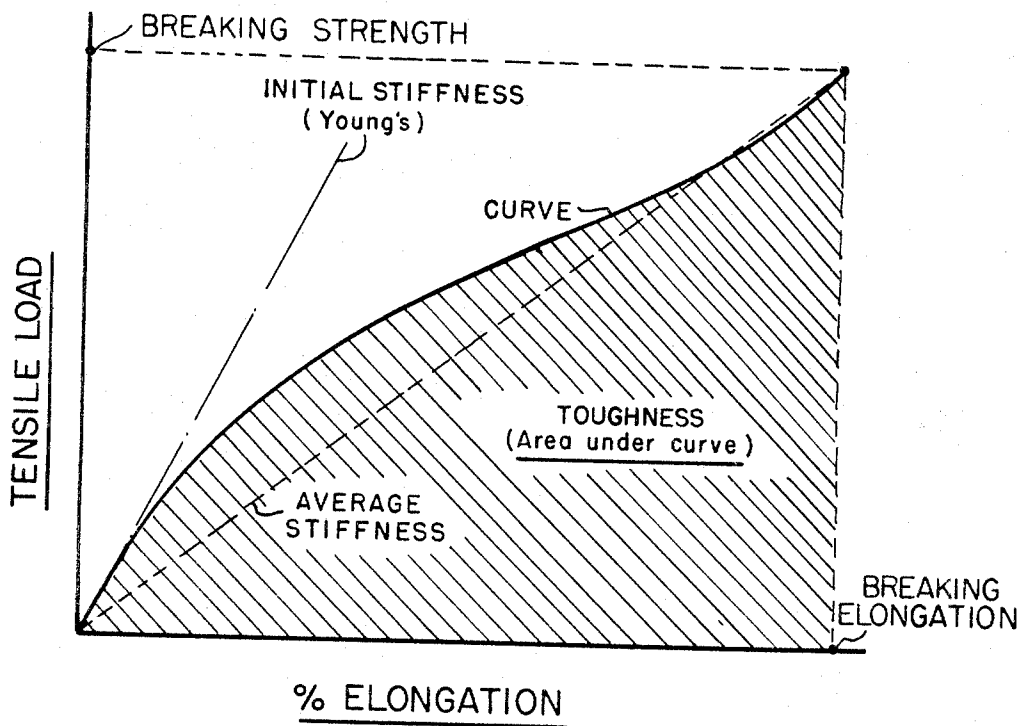


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METHYLPOLYSILOXANE ELASTOMER POLYMER
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TEXTILE FABRIC COATED WITH A HIGH MOLECULAR WEIGHT METHYLPOLYSILOXANE ELASTOMER POLYMER

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2 Claims

ABSTRACT OF THE DISCLOSURE

There is provided a process and a product wherein a textile is coated with a high molecular weight elastomeric polymer of methylpolysiloxane from an organic vehicle containing 5 to 15 percent of the said elastomer. The coated product is then dried and cured. The elastomer is characterized by its capability of forming a continuous tack-free film when dried and cured and has the following physical properties: 300 to 600 percent elongation, 5 to 150 grams per mil tensile strength, a Young's modulus of 5 to 50 grams per mil thickness per percent elongation, a tuftness index of 1,000 to 50,000 grams per mil $\times$ percent elongation/2 and resiliency such that the film recovers at least 70% after a 25 to 35 percent elongation. The coating is deposited essentially completely at or near the outer surface of the fibers constituting the textile and being interlocked to the textile in a noncrosslinking manner such that the coating is substantially completely dissolvable from the textile by cupric ethylene diamine. The resulting coated textile exhibits superior wrinkle resistance and wash and wear properties, good resiliency and resistance to laundering and wear along with breathability.

The present invention relates to the treatment of textile fabric. The invention is especially concerned with the preparation of improved wash/wear and wrinkle-resistant fabric although other improved properties are also contemplated as will be hereinafter apparent.

Considerable effort has been expended, especially in recent years, towards developing wash/wear fabrics which can be laundered wrinkle-free without ironing. Additionally, much attention has been given towards improving the resistance of fabrics to wrinkling during wear. Some improvements have been made but despite large-scale research efforts, it has not hitherto been possible to effectively realize the ultimate in wash/wear or wrinkle resistance without in some way undesirably effecting other essential characteristics. For example, 100% cotton fabric has been extensively treated with a wide variety of resins and crosslinking agents and while it has been possible to thus obtain a treated product having good resiliency (i.e., ability to resist wrinkling during laundering and wear) these agents, when utilized in the amounts necessary to give the desired resiliency, tend to seriously degrade the tensile strength of the fabric. Accordingly, it is necessary to reach a compromise between strength and resiliency in the finished product depending on minimum strength requirements. This obviously means that there must be a sacrifice in wrinkle resistance and wash/wear properties to meet strength requirements but when this is done, the resulting wrinkle resistance and wash/wear properties may very well be less than the ultimate for customer satisfaction.

The above-mentioned problems are not limited to 100% cotton fabric. Thus, for example, polyester/cotton blends are frequently used to overcome the low strength properties of cotton fabric. Good wrinkle resistance in wear as well as laundering qualities are recognized in poly-

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ester/cotton fabrics and many blend varieties have appeared on the market. However, polyester/cotton fabrics have a serious limitation in that the resiliency or wrinkle recovery properties are entirely dependent on the amount of polyester in the blend. Commercially, the blends which predominate are 65% polyester/35% cotton or 50% polyester/50% cotton and cost of the polyester, as well as comfort qualities, prohibit higher percentages of polyester. As a result, conventional polyester/cotton blends represent a compromise based on economics and comfort and other considerations but the end result is that the ultimate qualities of performance, particularly after washing and line drying are not attained. Resin is oftentimes applied to these polyester/cotton blends to improve resiliency and other properties but there is a limit on the amount of resin which can be used due to abrasion effects thus limiting the benefits attainable by means of the resin.

Another area where the ultimate in resiliency has not been satisfactorily attained is in the case of acetate/rayon blends. Rayon is particularly lifeless or "dead," contributes nothing to hand or resiliency and may even adversely affect fabric resiliency. As a result, it is generally essential for acetate/rayon fabrics or other blends containing rayon to be resin-finished in order to achieve an acceptable degree of resiliency. A high amount of resin must be used to overcome the lack of resiliency of the rayon but this degrades the strength of the fabric and more particularly, the abrasion resistance of the rayon portion. This severely limits the possibility of obtaining maximum resiliency in blend fabrics containing rayon.

Additionally, polyester/rayon or polyester/cotton present problems inherent to crossdye effects where the polyester is dyed one color and the other component is dyed a different color. After resin treatment, the blend fabric shows a differential wear with loss of the cellulosic fiber. For instance, after abrasion of a fabric where the cellulose is dyed navy and the polyester is dyed gold, the abrasion area appears predominantly gold or is "frosted" gold in textile terminology. In this case, the resins have degraded the strength of the cellulosic component and abrasion is a problem. The amount of resin must be carefully regulated, and is usually kept low to prevent excess frosting. Accordingly, there must be a compromise in the resiliency in order to avoid frosting.

