

UNITED STATES PATENT OFFICE

2,484,598

REDUCING THE CREASE AND WRINKLING
TENDENCIES OF CELLULOSIC TEXTILE
FABRICS

Mark Weisberg, Providence, Archibald S. Stevenson, Pawtucket, and Leo Beer, Providence, R. I., assignors to Alrose Chemical Company, Cranston, R. I., a corporation of Rhode Island

No Drawing. Application June 5, 1945,
Serial No. 597,714

12 Claims. (Cl. 117—139.4)

1

This invention relates to the treatment of textile materials containing either natural or artificial cellulose fibers, alone or in mixtures of the two in various proportions, or in mixtures with protein fibers, such as wool, or fibers made from modified proteins, such as "Aralac" (trade-marked product of Aratex Inc. of Bristol, Rhode Island, which according to Hack and Grant's Chemical Dictionary, 3rd Ed. p. 71, is derived from casein) etc., to reduce their tendencies toward creasing and wrinkling. Fabrics made from these fibers more or less quickly suffer in appearance and lose their freshness when crushed, twisted or otherwise subjected to localized physical force. Rayon, moreover, by usage and successive washings develops on the face of the fabric a fuzz or lint, which denotes wearing of the cloth.

A widely employed chemical process for checking this marked yet natural tendency of cellulosic fabricated material is to apply a certain minimum quantity of specific types of a water-soluble resin in the presence of an acid or acid-liberating salt, then convert this precondensate into an insoluble resin by baking or curing. The resins are usually the urea-formaldehyde or melamine-formaldehyde types. To accomplish this, the textile material is impregnated with, for example, an aqueous solution of about 20% concentration of a dry urea-formaldehyde precondensate. These solutions also contain a small percentage of a free acid, such as boric, or lactic acids, etc., or salts which liberate free acid on drying, baking, or curing, the fabric, such as for example NH_4Cl , $(\text{NH}_4)_2\text{SO}_4$ or $(\text{NH}_4)_2\text{HPO}_4$. This acid or acid-liberating salt is known as a catalyst, whose function is to convert the soluble precondensate to the insoluble form. After the impregnation, the fabrics are squeezed, dried at about 120° F., then baked or cured. After these steps, the goods are washed, soaped, rinsed and dried.

The term "baking" or "curing" means heating the goods for a period of from 3-8 minutes in a dry heat, employing the temperature range of 250° F.-300° F. or even higher. By this operation the soluble precondensate, in the presence of the acid or acid-liberating salt, is converted to the insoluble resin. The importance or critical nature of the baking or curing step is exemplified

2

by the possibility of either under-treatment or over-treatment (baking), in either situation, with attendant disadvantages known to everyone who is familiar with use of this type of resin and treatment of fabrics therewith.

This aforesaid treatment does render cellulosic textile materials less susceptible to creasing. That this standard process does have certain disadvantages is well recognized. An aqueous solution of precondensate of this kind containing any one of the free acids or acidic salts is unstable, considering the concentration of the solutions necessary to produce crush-resistance. These said catalysts cause premature polymerization and the solutions are consequently of no further use for this purpose. Goods impregnated with solutions of urea-formaldehyde or melamine-formaldehyde type precondensates which solutions contain free acids or acidic salts must of necessity be cured without undue delay. Otherwise, premature polymerization takes place. As a consequence the best results are not possible under this condition.

In addition to this, this treatment has several fundamental disadvantages, especially when applied to natural cellulose fibers. This statement will be amplified and reference will be made to several specific fibers.

In the case of rayon fabrics, the crease-proofing, is carried out in many plants in the above-described manner, and it does not present too many difficulties to those familiar with the art. However, while it is known that in treating rayon fabrics with this type resins, the tensile strength of the material is increased in the dry state, it is likewise recognized that the resistance to abrasion is decreased to the extent of perhaps 50%. Thus, the treatment of rayons with such resins in the conventional manner actually affects deleteriously the wearing qualities of the fabric so treated.

While the conventional method of treating cotton goods with resins, as described supra, improves the appearance of the goods, the injuries to the fabric by the process more than offset any advantage which results. Significantly, the tensile strength is reduced by 30-50%, and the resistance to abrasion is reduced by 50-60%. It is, therefore, apparent that the wearing qualities of

cotton goods treated in the conventional manner with resins are seriously impaired.

