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PROCESS OF TREATING WOVEN TEXTILE FABRIC WITH A VINYL CHLORIDE POLYMER

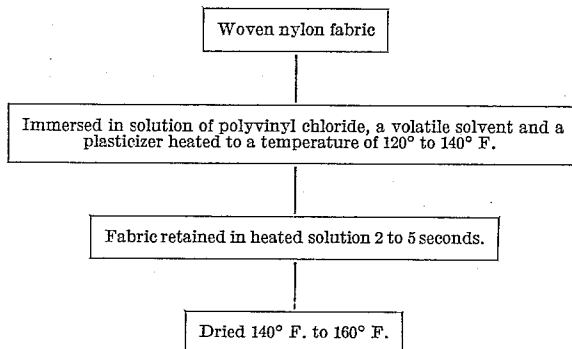
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This invention relates to crease resistant, waterproof fabrics and a method of treating textile fabrics made of natural and synthetic fibres whereby the said fabrics are rendered waterproof and given crease resistant and crease recovery properties yet retain tear strength, have a pleasing appearance and lustre and may be properly draped and tailored.

A simplified flow diagram of the method is as follows:



It is well known that many efforts have been made to treat fabrics with various resin condensates to impart waterproof or water repellent qualities and to make them crease resistant, but such efforts have not been very successful. Aldehydes, carbamides and derivatives of carbamides have been tried but it was found that these materials reduced the elasticity of elongation with resultant weakness and brittleness of fibre.

The use of urea formaldehyde, ketone formaldehyde, melamine formaldehyde and similar resins has also been tested but these, too, have been generally unsatisfactory. These materials produce a film which is unstable as to color, also, the degree of crease resistance of the treated material varied with the amount of resin applied and if sufficient resin was deposited on the fabric to impart the desired crease resistant properties, the fabric became so stiff and loss of tear strength was so great as to render the fabric unusable. Furthermore, the application of these resins required highly skilled labor and technical supervision because satisfactory results could only be achieved when the resin was in true solution in the A stage and partly in the B stage. The determination of when such stage is reached is critical and a matter for trained supervision. If too little condensation occurred, the treated fabric did not require the desired properties and if too much condensation was permitted, the fabric was stiff and unsuitable.

The use of vinyl resin condensates has been extensively tried. In order to produce a vinyl coating having the required degree of flexibility, it was found necessary to use relatively large amounts of plasticizer. This created problems which were difficult to solve. The plasticizers disclosed a marked tendency to migrate leav-

ing the film brittle. Moreover, the vinyl coating would become tacky and sticky at elevated temperatures and the use of wax to overcome this condition prevented the formation of a satisfactory bond with subsequent peeling of the film.

A great deal of difficulty was encountered in coating nylon fabrics. It is well known that little affinity exists between nylon and polyvinylchloride. Bonding could be obtained only by the mechanical anchoring of the polyvinyl composition in the fibres of the nylon fabric. Practice has shown that when vinyl condensate is permitted to penetrate into the fibres, such fibres are weakened and tear strength is reduced, consequently, in the prior art the polyvinyl chloride coatings were caused to adhere to the nylon fabric by pretreating the fabric with various anchoring agents.

It is a primary object of the present invention to provide a polyvinyl chloride coated fabric which is waterproof, non-crushing and non-creasing but which is soft to the touch, pleasing in appearance and retains the ability to be properly draped and tailored.

It is a further object of this invention to provide a polyvinyl chloride coated fabric which has an identical appearance on both of its sides, which is waterproof, soft and flexible and which has the ability to retain its softness and flexibility for an extended and indefinite period.

It is still another object of this invention to provide a polyvinyl chloride coated fabric which is identical in appearance on both of its faces, which is water proof and crease resistant yet remains flexible and soft to the touch over an extended and indefinite period without loss of tear strength and impact resistance.

Another object of this invention is to provide an improved and novel method of coating textiles, including nylon fabrics, with a polyvinyl chloride composition without any pretreatment of the fabric with an anchoring agent.