The foregoing comments illustrate the fact that it has not been possible or practical with prior techniques to obtain ultimate resiliency in fabrics containing cotton or other cellulosic fibers. A compromise between resiliency and strength, for example, is necessary with the result that there is a sacrifice in resiliency to maintain or retain minimum strength requirements. The problem is not, however, limited to cellulosic fabrics. For example, synthetic fibers in blended or 100% form fall short of the ultimate in wrinkle recovery performance. Thus, nylon or acetate tricot fabrics have a modest amount of resiliency but fail to keep a fresh appearance at all times. A common complaint is the fact that most lingerie is mussed in handling and does not present a new appearance over the counter to the consumer. Resin treatment does not generally help because most thermoset resins will not adhere to nylon or acetate and most thermoplastic materials do not add resilience to the natural resilience of the fiber. There is, therefore, a real need for some sort of treatment which will add to the resilience of fabrics made up of 100% nylon, acetate or various blends thereof.

There is also a serious problem in the case of glass textiles. In particular, glass fiber fabrics are of necessity finished with various thermoplastic materials which are intended to hold dye or pigment on the fiber and make the coloring washfast. In other cases, it is necessary

to add various finishing materials to glass fiber fabrics to prevent damage to the glass fiber in flex abrasion. All of these finishing agents contribute to the thickness of hand but very few chemicals increase the resiliency of the glass fabric and there is usually obtained a "dead" hand which is without life and does not add to the esthetic qualities of the fabric.

The principal object of the present invention is to provide a novel process for treating fabric comprising natural and/or synthetic fibers so as to eliminate the prior art problems referred to above. A more particular object of the invention is to provide means for obtaining the highest possible resilience in any type of textile fabric without seriously affecting other necessary and desirable characteristics such as strength, abrasion resistance, hand, etc.

A more specific object of the invention is to provide fabric having maximum resilience without compromising on strength or other useful and basic fabric properties. Still another specific object is the provision of fabric with unique wash/wear characteristics after laundering and outstanding resistance to wrinkling through wear. Other objects will also be hereinafter apparent from the following detailed description of the invention.

Broadly stated, the foregoing objects are realized by applying to the textile, a silicone elastomer as hereinafter defined, preferably in organic solvent solution, followed by drying and curing, if necessary. Preferred silicone elastomers are those available as Dow Corning products XT-40025, XT-40057 and 40057-A. However, other silicone elastomers having the necessary characteristics as set forth below may also be effectively used. Typically useful silicone elastomers are shown in U.S. Patent 3,076,726, assigned to Dow-Corning and are methylpolysiloxanes.

The success of the invention is due, at least in part, to the discovery that silicone elastomers which are generally characterized by high molecular weight are essential to produce the highly resilient effects and other advantageous results of the invention. Typically, a polyester/cotton fabric treated with Dow Corning XT-40025 silicone elastomer in the manner proposed herein has a high degree of bounce and liveliness as well as improved body, water repellency, wash/wear, wrinkle resistance, and tear strength. Surprisingly, the breathability of the fabric also is not impaired by the silicone elastomer. Application of this type of elastomeric finish to a wide variety of fabrics shows generally similar improvement in resiliency and the other characteristics indicated.

Broadly stated, the term "silicone elastomer" as used herein is intended to mean any silicone polymer composition which can be cast on a glass plate, dried and if necessary cured, to give a continuous film having elastomeric properties and moderate strength, i.e., strength such that the film does not powder or disintegrate when rubbed lightly by the hand.

Further details on the nature of the silicone elastomer and film obtainable therefrom are given hereinafter but, for present purposes, it is sufficient to note that the silicone polymer used should possess the properties indicated. The preferred silicone elastomers for use herein are characterized by a very high molecular weight as noted above, but even lower molecular weight silicones might be used provided the composition is adequately modified or the conditions appropriately selected so as to give a continuous film having the characteristics indicated when the silicone is cast on glass, dried and, if necessary, cured. In any event, the conditions which will give this continuous film having the characteristics indicated should be used when the silicone elastomer is applied to the fabric for present purposes.

The preferred use of an organic solvent system in the practice of the invention represents a distinct departure

from conventional textile processing operations. Such solvent systems are usually considered undesirable in the textile field but in the present case, these systems can be very effectively utilized to give highly unusual results. One advantage of solvent systems is that the solvent will not swell cellulosic fibers in contrast to water systems, so that rayon or cotton fabric do not shrink during the padding operation. However, it will be appreciated that elastomer emulsions or suspensions may be used in lieu of solvent systems if it is desired to do so.

It will be appreciated that, when using a solvent system, any inert solvent which will dissolve the elastomer can be used. Typical examples include hydrocarbon or chlorinated hydrocarbon solvents, e.g., mineral spirits, perchloroethylene or the like.

Any convenient method may be used to apply the elastomer to the textile. Thus, the elastomer may be applied by kiss roll, spraying, knife coating, knurled roll techniques or the like although padding is preferred. As well known in the art, padding involves dipping the fabric in the elastomer solution or pad composition and then passing the fabric through appropriate squeeze rolls to remove excess elastomer and distribute the retained polymer uniformly through the fabric. The amount of elastomer solids added to the fabric will depend on a variety of conditions, e.g., fabric construction, nature of the elastomer, etc. However, usually, the solids add-on will fall in the range of 0.1 to 30%; and preferably from 0.6 to 16%, based on the weight of the dry untreated fabric.

After padding or otherwise applying the elastomer, the fabric can be dried by air drying or by heating, e.g., in a suitably heated tenter frame. The temperature and time of drying may be selected as desired and can be widely varied as long as all solvent is removed before curing.

Curing can be accomplished at any temperature or time, but is dependent for the most part on the type of elastomer employed. The preferred time and temperature of cure also depend on the equipment available. Thus, times of the order of 30 minutes at 250° F. and 1-2 minutes at 425° F. may be used in loop cures. However, it may be expedient in some cases to frame cure or cure in a roller type oven by heating for from 1 minute to 10 minutes at a temperature in the range of 250° F. to 375° F.

Resilient effects are noticed most quickly when fabrics are cured at 325 to 375° F. Temperatures as low as 250° F. require times of 15 to 20 minutes or more to obtain the optimum effects. With catalyst present, some elastomers will cure without heat (room temperature) for time exposures of up to a day or more. This can be important in cases where it is impossible to apply heat or where heat may damage the base structure.

An unexpected aspect of the invention, using a silicone elastomer, is the fact that this single component alone is adequate to give the ultimate in resiliency while at the same time improving or at least maintaining at a high level other essential properties such as tensile strength, tear strength, breathability, oil repellency, wash/wear characteristics and water-repellency. In the past, it has generally been considered necessary to use a combination of materials, e.g., mixtures of polymers, high polymer resins, crosslinking agents and/or other materials in order to obtain such a combination or properties.

The manner in which the elastomer functions to give the results described herein is not fully understood. However, it is apparent that there is no significant crosslinking between the textile and the elastomer at least in the conventional sense. Normal resin finishing materials are water soluble chemicals which are capable of crosslinking with, for example, cellulose because two or more reactive sites (difunctional) are present on the chemical. Because of the water solubility, the chemical penetrates water swollen cellulose, and is in position to crosslink when dried and cured with an appropriate catalyst. This crosslinking oc-

curs deep inside the fiber, uniformly distributed within the accessible regions of the cellulose fiber and tends to cause embrittlement of the fiber. Fabric which has been treated with crosslinking chemicals will not dissolve in CED (Cupri Ethylene Diamine), a standard solvent for cellulose and a normal test for the presence of crosslinking.