According to the percentage of cotton in the weave or yarn of goods consisting of a mixture of cotton and rayon, to that extent the tensile strength of the fabric is affected seriously by the aforesaid conventional treatment with such resins. The resistance to abrasion in fabrics woven or knitted from mixture of the two fibers, cotton and rayon is affected in the same manner as in fabrics woven or knitted of the individual fiber. Thus it will be apparent that the conventional treatment with such resins of fabrics woven or knitted from mixtures of cotton and rayon likewise impairs their wearing qualities.

To improve the appearance of linen by crease-proofing is a difficult problem. In the first place the linen fiber is very sensitive to most chemical actions. When that percentage of resin is incorporated in the fiber which is necessary to produce crease-resistance, the tensile strength and resistance to abrasion are so affected that the linen fabrics have no wearing qualities at all. Yet when the percentage of resin incorporated into the fiber is reduced in order to retain the tensile strength, the fabrics have no crush resistance.

The incorporation of resin in the fiber by the employment of the orthodox or conventional resin treatment on mixtures of linen and other cellulose fibers, either in the yarn or woven fabric, is fraught with serious disadvantages. While the appearance of the fabric may be enhanced, the serious impairment of the tensile strength and the resistance to abrasion more than offset any advantage derived from the process. This is more apparent as the percentage of linen in the mixture is increased.

The view or opinion in the industry has heretofore been held that to produce washable crush-proofing within the cellulosic fiber the reaction necessary to produce crush-proofing, namely insolubilizing the precondensate, must take place in a sour medium. As has been seen, in the conventional method as described previously, the resin precondensate treatment required the addition of a certain proportion of an acid or an acid-liberating salt in order to produce crease-proofing. If there is not a sufficiently high percentage of acid or acid-liberating salt in the solution of the resin precondensate so as to produce a certain pH value on the acid side, the resulting crush-proofing effect, employing this same orthodox procedure, is negligible. On the other hand, if polymerization of the resin precondensate within the fiber is carried out on the alkaline side, there is no permanency of the resulting crush-proofing effect to washing.

In arriving at a middle course between the acid medium and the fixed alkaline medium, attempts have been made to use heat-volatile alkaline bases, such as a pyridine base. German Patent #735,811 is illustrative of the method. The results from this have not been satisfactory.

Furthermore, to improve the poor results in resistance to abrasion resulting from the conventional resin treatments of cellulosic fibers, several suggestions have been put forward, such as adding to the precondensate solution containing the acidic catalyst a certain proportion of different products such as glue, casein, starch and starch products. But the effect achieved is only semi-permanent, as successive washings remove some of the improvement which results initially.

We have invented a method whereby these

aforesaid mentioned disadvantages may be obviated. In our method the addition of the catalyst in the form of an acid, such as boric acid, lactic acid, etc., or an acid-liberating salt, such as normal ammonium sulfate, ammonium acid phosphate, ammonium thiocyanate, etc., to the aqueous solution of the precondensate of urea-formaldehyde or melamine-formaldehyde resins, with which the fabric is to be impregnated, is done away with. A second difference is the replacement of the dry, high temperature curing or baking (250°-300° F.) and employing instead a steaming operation in the presence of a volatile organic acid to convert said water-soluble or -dispersible condensation within the fiber to the insoluble form of the resin. The volatile acid is introduced into the steaming chamber by injection or other suitable means.

By the combination of the use of resin precondensate solution in which there is no acidic catalyst in the solution, with the distinctive step of polymerizing this resin precondensate in the fiber by steaming in the manner set out supra, none of the hitherto well known and expected disadvantages takes place.

Not only is the tensile strength of the cellulosic fibers treated in this way undiminished, but, on the contrary, it is actually increased to a slight degree. As a matter of fact, whereas cotton usually is diminished in tensile strength to a considerable degree by the conventional resin treatment, by our method the cotton shows the phenomenon of an actual increase in tensile strength.

Also, there is no loss in abrasion resistance in any kind of cellulosic fabrics treated by our process as compared with the original fibers, but there is an actual permanent increase in the abrasion resistance.

This may be due to the fact that the insoluble resin formed in this new process with the aforesaid dual distinctions by our process seems to be different physically from the insoluble resin in the conventional process. The fact that the insoluble resins formed in the cloth according to our process as set out herein seem, in addition to the other advantages mentioned supra, to possess better washability as compared to the resins formed in the conventional dry heat curing method, lends credence to this view. While this would chemically appear to afford an explanation, we set this forth only as our theory or belief.

