers which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) from 3.5 to 12% by weight of a partially polymerized positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde per mol of melamine and (2) from 1.2 to 8.5% by weight, calculated on the basis of a 10% by weight solution of the condensation product, of a water-soluble organic acid selected from the group consisting of acetic acid, hydroxy acetic acid and formic acid; extracting the fabric to deposit from 3.5 to 8% by weight, based on the fabric, of said condensation product; and heating said fabric at temperatures between 200 and 325° F. to insolubilize said condensation product.

3. A process of improving the resistance to shrinking and felting of fabrics comprising at least 50% by weight of wool yarns which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) from 3.5 to 12% by weight of a partially polymerized positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde per mol of melamine and (2) from 6.5 to 8% by weight, calculated on a 10% by weight solution of said condensation product, of acetic acid, said solution being at a temperature of about 70 to 90° F.; extracting the fabric to deposit from 3.5 to 8% by weight, based on the fabric, of the condensation product; and then heating the fabric at temperatures of 200 to 325° F. to insolubilize said condensation product.

4. A process of improving the resistance to shrinking and felting of fabrics comprising at least 50% by weight of wool yarns which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) from 3.5 to 12% by weight of a partially polymerized, positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde per mol of melamine and (2) from 7 to 8.5% by weight, calculated on a 10% by weight solution of the condensation product, of hydroxy acetic acid, said solution being at a temperature of 70 to 90° F.; extracting said fabric to deposit from 3.5 to 8% by weight, based on the fabric, of the condensation product; and heating said fabric at temperatures between 200 and 325° F. to insolubilize said condensation product.

5. A process of improving the resistance to shrinking and felting of fabrics comprising at least 50% by weight of wool yarns which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) from 3.5 to 12% by weight of a partially polymerized, positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde per mol of melamine

and (2) from 1.4 to 2% by weight, calculated on a 10% by weight solution of the condensation product, of formic acid, said solution being at a temperature of 70 to 90° F.; extracting said fabric to deposit from 3.5 to 8% by weight, based on the fabric, of the condensation product; and heating said fabric at temperatures of 200 to 325° F. to insolubilize said condensation product.

6. A process substantially according to claim 2, but further characterized in that the organic acid used is acetic acid and it is used in an amount sufficient to provide a solution containing from 6 to 8.5% by weight of said acid calculated on the basis of a 10% by weight solution of the condensation product.

7. A process susbtantially according to claim 2, but further characterized in that the organic acid used is hydroxyacetic acid and it is used in an amount sufficient to provide a solution containing from 6 to 8.5% of said acid calculated on the basis of a 10% by weight solution of the condensation product.

8. A process substantially according to claim 2, but further characterized in that the organic acid used is formic acid and it is used in an amount sufficient to provide a solution containing from 1.2 to 3% by weight of said acid calculated on the basis of a 10% by weight solution of the condensation product.

9. A process of improving the resistance to shrinking and felting of fabrics comprising animal yarns which comprises wetting out the fabric in an acidic aqueous colloidal solution of (1) a partially polymerized positively charged methyl ether of methylol melamine condensation product containing from 2.8 to 6 mols of combined formaldehyde and from 2 to 6 mols of combined methanol per mol of melamine and (2) a water-soluble organic acid selected from the group consisting of acetic acid, hydroxyacetic acid and formic acid; extracting the fabric to deposit from 3.5 to 8% by weight, based on the fabric, of said condensation product; and heating said fabric at temperatures between 200 and 325° F. to insolubilize said condensation product.

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