In contrast, fibers treated with elastomer according to the present invention will dissolve in CED leaving behind only a slight residue which appears to be elastomer. The dissolution of the fiber in CED is an indication that no crosslinking occurs inside the fiber and shows that the action of the elastomer is completely different from normal resin crosslinking which tends to embrittle the fiber. Apparently, the original internal structure of the fiber is retained without any appreciable chemical change by operating according to the present invention thus avoiding the undesired embrittlement which occurs with crosslinking. In addition, it is well known that solvents of the type used will not swell cellulose; hence, the elastomer has little chance to penetrate cotton for instance.

The discovery that a high degree of resiliency can be obtained on cellulosic fabric without crosslinking is highly unexpected since very little resiliency has been obtained in the past when cellulose fiber is chemically reacted with monofunctional reagents that are unable to crosslink. Thus, for example, chemicals such as monochloroacetic acid (with only one reaction site) will react with cotton but monochloroacetic does not impart resiliency as indicated by tests for wrinkle recovery. In short, crosslinking has previously been considered essential for resiliency but the present invention shows that the ultimate in resiliency can be obtained without any apparent crosslinking taking place.

Additionally, in contrast to prior techniques, it does not appear that the elastomer as used herein penetrates into the cellulosic or other fiber. Apparently, the solvent or vehicle penetrates only the outer skin of the fiber carrying sufficient elastomer into the outer skin of the fiber to cause good adhesion. The elastomer is picked up from the pad bath or other applying means and deposited in a film on the outer skin or surface of the fiber being treated. It is this outer film which appears to be important, the film acting to impart to the fiber all of the elastomeric qualities of the basic film itself. Since no crosslinking apparently takes place, the strength of the cellulosic fiber is not degraded and the basic strength of the cellulosic fiber is retained.

In addition to the film coating on each fiber, it also appears that some amount of polymer cementing or spot welding may occur between fibers. The amount of such spot welding is apparently limited because if all fibers were cemented together a stiff fabric would result. Other evidence that only limited spot welding exists is shown in the treatment of rayon high pile fabric by the method described herein. More particularly, when the high pile fabric is passed through a solution of elastomer and dried, the pile is matted down with the pad squeeze. However, only brief brushing by hand is needed to erect the pile in separate individual fibers similar to the control of untreated fabric. After curing, the pile fabric shows improved resiliency for the rayon pile compared to a control of untreated fabric.

The type of elastomer used is important to obtain optimum resiliency without a stiff hand. For instance, acrylic resins (e.g., "Acryloid") have good resilient properties when cast in a film. However, when applied to fabric, desirable resiliency is not obtained. Thus, while the acrylic may be film-forming and elastomeric in nature, both of which characteristics are important for the elastomer herein, other factors prevent the acrylic film from imparting good resilience to fabric. The best results by far are obtained with silicone elastomers, but other high polymer elastomers, e.g., polyurethanes, polysulfides, or even acrylics, can be used in combination with the silastic or its equivalent.

Another property necessary in the elastomer to insure resiliency is that it must tend to lubricate the fibers and yarns in the fabric. Films which appear to be too tacky or too dry are examples of elastomers which do not impart a high degree of resilience. In particular, very thin films which are not tacky and have a slick surface, well lubricated if rubbed lightly between the fingers, impart the desired resilient characteristics. This simple test may be used to determine whether or not an elastomer can be used to impart resilience. Thus, for example, urethane elastomers are tough and elastic, yet the resilient effect on fabric is only fair. The film of the urethane elastomer is sticky to the touch indicating that fabric coated with the urethane elastomer would tend to stick together when folded. Polyvinyl alcohol films impart no resiliency to fabric and the hand is stiff, boardy, tending to crack if too much polyvinyl alcohol is used. On the other hand, silicone elastomers are slick to the touch, not sticky and when applied to fabric impart desired resiliency. Surprisingly, the properties of silicone films by themselves are not outstanding and, in fact, are only average compared to other elastomers. Nevertheless, for present purposes, the silicone elastomers are remarkably effective when applied to fabric.

The results of the invention are especially surprising in view of the fact silicone oils in emulsion form as commercially supplied, will not give equivalent results. These oils have been extensively used in the past to impart water repellency to fabric. They demonstrate a lubricating effect on fibers but the resilient effect using silicone oils alone is not sufficient to be of any commercial value. Generally, if high resiliency is desired, the silicone oils are combined with ordinary resins, the latter being used to impart resiliency while the silicone provides lubrication and softness of hand. However, the use of the resin brings about a tensile strength loss due to crosslinking between the resin and fibers.

Although the exact mechanism of the invention is not fully understood, it has been ascertained that the requirements for an effective elastomer to impart resiliency without undesirable strength loss include the following:

- (1) the agent used must be a high polymer with high molecular weight;
- (2) the material must be capable of forming a continuous film when cast on glass and when applied to fabric from solution, must deposit near or on top of the surface of the fibers;
- (3) the material must not be tacky, but must include some lubrication or tack-free properties;
- (4) the agent must also be resilient and must show good recovery from elongation or deformation. The closer to 100% recovery, the better. From 70% to 100% recovery when tested as a film is usually satisfactory.

Best results, including the highest degree of fabric resiliency, are obtained using elastomers which give films having the following characteristics when cast from solvent solution (e.g., mineral spirits) onto glass, dried and cured:

- (a) moderate elongation (e.g., elongation in the range of about 300-600% at the break);
- (b) low to moderate tensile strength (representative values are 5 to 150 grams/mil and preferably 10-50 grams/mil representing the force required to stretch the elastomer in grams divided by thickness of the sample in mils);
- (c) low to moderate initial and average stiffness. The initial stiffness is the same as Young's modulus which is determined by the stress-strain curve of the elastomer obtained by plotting tensile strength opposite percent elongation. The value is determined by the slope of the initial or elastic portion of the stress-strain curve drawn from origin tangent to curve. To make the determination, the grams tensile strength (vertical axis of the curve) is divided by thickness in mils of the sample,

then divided by percent elongation (horizontal axis of the slope), the whole result being multiplied by 100. Measurement is usually made at the 50% elongation point. A high degree of straightness in the initial portion of the stress-strain curve at a relatively steep angle, e.g., at least 60°, is characteristic of a highly desirable elastomer for use herein. Average stiffness is based on the slope of the line drawn from origin to breaking point, using the same calculation as Young's modulus. Typical values for Young's modulus are in the range of 5 to 50 grams/mil thickness/percent elongation for suitable elastomers with a preferred range of 10-40 grams/mil/percent elongation. Average stiffness will vary from 1-30 grams/mil/percent elongation with a preferred range of 3 to 25. A typical elastomer stress-strain curve is shown in the figure attached hereto, the horizontal axis representing percent elongation and the vertical axis the tensile strength. Young's modulus and average stiffness are shown by the broken lines and, as indicated, toughness is represented by the area under the curve;

Operating conditions

Pad fabric at 80 pounds padder pressure with the appropriate formulation. Air dry at room temperature or dry in oven at 200-250° F. Cure 3 minutes at 375° F. unless otherwise specified. No after wash.