We may treat by our process textile fabrics composed of fibers of cotton, linen, ramie, hemp, jute, regenerated cellulose, cellulose esters, cellulose ethers, cupra ammonium—or xanthate rayon, mixtures of cotton and rayon and other fibrous materials of cellulosic nature, or mixtures of one or more of these with protein fibers, such as wool, or fibers made from modified proteins, such as "Aralac," etc.

According to our method a material of this type is impregnated with an aqueous solution of a water-soluble or water-dispersible precondensate of a urea-formaldehyde or a melamineformaldehyde type resin, in the absence of acid or acidic salt, squeezed, dried at moderate temperature, then steamed through a steam chamber at a temperature of 212° F. to 250° F. or even higher in an atmosphere of an excess of a steam-volatile organic acid. The much preferred temperature range is 212° F.-220° F. The time in the steam chamber is substantially 5-8 minutes. But at temperatures higher than 220° F. a shorter time

can be employed, the length of time varying inversely with the temperature. The resin becomes water-insoluble and that change governs the time.

While of course a minimum period of time is required for the reaction, no harm will accrue to the fabric even if it is exposed to the acid steaming step for a much longer period. In other words, there is a time-margin which takes from this steaming all the critical features of the curing step used in the orthodox or conventional process of crease or crush control.

The amount of resin in the impregnating solution should be any amount over 100 grams per liter and up through 300 grams of a 90-100% resin precondensate, where there is a 100% pick-up, based on the dry weight of the goods, after squeezing. If the goods will only pick up 60% of the solution under this condition, a corresponding larger proportion of the resin must be used in the bath. To illustrate, 175 grams per liter of a water-soluble urea-formaldehyde resin is tested with a selected cellulosic fabric believing that the fibers of the goods will pick up 100%, based on the dry weight of the goods, after squeezing. But due to the nature of the goods the pick-up after squeezing is actually only 75%. The concentration of the solution should be increased to where it contains 233.3 grams per liter.

Steam-volatile organic acids are employed. These embrace the aliphatic, aromatic, alkyl-aryl acids and their derivatives. Examples of these are: formic, acetic, propionic, butyric, diethyl-acetic, benzoic and toluic acids. The acids may be formed, as in situ, during the steaming operation.

Because there is no acidic catalyst in the solution of resin precondensate, a solution is assured which has practically unlimited stability and is usable indefinitely. In the orthodox method in general use, where an acidic catalyst is used in the precondensate solution, this said solution is stable and usable for a relatively short time only as has been explained supra. This difference alone represents a big advantage in favor of our method. Furthermore, goods impregnated with resin solutions from which the catalyst has been omitted have the added virtue that no premature polymerization takes place by storing the impregnated goods, which makes this process not only safer, but more economical.

The resin formed in cellulosic cloth by our method moreover prevents the formation of fuzz on the cloth, and consequently improves the wearing qualities of the fabric.

For the purpose of more clearly establishing the superiority of applicants' textile treating process for conferring thereto crease-resistant quality, as compared with the conventional process, the results of a series of tests will be presented.

The following table shows the results on (a) cotton goods, wherein standard tests on the goods were made. The samples selected were 100% cotton, both warp and filling.

The figures in the vertical columns represented by the designations sample No. 1 and sample No. 2 respectively correspond to measurements on samples subjected to the conventional resin treatment and our resin treatment respectively.

The solution which was used for treating sample No. 1 was formed from 200 grs. of powdered urea-formaldehyde precondensate and 8 grs. of ammonium sulfate $(\text{NH}_4)_2\text{SO}_4$ diluted to 1 liter with water. The solution which was used

for treating sample No. 2 was formed from 200 grs. of the same resin diluted to 1 liter. The later solution thus differed from the former only in the absence of the catalyst.

The fabrics were impregnated in the above described solutions, squeezed, allowing a pick-up of 100% based on the dry weight of the goods and dried at substantially 120° F. Sample No. 1 was dry heat cured-baked for 4 minutes at a temperature of 275° F. Sample No. 2 was steamed in a steam box in the presence of an excess of acetic acid for a period of 5 minutes at a temperature of substantially 212° F.