A further object is to provide a method of treating textiles whereby they are rendered waterproof and crease resistant without loss of tear or sew line strength.

These and other important objects are achieved by the following invention.

It has been discovered that these objects may be achieved when a textile fabric is passed rapidly through a polyvinyl chloride coating composition containing high boiling ketone and toluene solvents and rapidly dried in a heating chamber. The rapid passage of the fabric through the composition and the heating chamber inhibits penetration of the fibre but completely fills the interstices between the fibres thus enclosing each of the fibres in its own protective polyvinyl envelope without the fibres themselves being affected in any way by the composition. The polyvinyl contained in the interstices between the fibres anchors the coating, forming a tenacious and enduring bond with the fabric and no pretreatment of the fabric or the use of any anchoring agents is necessary. Because the composition is not permitted to penetrate into the fibres there is no loss in tear or impact strength or any fibre deterioration and it has been found that by reason of the protection afforded to the fibres, each in its own polyvinyl envelope, the life of the fabric itself is extended and its tear and impact strength are actually increased.

The appearance of the fabric itself is not changed by the treatment unless color pigment is used in the composition, as hereinafter set forth, nor is its original softness and lustre visibly affected. However, the treated fabric is rendered waterproof and endowed with crease resistant and crease recovery properties which it did not possess before treatment.

3

While any proper and well known synthetic resin composition may be used in practising the novel method above described, it is preferred to use a plasticized solution of polyvinyl chloride.

Such solutions have been difficult to control because of the problem of plasticizer migration. It is well known that loss of plasticizer renders the coating brittle and causes cracking. It has been found that a hot solution of vinyl chloride, methyl ethyl ketone and toluene, formulated with two or more plasticizers in proper ratios, will provide a condensate wherein the plasticizing properties remain stable and not fugitive and the treated fabric will retain for extended and indefinite periods its original softness, flexibility and finish with respect to lustre, grain and color.

The invention will be illustrated in greater detail by the following specific examples although it should be understood that these examples are given primarily for the purpose of illustration and that the invention, in its broader aspects, is not limited thereto. Throughout, all percentages of the various compositions are expressed on a weight basis.

Example 1

A woven nylon fabric having a thread count of 52 x 30 was treated with the following composition.

	Percentage
Copolymer of vinyl chloride and vinyl acetate in the ratio of approximately 96 parts of vinyl chloride and 4 parts of vinyl acetate	15.0
Methyl ethyl ketone	40.0
Toluene	40.0
Di-iso-octyl azelate	2.0
Di-octyl adipate	1.5
Di-iso-butyl ketone	.5
Elastomeric vinyl chloride monomer	.5
Stabilizer	.5

The above composition was heated and maintained at a temperature of 120° F. to 140° F. at which temperature it was extremely fluid. The nylon fabric was passed once through the fluid composition in two to five seconds and through a drying chamber heated to approximately 140° F. to 160° F. in thirty to forty-five seconds where the volatile components were evaporated. Upon emerging from the drying chamber, the treated material was dry enough to be rolled and was coated on both sides with a highly elastic non-shrinking film. It retained its original flexibility and softness, was completely waterproof, crease resistant and had crease recovery properties. Exposure to temperatures varying from -20° F. to 150° F. for long periods showed no loss of flexibility or softness, no tackiness or stickiness and there was no visible loss of tear strength or waterproof properties. It remained suitable for its intended uses, such as rainwear of all kinds, shower curtains, tarpaulins, water protective coverings, life rafts, etc.

Example 2

A composition was prepared in the same manner and employing the same constituents as set forth in Example 1, except selected color pigments were added. Black, green, pink and tan were all used. The same type of nylon fabric was treated in the same manner. The treated fabric again emerged from the drying chamber coated on both sides and dry enough to be rolled. Both sides of the fabric presented an identical appearance and flexibility, softness and waterproofing qualities were present. The coloring pigment in no way affected the treated fabric except in imparting a new appearance and the said fabric was found to be particularly suitable for women's and children's colored rainwear garments.