The invention is illustrated, but not limited, by the following examples wherein the procedure outlined above is followed unless otherwise indicated:

EXAMPLE 1

Four pieces of the same woven fabric (colored yarn sportswear, 100% combed cotton) were padded with (a) 10% ordinary commercial resin composition; (b) 15% resin; (c) Silicone elastomer Formula 5; and (d) Silicone elastomer Formula 6, respectively; dried at 200-250° F. and cured in 3 minutes at 375° F. The fabric pieces were then tested for crease resistance, abrasion resistance, breaking strength, tongue wear and washwear appearance with the following results:

	10% Ordinary Commercial Resin ¹ Only	15% Ordinary Commercial Resin ¹ Only	Silicone Elastomer Formula #5 Only	Silicone Elastomer Formula #6 Only
Crease Resistance,°:				
Dry—Warp/Fill.....	125/129	138/135	116/122	118/124
Wet—Warp/Fill.....	97/113	108/118	95/122	108/136
Stoll-Flex Abrasion:				
Warp.....	1,538	496	3,261	4,590
Filling.....	2,156	690	3,943	5,484
Breaking Strength, Warp/Fill.....	71/62	66/60	77/77	79/83
Tongue Tear, Warp/Fill.....	1.7/2.0	0.7/1.4	5/7/6.7	6.2/7.7
Wash/Wear Appearance, 3 Laund. 105° Line dry.....	3.0	4.5	3.0	3.0

¹ The resin was "Aerotex" Resin 23 (American Cyanamid Co.).

- (d) low to moderate toughness. Typical toughness index values for elastomers used herein fall in the range of 1,000 to 50,000 gm./mil×percent elongation/2.
(e) at least 70% recovery, preferably 70-100% recovery after 25-35% elongation.

The above characteristics for the elastomer used herein are important to the success of the invention and, as noted, these characteristics are found in the silicone elastomers, typically those shown in U.S. Patent 3,076,726. However, as noted heretofore, other high polymer elastomers may also demonstrate these characteristics when cast into films and may be useful herein. This includes such elastomers as polyurethanes of the polyether or polyester type, acrylic and polysulfide elastomers. These last-mentioned elastomers will normally be used in combination with one or more silicone elastomers to give specific film properties which might be desirable for any particular situation.

Typical elastomer formulations and other operating conditions for use herein in the practice of the invention are set forth below, the elastomer in each case being Dow XT-40025:

	Elastomer Formula Number					
	1	2	3	4	5	6
Percent Solids Elastomer.....	3	4	6	7	10	15
Silicone Elastomer (30% Solids in solvent as supplied).....	9.9	13.3	20.0	23.4	33.0	50.0
Silicone Catalyst (Organic-Metallic Type) ¹	0.3	0.4	0.6	0.7	1.0	1.5
Silicone Binder (Silane Type) ²	0.5	0.5	0.5	0.5	0.5	0.5
Acetic Acid (Glacial).....	0.5	0.5	0.5	0.5	0.5	0.5
Solvent (Mineral Spirits) ³	88.8	85.3	78.4	74.9	65.0	47.5
Total Parts.....	100	100	100	100	100	100

¹ The organo-metallic catalyst is Dow-Corning Catalyst 23A.

² The silane is Dow-Corning QZ-80925.

³ Other suitable solvents include toluene, perchloroethylene or other inert hydrocarbon or halo-hydrocarbon.

This example shows the limitation of ordinary resins which crosslink cotton cellulose chains compared to the silicone elastomer which apparently deposits as a film primarily on the outside the fiber and does not crosslink cellulose molecules.

The data indicates that 15% of the resin will impart a high degree of wash and wear both during laundering and during wear. However, the strength of the fabric has been degraded to the point that the tear strength and abrasion, in particular, are dangerously below the safe minimum expected of this fabric. In commercial practice, the fabric finish is compromised, as noted earlier, by using less resin along with addition of softeners which tend to help abrasion and tear strength. Since the softeners do not add much to the wash and wear qualities, if anything at all, the sacrifice in wash and wear is readily apparent and a cautious balance between minimum standards for strength and maximum wash and wear must be constantly maintained.

The silicone elastomer on the other hand, by means of a single basic component does not damage the cotton. As a matter of fact, the elastomer increases the tear strength

tremendously while maintaining and even increasing the tensile strength as more elastomer is added. No sacrifice in wash/wear appearance is made and the hand is soft and pleasant.

The silicone elastomer may be used to top a previously resin treated fabric which supplies a portion of the wash and wear. In the interests of economy, a lower amount of silicone elastomer can be topped on this previously resin treated fabric by solvent methods to add greatly to wash and wear qualities as illustrated by other examples herein.

An emulsion of the silicone elastomer can be added to the resin formulation (which is water soluble) to achieve superior wash and wear properties without resorting to a compromise between quality of wash and wear and physical properties because of the limitation imposed by the amount of resin.

The above results show that the addition of the elastomer greatly improved the wrinkle recovery of the resin pretreated fabric. This example also illustrates the very significant durability of the treated fabric. Thus, the wrinkle recovery of the resin pretreated decreased during 10 launderings but wrinkle recovery of the resin pretreated fabric with the elastomer on top did not decrease significantly, and in particular, the wet wrinkle recovery was retained through 10 launderings.

EXAMPLE 4

100% rayon fabric was treated with Formula 6 in the manner indicated above with 7.8% solid add-on. Comparison between the treated and untreated fabric gave the following results:

Treatment	Bending Length Stiffness		Crease-Resistance			
	Original	5 Launderings	Original		5 Launderings	
			Dry	Wet	Dry	Wet
Untreated	1.04	1.03	249	173	256	172
Elastomer Treated	1.45	1.44	299	252	300	244

EXAMPLE 2

Formaldehyde pretreated 100% cotton (woven fabric) was treated in the manner indicated below using the procedure previously outlined with the following results:

Test	Control, No Elastomer Formaldehyde Pretreated	Formaldehyde Pretreated Elastomer Formula #5
Crease Resistance, Monsanto:		
Dry (Warp + Fill.)	166	232
Wet (Warp + Fill.)	221	268
Wash/Wear, 3 Launderings, Line Dry	2.0	2.5
Tensile Strength (Warp/Fill.)	66/42	59/42
Tear Strength (Warp/Fill.)	1.1/1.5	3.1/3.9

This illustrates that the elastomer can be applied to previously resin treated cotton, in this case formaldehyde treated cotton. It will be noted that although the wrinkle recovery has been improved tremendously, the tensile strength and the tear strength have not been disturbed and the tear strength has been increased significantly.

EXAMPLE 5

Woven fabric comprising a blend of polyester/Zantrel rayon was treated as indicated with the following results showing the durability of the elastomer treatment.