After converting the water-soluble urea-formaldehyde precondensate to the insoluble form in the goods by the dry heat curing and the acid steaming of the respective samples, the swatches were washed and soaped for 5 minutes at 100° F., rinsed in warm then cold water, and finally dried.

These two samples were allowed to condition after which they were tested and measured.

The treated fabrics, samples No. 1 and No. 2, exhibited marked resistance to creasing and crumpling.

The following table sets out the results of the examination by standard tests:

TABLE I

(a) 100% cotton goods

	Untreated Sample	Sample No. 1 (Old Method)	Sample No. 2 (Our Method)
TENSILE STRENGTH			
Warp.....	82	49	87.8
Filling.....	38	17	38
ABRASION			
	300 cycles	150 cycles	450 cycles

From an inspection of Table I supra it will be seen that the tensile strength of cotton goods treated by the conventional method has deteriorated about 50%, whereas by our method there has actually been a slight gain in the tensile strength in the case of warp and no decrease in the case of filling. Furthermore the resistance to abrasion has decreased to about 50% when the conventional method was employed, yet there was quite an appreciable increase in the resistance to abrasion when our method was used.

The following table shows the results on (b) rayon both warp and filling, wherein the same standard tests on the goods were made.

The figures in the vertical column represented by the designations sample No. 3 and sample No. 4 respectively correspond to the measurements on samples subjected to the conventional resin treatment and our resin treatment respectively.

The solutions which were used for treating samples No. 3 and No. 4 were the same as those applied to samples No. 1 and No. 2 respectively.

The fabrics were impregnated in the above-described solutions, squeezed, allowing a pick-up of 100% based on the dry weight of the goods and dried at substantially 120° F. Sample No. 3 was dry heat cured at 270° F. for 4 minutes. The sample No. 4 was steamed in a steam box in the presence of an excess of formic acid at a temperature of substantially 212° F. for a period of 5 minutes.

7

The washing, soaping and conditioning steps of the goods, after insolubilizing of the resin therein, were the same as given samples No. 1 and No. 2. Samples No. 3 and No. 4 were then tested and measured. Each of these samples exhibited marked resistance to creasing and crumpling.

The following table sets out the results of the examination by standard tests:

TABLE II

(b) 100% spun rayon

	Untreated Sample	Sample No. 3 (Old Method)	Sample No. 4 (New Method)
TENSILE STRENGTH			
Warp.....	55	57	59.5
Filling.....	62	57	64.5
ABRASION			
	250 cycles.	125 cycles....	350 cycles

From a study of Table II supra, it will be seen that in the treatment of rayon: (1) using applicants' method there is a slightly greater increase in tensile strength than when using the old method (2) resistance to abrasion using the orthodox method has decreased about 50%, whereas by using applicants' method there has been an increase of 50% in resistance to abrasion.

Beside this, there is no fuzz or lint formed on the rayon by successive washings, proving that there is an improvement in wearing qualities. These aforementioned advantages are in addition to the appearance of freshness and permanent crease-proof qualities of the fabric.

The next table shows the results by the same standard tests on (c) linen, both warp and filling. The figures in the vertical columns represented by the designations sample No. 5 and sample No. 6 respectively correspond to the measurements on samples subjected to the conventional resin treatment and our resin treatment respectively.

The solution which was used for producing sample No. 5 was formed from 200 grs. of powdered urea-formaldehyde (90-100%) resin precondensate and 8 grs. of di-ammonium phosphate $(\text{NH}_4)_2\text{HPO}_4$ diluted to 1 liter with water. The solution which was used for producing the sample No. 6 was formed from 200 grs. of the same resin diluted to 1 liter with water. This solution thus differed from the previously mentioned solution only in the absence of the catalyst. The fabrics were impregnated in the above-described solutions, squeezed, allowing a pick-up of 100% based on the dry weight of the goods and dried at substantially 120° F. Samples No. 5 and No. 6 were then subjected to the same heat treatment as given samples No. 3 and No. 4 respectively to convert the water-soluble urea-formaldehyde precondensate to the insoluble form in the goods, then washed, soaped and dried in the same manner.

These two samples were allowed to condition after which they were tested and measured. Samples No. 5 and No. 6 exhibited marked resistance to creasing and crumpling.