Example 3

A loosely woven saran fabric was treated in the same manner as stated in Example 1 except that the vinyl chlo-

4

ride monomer was omitted. The formula for the coating composition was as follows:

	Percentage
Copolymer of vinyl chloride and vinyl acetate in the ratio of approximately 96 parts of vinyl chloride, 4 parts of vinyl acetate	15.0
Methyl ethyl ketone	40.0
Toluene	40.0
Di-iso-octyl azelate	2.0
Di-octyl adipate	1.5
Di-iso-butyl ketone	1.0
Stabilizer	.5

This composition was also heated and maintained at a temperature of 120° F. to 140° F. The material was again passed once through the fluid composition within a period of from three to five seconds and then immediately passed through the heated drying chamber in thirty to forty-five seconds. It was dry when it emerged from the chamber. The interstices between the fibres of this fabric were much larger than those of the material treated in Example 1 but the composition had completely filled these interstices and the coating was firmly bonded to the fabric. The treated material was tough but soft and flexible and suited for its intended use such as glass substitute for windows, chicken houses, hot houses and the like. A piece of the treated material was fitted into a window in place of glass and subjected to the elements for almost a year without any visible deterioration.

Example 4

A woven cotton fabric having a thread count of 80 x 80 was treated with the following composition.

	Percentage
Copolymer of vinyl chloride and vinyl acetate in the ratio of approximately 96 parts of vinyl chloride, 4 parts of vinyl acetate	15.0
Methyl ethyl ketone	50.0
Toluene	30.0
Di-iso-octyl azelate	2.0
Di-octyl adipate	1.5
Di-iso-butyl ketone	.5
Elastomeric vinyl chloride monomer	.5
Stabilizer	.5

The material was treated in exactly the same manner as described in Example 1 and produced the same results. The treated material was soft, flexible and waterproof and was found suitable for use as tablecloths and the like.

Woolen and viscose fabrics were also treated with the composition of Example 4 and were found suitable for use as draperies, seat coverings, furniture coverings and the like.

From the examples above given, it is clear that any kind of material may be treated by the method of the present invention with satisfactory results. The coating on the treated material acts to prevent deterioration of the fabric and does not impair its strength. No pre-treatment of the material is required nor is calendering or washing after treating necessary and the novel method herein disclosed is fast and relatively inexpensive as compared with prior art methods.

While the present invention has been explained and described with reference to specific examples, it will be understood, nevertheless, that numerous modification and variation is susceptible of being incorporated without departure from the essential spirit or scope thereof. Accordingly, it is not intended for an understanding of this invention to be limited by the foregoing description nor by the examples given except as indicated by the hereinafter appended claims.

What is claimed as new and desired to be secured by Letters Patent of the United States is as follows:

1. A process for treating a woven nylon textile fabric which comprises immersing said fabric for a period of only between 2 and 5 seconds in a solution heated to

between 120° and 140° F., having the following approximate composition in parts by weight:

	Percentage	
Copolymer of vinyl chloride and vinyl acetate in the ratio of approximately 96 parts by weight of vinyl chloride and 4 parts by weight of vinyl acetate	15	5
Methyl ethyl ketone	40	
Toluene	40	
Di-isooctyl azelate	2	
Di-octyl adipate	1.5	10
Di-isobutyl ketone	0.5	
Elastomeric vinyl chloride monomer	0.5	
Stabilizer	0.5	

thereafter removing the fabric from said solution and heating it to a temperature between 140° and 160° F. for a period of 30 to 45 seconds whereby to volatilize the volatile constituents of the solution on said fabric and form the desired product.

2. A process of treating woven textile fabrics which comprises immersing said fabric for a period of only between 2 and 5 seconds in a solution heated to between 120° and 140° F., said solution containing polyvinyl chloride, a volatile solvent for said polyvinyl chloride and a plasticizer whereby when said fabric is immersed in said heated solution, the said solution penetrates the interstices between the fabric fibres but does not impreg-

nate said fibres, thereafter heating the said treated fabric to a temperature between 140° and 160° F. to volatilize the volatile constituents of the solution on said fabric to form the desired product.

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