Treatment	Crease-Resistance, Warp+Filling			
	Original		After 3 Launderings	
	Dry	Wet	Dry	Wet
Untreated	300	258	254	258
Elastomer Treated, Formula #5 (10.6% Add-on)	313	280	308	277

EXAMPLE 3

The process of Example 2 is repeated on nitrogenous resin pretreated cotton fabric with the variations indicated:

Test	Resin Pretreated	Resin Pretreated Plus Elastomer Formula #6 (4.2% solids add-on)
Crease Resistance, Original:		
Dry (Warp + Fill.)	207	295
Wet (Warp + Fill.)	234	287
Crease Resistance, After 10 Launderings:		
Dry (Warp + Fill.)	192	280
Wet (Warp + Fill.)	196	282

EXAMPLE 6

A polyester/Zantrel rayon woven fabric was processed and tested with the following results:

Treatment	Crease Resistance, Warp + Filling				Tear Str.	Wash/Wear Rating	Tensile Strength
	Original		After Launderings				
	Dry	Wet	Dry	Wet			
Untreated	258	193	264	192	5.5	2.4	85
Elastomer Treated Formula #5 (6.8% Add-on)	287	274	287	260	7.4	3.0	77

This illustrates the durability of the elastomer treatment, the increase in the wash/wear properties and the increase in the tear strength with very little loss in tensile strength. This example also illustrates very well the limited wrinkle recovery which the polyester/viscose blend has without elastomer treatment and the significant increase in the wrinkle recovery using the elastomer. Additionally, the wrinkle recovery is retained after laundering.

EXAMPLE 7

DURABILITY OF BODY STIFFNESS AND CREASE RESISTANCE, ELASTOMER VS. RESIN TREATMENT, FORTREL POLYESTER/ZANTREL, FORMULA #6, 9% ADD-ON

Treatment	Bending Length Stiffness		Crease Resistance (Warp+Fill.)			
	Original	10 Launderings	Original		10 Launderings	
			Dry	Wet	Dry	Wet
Untreated.....	1.24	1.13	256	253	192	187
Elastomer Treated, 9% Add-on.....	1.63	1.43	286	293	258	268
Conventional Nitrogenous Resin.....	2.23	1.32	285	287	243	241

This illustrates the results of measuring untreated and elastomer treated fabrics on the Stoll Wrinkleometer (Celanese wrinkle tester). This apparatus measures an effect similar to that of squeezing a sample of the fabric in the hand. Although untreated Dacron/wool is in itself a highly resilient fabric, the rating obtained on the Stoll Wrinkleometer is poor. It is noted that application of the elastomer, even in small amounts, raises the rating to a good rating.

EXAMPLE 10

DACRON/COTTON, FORMULA #5, 1.8% ADD-ON

Test	Untreated		Elastomer Treated	
	Original	10 Launderings	Original	10 Launderings
Crease Resistance, Monsanto:				
Dry (Warp+Fill.).....	286	265	324	315
Wet (Warp+Fill.).....	250	250	314	306
Tensile Strength (Warp+Fill.).....	120/77	-----	111/76	-----
Tear Strength (Warp+Fill.).....	9.6/8.0	-----	11.4/9.2	-----

This illustrates the durability of the body (stiffness) and crease resistance for the elastomer treated product opposite a resin treatment on the same product (polyester/viscose blend). The stiffness of the fabric as indicated by the bending length, particularly in the conventional nitrogenous resin, is lost during laundering. This means that the fabric goes from a desirable, firm hand to a very soft, raggy hand. The elastomer treated fabric on the other hand retains the firmness and it is not appreciably lost during laundering. As an additional advantage, it can be noted that the elastomer treated product is resistant to oil stains placed on the fabric.

EXAMPLE 8

ACRYLIC/RAYON/ACETATE WOVEN FABRIC, FORMULA #4 APPLIED, 9.4% ADD-ON, BODY AND CREASE ANGLE DURABILITY

Treatment	Bending Length Stiffness		Crease Resistance (Warp+Fill.)			
	Original	10 Launderings	Original		10 Launderings	
			Dry	Wet	Dry	Wet
Untreated.....	1.24	1.25	257	257	176	177
Elastomer Treated.....	1.71	1.58	303	293	253	245

This further illustrates the increase and durability in wrinkle recovery resulting from the treatment of the invention. In this particular case, there is a small loss in bending length stiffness which indicates that there is some slight loss of stiffness due to breaking of the bonds or spot welds that may be present on the fabric.

EXAMPLE 9

Wrinkle resistance and measure of resilience, Stoll/Wrinkleometer (Celanese wrinkle tester)

Fabric and treatment:	Rating
Dacron/wool S/4800-448 untreated ..	Poor; mussy
Dacron/wool S/4800-448 elastomer, Formula 2	Good
Fortel/Zantrel S/47016, untreated	Poor; mussy
Fortel/Zantrel S/47016, elastomer, Formula 6	Excellent

This is an illustration of the effect of the elastomer on Dacron/cotton. There is a significant increase in wrinkle recovery after the elastomer treatment, while the tensile strength has been held quite close to that of the untreated, and the tear test rating has been improved slightly.

EXAMPLE 11

Oil repellency.
Fabric.

Fortrel/Zantrel, Dacron/cotton.

Elastomer.—A silicone elastomer having oleophobic properties (XT-40057-A) was applied (similar to For-

mula 5) to Fortrel/Zantrel and Dacron/cotton woven fabrics. Highly desirable resilience, hand, body and water repellency were obtained. The elastomer finished fabric also had oleophobic properties.

EXAMPLE 12

Woven Dacron/wool fabric was treated and tested in this example with the following results:

Test	Untreated Dacron/Wool	Formula #2 Silicone Elastomer Treated 3.1% Add-on
Crease Resistance:		
Dry, (Warp+Fill.).....	316	327
Wet, (Warp+Fill.).....	265	301
Spray Rating, Water Repellency.....	50	100
Tensile Strength (filling).....	78	73
Tear Strength (filling).....	7.2	12.6
Bending Length, Stiffness.....	1.20	1.64

The above data shows the benefits in resiliency (wrinkle resistance), water repellency, body stiffness and tear strength obtained with the elastomer treatment without significantly affecting tensile strength.

The following three examples relate to the treatment of woven glass fabrics as indicated:

EXAMPLE 13

"Beta" fiberglass—Formula 5—0.62% add-on

Results.—Increased body, resilience, creasing resistance and abrasion resistance. Durability to washing.

Test	Untreated	Elastomer Treated
Crease Resistance:		
Original, Dry (Warp+Fill).....	294	360
Original, Wet (Warp+Fill).....	296	355
5 Launderings, Dry (Warp+Fill).....	276	357
Wet (Warp+Fill).....	271	342
Bending Length Stiffness:		
Original.....	2.40	2.72
5 Launderings.....	2.21	2.96
Stoll Wrinkleometer.....	(1)	(2)
Stoll-Flex Abrasion (Round Rod) Warp/Fill..	424/141	2,948/3,814

¹ Very poor.

² Excellent.

The above data show perfect or near perfect crease angles before and after laundering for the elastomer treated fabric. This is very unusual on fiberglass. Additionally, abrasion resistance is increased several times, and the treated fabric has excellent resistance to wrinkling. It should be noted that 5 launderings on a glass fabric is equivalent to washings for 2 years normal use. Excellent durability is obtained and this in itself is very unusual since fiberglass is notorious for lack of adhesion to finishes and maintaining durability in washing. Colored fabrics checked for lightfastness showed no change after 140 hours exposure.