8

The following table sets out the results of the examination by standard tests:

TABLE III

(c) 100% linen

	Untreated Sample	Sample No. 5 (Old Method)	Sample No. 6 (Our Method)
TENSILE STRENGTH			
Warp.....	50	30	49
Filling.....	35	18	35
ABRASION			
	300 cycles.	75 cycles....	400 cycles

The figures on abrasion values were obtained in all the above three tables by using the Taber machine.

From a study of Table III supra, it will be seen that whereas in the treatment of linen fabrics using the conventional method the tensile strength is substantially diminished, by our method the tensile strength is left unchanged or practically unchanged.

However, as is well known and likewise confirmed by our study, it is in the resistance to abrasion where linen is most adversely affected by the conventional application of resins to obtain crease-proofing results. It is here, nevertheless, that the advantage of our process as contrasted to the orthodox method is most impressive, as scrutiny of the figures in Table III makes apparent at once.

In conclusion we would point out that the tabulated figures prove that our unique method with the step of impregnating the fibers with an aqueous solution of urea-formaldehyde precondensate in which there is no acidic catalyst, in combination with the step of polymerizing by steaming in a steam chamber in the presence of an excess of an organic acid, has definite advantages which cannot be obtained by the conventional method with its steps of using an acidic catalyst in the precondensate solution and converting the soluble resin precondensate within the fibers to the insoluble resin by heat curing or baking with a high dry heat, steps of pressure removal of surplus liquid and drying being common to both processes. The accuracy of this statement has been established by tests on three different cellulosic fibers, namely cotton, rayon and linen. It has been further confirmed by additional comparative tests of the same nature employing a melamine-formaldehyde resin.

It will be realized by those skilled in the art that changes may be made in the processes hereinbefore described without departing from the scope of this invention. We do not intend to be bound except by the appended claims. The terms "cellulosic textile fabric" and "textile fabric of cellulosic nature" unless otherwise qualified includes fabric made of either natural or artificial cellulose fibers alone or in mixtures of the two in various proportions, or in mixtures with protein fibers, such as wool or fibers made from modified proteins.

We claim:

1. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic na-

ture with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

2. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric as it is advanced forward through a chamber to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

3. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°-substantially 220° F. for a period of 5-8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

4. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of acetic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has be-

come water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

5. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde-melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of formic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

6. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric as it is advanced forward through a chamber to steam in an atmosphere consisting of an excess of acetic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

7. In the process of treating cellulosic textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cellulosic nature with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric as it is advanced forward through a chamber to steam in an atmosphere consisting of an excess of formic acid at a temperature in the range of 212°-substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90-100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

8. In the process of treating cotton textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of cotton with an

11

aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°—substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90–100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

9. In the process of treating rayon textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of rayon with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°—substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90–100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

10. In the process of treating linen textile fabric to reduce its tendencies toward creasing and wrinkling but without impairing its tensile strength and abrasion resistance, the steps of impregnating the textile fabric of linen with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°—substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90–100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

11. A cellulosic textile fabric resistant to creasing and wrinkling but whose tensile strength and abrasion resistance is unimpaired, impregnated

12

throughout with 10–30% of a water-insoluble condensation product of the group consisting of urea-formaldehyde and melamine-formaldehyde type resins, said cellulosic fabric having been impregnated with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°—substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90–100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

12. A linen textile fabric resistant to creasing and wrinkling but whose tensile strength and abrasion resistance is unimpaired, impregnated throughout with 10–30% of a water-insoluble condensation product of the group consisting of urea-formaldehyde and melamine-formaldehyde type resins, said linen fabric having been impregnated with an aqueous solution of a water-soluble precondensate of a member of the group consisting of urea-formaldehyde, melamine-formaldehyde type resins in the absence of an acidic catalyst, mechanically removing surplus liquid from the fabric, drying it, thereafter exposing the said impregnated textile fabric to steam in an atmosphere consisting of an excess of steam-volatile organic acid at a temperature in the range of 212°—substantially 220° F. for a period not to exceed substantially 8 minutes, until the precondensate has become water-insoluble, and wherein the amount of the precondensate employed is over 100 grams but not over 300 grams of a 90–100% resin per liter calculated upon a 100% pick-up based on the dry weight of the goods.

MARK WEISBERG.

ARCHIBALD S. STEVENSON.
LEO BEER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,088,227	Battye et al.	July 27, 1937
2,191,362	Widmer	Feb. 20, 1940

FOREIGN PATENTS

Number	Country	Date
437,642	Great Britain	Nov. 4, 1935