EXAMPLE 14.—REGULAR DE FIBERGLASS (FORMULA #5) 1.6% ADD-ON

Test	Untreated	Elastomer Treated
Crease Resistance, Monsanto:		
Dry (Warp+Fill).....	294	360
Wet (Warp+Fill).....	296	360
Tensile Strength, lbs. Grab (Warp/Fill)...	93/93	115/120
Wash/Wear, 3 Launderings, Line Dry.....	4.0	5.0
Stoll Wrinkleometer.....	(1)	(2)

¹ Poor.

² Excellent.

It should be noted that the treated fabric has perfect dry and wet crease recovery. This is highly unusual on glass fabrics. The fabric also has perfect washability and shows a strength gain due to the treatment. The fabric can be stored in a completely wrinkled and compressed state for long periods of time, and will emerge free of wrinkles. This suggests uses such as parachutes, etc., which must recover quickly after long storage.

EXAMPLE 15.—INURLED ROLL APPLICATION—COLORED FIBERGLASS—FINELY ENGRAVED LINED ROLL, FORMULA #5 SILICONE ELASTOMER

Test	Untreated	Silicone Treated
15 Tensile Strength (warp/filling).....	225/225	226/232
Dry Crease Resistance (warp + filling).....	314	344
Bending Length, Stiffness, ins.....	2.70	3.22
Stoll Wrinkleometer.....	(1)	(2)
Lightfastness, 100 hours.....	5	5

¹ Poor.

² Excellent.

The above data show that the treatment results in tensile strength gain while imparting added crease resistance, more desirable body (stiffness), excellent wrinkling resistance, and no effect on color of fabric after long light exposure.

EXAMPLE 16.—100% COTTON (WOVEN FABRIC) PRETREATED WITH NITROGENOUS RESIN, FORMULA #4 APPLIED, 8.8% ADD-ON

Test	Resin Treated Only	Resin Plus Elastomer Treated
Tensile Strength, Warp/Filling.....	63/37	53/31
Tear Strength, Warp/Filling.....	4.04/4.1	4.3/3.7
35 Crease Resistance, (Warp + Filling):		
Dry, Original.....	233	287
Wet, Original.....	207	245
Dry, After 5 Launderings.....	218	267
Wet, After 5 Launderings.....	214	252
Dry, After 5 Dry Cleanings.....	241	291
Wet, After 5 Dry Cleanings.....	208	251
40 Construction, Warp/Filling.....	76/60	73/61
Wash/Wear Rating.....	2.5	4.5

The above combination of the resin plus the elastomer treatment is an excellent example of how the ultimate in wash/wear properties on 100% cotton can be reached. Not only is there a significant increase in wet and dry wrinkle recovery properties which are durable through laundering, but there is also a significant increase in the wash/wear rating. All of this is obtained at no expense in the tear strength and very slight expense in tensile strength.

EXAMPLE 17.—RAYON/ACETATE, WOVEN, FORMULA #4, 5.9% ADD-ON

Test	Untreated	Untreated Topped With Elastomer only	Conventional Nitrogenous Resin Treatment
Tensile Strength (Warp/Fill).....	115/113	110/107	93/111
Tear Strength (Warp/Fill).....	5.0/5.7	14.8/15.6	8.1/11.2
Crease Resistance, Monsanto (Warp+Fill):			
Dry, Original.....	256	280	306
Wet, Original.....	168	205	187
Dry, Aft. 5 Laund.....	230	285	271
Wet, Aft. 5 Laund.....	158	203	191
Dry, Aft. 5 Dry Clean.....	265	286	299
Wet, Aft. 5 Dry Clean.....	150	178	168
Construction (Warp/Fill).....	91/39	86/36	84/35
Stoll Flex Abrasion (Warp/Fill).....	1,427/4,406	1,382/4,208	317/590
Water Repellency, Spray Ratings:			
Original.....	0	100	0
After 5 Launderings.....	0	80	-----
After 5 Dry Cleanings.....	0	70	-----
Chlorine Damage:			
Tensile, Original (Warp/Fill).....		88/86	74/89
Tensile, Scorched (Warp/Fill).....		87/89	41/31
Percent Tensile Loss (Warp/Fill).....		1/3.5+	45/65
Appearance after Scorching.....		(2)	(2)
Wash/Wear Rating.....	2.5	2.5	2.5
Air Porosity.....	53.8	112.0	-----

¹ Gain.

² Good.

³ Noticeable Scorch.

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This example gives a direct comparison between (a) untreated rayon/acetate fabric; (b) the same fabric treated with elastomer and (c) the same fabric treated with nitrogenous resin in conventional manner (including the usual softeners and hand builders). The results show the problems encountered with conventional resin treatments. Thus, for example, the tensile strength is not badly hurt, and this is characteristic of resins on rayon. (Cotton on the other hand will be degraded by this same amount of resin.) Tear strength has been improved by the addition of conventional silicone type softeners and the wrinkle recovery obtained is quite good. However, this wrinkle recovery is obtained at the expense of still flex abrasion which has been significantly reduced below that of the untreated in spite of the lubricating effect of the ordinary silicone. The overall results obtainable with the elastomer treatment, however, are outstanding and this example, therefore, illustrates that, for all intents and purposes, one basic chemical can be used, according to the invention, to achieve the same properties that are obtained in nitrogenous resins, hand builders and softeners.

EXAMPLE 18.—ACRILAN/RAYON/ACETATE WOVEN FABRIC, FORMULA #4, 7% ADD-ON

Test	Untreated	Elastomer Treated	Conventional Nitrogenous Resin Treatment
Tensile Strength (Warp/Fill.)	118/82	123/87	104/62
Tear Strength (Warp/Fill.)	5.2/4.5	8.9/7.9	7.7/6.3
Crease Resistance (Warp/Fill.):			
Dry, Original	283	307	268
Wet, Original	204	271	222
Dry, After 5 Launderings	281	302	280
Wet, After 5 Launderings	211	274	233
Dry, After 5 Dry Cleanings	282	309	284
Wet, After 5 Dry Cleanings	187	242	201
Construction	54/39	52/37	49/37
Stoll Flex Abrasion, (Warp/Fill.)	966/654	1,880/1,489	1,347/1,171
Wash/Wear Rating	3.5	5.0	3.5
Air Porosity	62.7	87.6	—
Light Fastness, 20 hrs.	4	4	4
Water Repellency, Spray Rating:			
Original	0	100	70
After 5 Launderings	0	100	—
After 5 Dry Cleanings	0	70	—

The above example illustrates the fact that the silicone elastomer treatment of the invention does not effect air porosity of the treated fabric. Additionally, the pressed crease retention is not changed by addition of the elastomer. It might be expected that an elastomer with such wrinkle resistant properties would decrease the ability of the fabric to take a crease and retain the crease during laundering. However, the fabric was tested by making a pant leg and the elastomer treated and untreated pant legs were then washed. The rating given to both of these fabrics was 5 for the best rating that can be obtained for pressed crease retention.

The treated fabric of this example is particularly outstanding and a ladies garment made therefrom has been worn 70 hours without showing any signs of wrinkling. After 70 hours wearing, the fabrics still showed good hand and resilience of properties.

EXAMPLE 19.—WOVEN FABRIC (FORTREL/ZANTREL BLEND) FORMULA #4, 3.7% ADD-ON.

Test	Untreated	Elastomer Treated	Conventional Nitrogenous Resin Treatment
Tensile Strength, (Warp/Fill.)	86/86	83/82	77/68
Tear Strength (Warp/Fill.)	4.0/3.8	7.7/8.0	3.8/3.3
Crease Resistance (Warp + Fill.):			
Dry, Original	285	288	284
Wet, Original	239	280	253
Dry, After 5 Launderings	271	288	272
Wet, After 5 Launderings	238	262	228
Dry, After 5 Dry Cleanings	293	311	286
Wet, After 5 Dry Cleanings	220	270	200
Stoll Flex Abrasion (Warp/Fill.)	4,339/5,136	2,370/5,254	3,364/3,986
Bending Length, Ins.:			
Original	1.17	1.59	1.78
After 5 Launderings	1.14	1.27	1.22
After 5 Dry Cleanings	1.13	1.27	1.32
Wash/Wear Rating	2.5	3.0	4.0
Construction	88/66	88/66	88/65

The above data further demonstrates the unique advantages of the elastomer treatment described herein.

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EXAMPLE 20

This example shows the effect of the elastomer treatment when applied to a woven Dacron/cotton blend which has been given a commercial finish (i.e., nitrogenous resin, softeners, hand builders). Formula 4 is used with 3% solids add-on.

Test	Commercial Finish	Commercial Finish Followed by Elastomer Treatment
Tensile Strength Warp/Fill.)	106/63	97/50
Tear Strength (Warp/Fill.)	9.0/8.0	9.5/8.2
Crease Resistance (Warp + Fill.):		
Dry, Original	291	321
Wet, Original	252	302
Dry, After 5 Launderings	287	315
Wet, After 5 Launderings	255	288
Dry, After 5 Dry Cleanings	291	316
Wet, After 5 Dry Cleanings	235	279
Construction (Warp/Fill.)	91/62	91/629
Wash/Wear Rating	3.5	4.5
Stoll Wrinkleometer	(1)	(2)

¹ Poor, mussy.

² Excellent.

It will be noted that while the commercially finished fabric shows good wrinkle recovery and wash/wear appearance after laundering, the fabric topped up with the elastomer showed much improved crease recovery and one full unit better wash/wear rating. This is done with only a minimum loss in tensile strength and no loss in tear strength.

EXAMPLE 21

This example shows the application of the invention to

a knitted fabric, namely, "Arnel" Triacetate/nylon tricot using Formula 3 above:

Test	Untreated	Elastomer Treated
Crease Resistance:		
Dry (Warp+Fill).....	270	326
Wet (Warp+Fill).....	210	213
Stiffness-Bending Length.....	0.71	0.86
Wash/Wear, 3 Launderings, Line Dry.....	3.5	3.5

The treated fabric had a desirably high degree of 10 resilience, slickness and muss resistance.

EXAMPLE 22

The elastomer treatment of the invention may be applied to a wide variety of fibrous structures. This includes the following, the silicone elastomer referred to being Dow XT-40025 and the method of application being the same as that outlined above.

Paper

Road maps.—3 and 6% silicon elastomer produced a waterproof map.

Kraft paper and light, filmy paper products.—6% silicone elastomer, produced high resistance to water and high wet strength.

Fur or pile fabrics

Plush.—4 and 10% solids applied to 100% rayon gave high resilience, crush resistance, fuller hand, water and stain repellence and slicker, smoother surfaces.

Apparel coating, mohair/Dynel.—10% solids, same properties as in the case of plush fabric. (Cured at 250° F. to protect Dynel.)

Synthetic sealskin, nylon/Orlon, imitation sealskin.—3 and 6% silicone elastomer produced markedly improved slickness and smoothness highly desirable in this fabric. Water repellent and stain repellent. Fabric highly resilient.

Other materials suitable for treatment herein include, for example, webbings such as nylon seat belt webbings, nonwovens, wool blankets, sewing thread, cord, ribbon.

Staple fibers or continuous filaments of natural or synthetic materials, e.g., polyester, rayon, acrylics (Orlon), nylon, cotton, wool, etc., may also be treated with silicone elastomer in the manner indicated. Fur and pile fabrics are especially benefitted by the addition of the elastomer since the treatment gives high resiliency and also gives better crush resistance and hand as well as water and stain repellency.

EXAMPLE 23

This example compares differential abrasion or frosting for elastomer treated fabric opposite the same fabric treated instead with conventional urea-formaldehyde resin:

Tester.—Press abrader machine, coarse screen, 10 minutes, 1.2 lbs./sq. in. pressure

Elastomer treatment.—Formula 5 silicone elastomer

Fabric.—Woven Fortrel/T-700 Zantrel

Rating scale.—5 represents high resistance to differential abrasion (frosting)

1 represents low resistance to differential abrasion (frosting)

Untreated.—Rating 5

Elastomer Treated.—Rating 4

Urea Formaldehyde Resin Treated.—Rating 3 (6.3% solids)

As shown, the elastomer treated fabric had a rating only one unit below the untreated rating of 5, while urea-formaldehyde resin lowered the rating 2 units below that of the untreated. A rating of 5 is perfect and represents no frosting.

EXAMPLE 24

This example compares stretch recovery for untreated

100% Zantrel suiting and the same material treated with Formula 5 in the manner outlined above:

	Elastomer Treated	Untreated
Stress Required to Stretch to Elastic Limit.....	17.5	19.5
Percent Elasticity in Filling at Elastic Limit.....	28.5	29.2
Percent Stretch, 3 Lb. Load, 30 Mins.....	16.5	20.0
Percent Stretch Recovery:		
Immediately.....	63.6	47.5
After 15 Minutes.....	72.7	60.0
After 2 Hours.....	78.8	67.5
After 24 Hours.....	84.8	75.0

EXAMPLE 25

Two silicone elastomers (namely Dow C-42024 and Dow C-42038) measured in the same solvent (perchloroethylene) at the same solid level (30%) (130,000 centistokes vs. 18,000 centistokes, respectively) were both applied in 6% solids levels on Fortrel/Zantrel and fiberglass fabrics. Both treatments gave products having essentially the same resilient property, body and surface lubricity. The effect is characteristic of many other silicone elastomers of widely varying viscosities or molecular weights provided the characteristics and properties referred to above are present.

EXAMPLE 26

Two silicone elastomers (Dow XT-40025 and combination of General Electric SS-4100 and SS-4025) were applied at 6.5% solids level each, to Fortrel/Zantrel fabrics of the same construction. Infrared analysis shows the two elastomers to be very similar in basic structure. The following comparative results were obtained:

Treatment	Crease Resistance, Monsanto Warp and Filling	
	Dry	Wet
Untreated.....	272	213
Elastomer (1).....	298	260
Elastomer (2).....	276	238

The above shows that both elastomers add materially to crease angles.

EXAMPLE 27

Regular very low viscosity silicone fluid in emulsion form (Sylmer 1108) was applied (8% solids) to a Dacron/cotton fabric and compared with the untreated fabric and the same fabric treated with silicone elastomer according to the invention. The following results were obtained:

Treatment	Crease-Resistance, Monsanto (Warp+Fill.)		Wash/Wear Rating
	Dry	Wet	
Untreated.....	267	255	3.0
Regular Silicone, 8% Solids.....	288	271	3.0
Silicone Elastomer, 7% Solids.....	311	304	4.5

As indicated, the silicone elastomer produces more resistance to creasing and significantly better washing performance than the regular silicone even when less elastomer solids are used.

While the elastomer is preferably applied in a solvent system according to the invention, it is also possible to use emulsions of silicone elastomers. This is shown below.

EXAMPLE 28

Water/oil and oil/water emulsions of solvent-dissolved silicone elastomers were prepared by conventional techniques of using appropriate emulsifiers, solvents, and high shear mixing equipment. These emulsions were applied to Dacron/cotton and fiberglass fabrics at the 10% solids level and produced good resilience, slickness and body, as well as repellency. The water/oil system

produced slightly better resiliency than the oil/water system.

An oil/water emulsion of another silicon elastomer having oleophobic properties (i.e., Dow XET-40078), prepared by a colloid milling technique, also produced very desirable slickness, wrinkle resistance and body.

EXAMPLE 29

A typical silicone elastomer (i.e., Dow XT-40025) in solvent solution was compared to a typical silicone elastomer (i.e., Dow XT-40057A) in an emulsion system, on an equal solids level (3%) and on the same substrate (fiberglass).

Test	Silicone Elastomer Solvent System		Silicone Elastomer O/W Emulsion System	
	Original	5 Launderings	Original	5 Launderings
Crease Resistance (Warp+ Fill):				
Dry.....	343	337	337	333
Wet.....	325	326	338	331
Bending Length Stiffness.....	2.07	2.08	2.27	2.29

The two systems show the same crease resistance and durability to washing. The emulsion tends to produce more body (stiffness) than the solvent system. Slickness is also slightly more in an emulsion than in a solvent system, probably because of more surface deposition on the fabric.

As noted earlier, it is possible to use mixtures of the silicone elastomer and other polymers to modify properties as may be desired. Thus, it is possible to blend with the silicone elastomer other solvent soluble polymers or elastomers such as fluorocarbons, acrylics, urethanes (hydrophilic and hydrophobic), ethylene-vinyl type, other silicones, etc., to modify properties such as abrasion resistance, color binding, economics, body, "hand," lubricity, resilience, durability, repellency, strength, crease resistance, solidability, ad infinitum. These polymers can be applied either simultaneously with, as pretreatments before, or post-treatments after, the preferred elastomer. These polymers or elastomers can be used as protective coatings for other more fugitive or less durable finishes applied as pretreatments. They may also be used to add significantly to other pretreatments.

The use of a mixture of silicone elastomer and polyurethane in the treatment of woven glass fabric is shown below:

EXAMPLE 30

Treatment	Stoll-Flex Abrasion Round Rok, 1 lb. load, 2 lb. Tension, Cycles to Failure	Crease Resistance, Monsanto			
		Original		5 Laund.	
		Dry	Wet	Dry	Wet
Untreated (Warp/Fill).....	127/147	312	308	266	264
Silicone Elastomer, Urethane (3% solids each mixed together).....	3,231/1,985	336	335	312	310

As shown, the elastomer-urethane mixture gives better abrasion resistance than the untreated. Good resilience and crease resistance, with good durability to laundering, are also obtained.

EXAMPLE 31

A Fortrel/Zantrel fabric was treated with a combination of a silicone elastomer and Elvax (ethylene vinyl acetate copolymer, E. I. DuPont Company).

FABRIC FORTREL/ZANTREL

	Silicone Elastomer Only	Silicone Elastomer plus Elvax
Crease Resistance:		
Dry, Warp, degree.....	138	144
Dry, Fill, degree.....	140	139
Wet, Warp, degree.....	126	129
Wet, Fill, degree.....	126	129
Stiffness Test, inches.....	1.74	1.62

The Elvax contributed to wrinkle recovery and bulk without adding to stiffness.

Further examples showing the use of high polymers other than silicone elastomers, from a solvent system, and the results obtained thereby, are shown below:

EXAMPLE 32

Polysulfide formulation

10% solids polysulfide SH terminated (Thiokol LP-32)
1% cumene hydroperoxide
0.1% amine accelerator (EH-310)
88.9% toluene

This formulation was applied to Dacron/cotton, resin treated cotton, nylon and glass fabric with drying and curing at room temperature and at 375° F. Body was imparted to the fabrics with only fair resilience.

EXAMPLE 33

A formulation was prepared comprising solvent soluble polyacrylate (Thiokol D-2072 94-2) with red lead and NA-22 catalyst. The formulation was applied to Dacron/cotton and glass fabric as 10% solids in toluene, curing at 300° F. Wrinkle resistance and body were

obtained and abrasion resistance was imparted to the glass as shown below:

Fabric treatment:	Cycles, stoll flex abrasion round bar 1 lb. head load, 2 lb. tension	
	None	Finished standard
None	1,181	1,572
Finished standard	1,572	26,313
Polyacrylate finished	26,313	

EXAMPLE 34

The following solution was prepared:

10% solids solution of urethane

	Gm.	5
Urethane (Thiokol Elastothane 455) (40% solids) --	25	
Sulfur -----	0.1	
Methyl ethyl ketone -----	74	

This solution was applied to Dacron/cotton, glass and cotton fabrics with curing at 300° F. The treated products had low resilience and more body.

The superiority of the silicone elastomers having the essential characteristics outlined herein, utilized alone or in combination with other elastomers or polymers, will be apparent from the foregoing examples, including those wherein polysulfides, polyacrylates and polyurethanes, are utilized. Obviously, other elastomers than those shown above may be mixed with the silicone elastomer for use herein, e.g., any of those falling within the family of disulfones, urethanes, acrylics, sulfides and other rubbers. Additionally, various other modifications may be made in the invention as described above. For example, the elastomer treated fabric, e.g., knitted nylon goods, may be subsequently dyed to produce highly uniform dyeings with no evidence of spotted or heavily dyed areas. The elastomer finished remains even after severe dyeing conditions thus showing its surprising durability under the most rigorous conditions.

Other modifications may also be made without departing from the spirit and scope of the invention.

We claim:

1. A textile fabric rendered highly resilient and having thereon a coating of a cured high molecular weight methylpolysiloxane elastomer polymer, said coating being present

in a substantially noncrosslinked state with respect to said fabric and said coating being substantially completely dissolvable from the fabric by cupric ethylene diamine and said coating being disposed essentially completely at or near the outer surface of the fibers constituting said fabric, the elastomer being characterized by its high molecular weight and forming a continuous film which is tack-free, and demonstrates a resiliency such that at least 70% recovery occurs after 25-35% elongation, 300-600% elongation at break, 5-150 grams/mil tensile strength, a Young's modulus of 5-50 grams/mil thickness/percent elongation, and a toughness 1,000-50,000 grams/mil $\times$ percent elongation/2.

2. The product of claim 1 wherein said elastomer composition contains at least one other elastomer selected from the group consisting of urethanes, acrylics, disulfones and sulfides.

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