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COLLAR AND CUFF-LIKE GARMENT MEMBER
AND METHOD OF MAKING IT
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FIG. -1-

FIG. -2-

FIG. -3-

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COLLAR AND CUFF-LIKE GARMENT MEMBER AND METHOD OF MAKING IT

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12 Claims

ABSTRACT OF THE DISCLOSURE

An abrasion resistant woven or knitted apparel fabric wherein the uppermost fibers of one face of the fabric are held tightly together by a polymeric coating composition. The fabric is further characterized in that a substantial number of yarns below the coated face thereof have the ability to move freely relative to adjacent yarns. The fabric is suitable for use in garment members such as collars, lapels, cuffs and the like.

This invention relates to abrasion resistant fabrics and more specifically to stiffened abrasion resistant piled fabrics suitable for use in garment members such as collars, lapels, cuffs and the like.

Stiffened garment sections such as shirt collars and the like are commonly prepared by fusing two sections of fabric to an interioirly disposed plastic stiffener or by stitching two sections of fabric to an interioirly disposed stiffening fabric or by stitching together a plurality of fabric layers of substantially similar construction. Garment members prepared in the aforementioned manner still rely upon the outer fabric construction for abrasion resistance properties. For this reason, it is common to employ a heavier fabric in cuff, collar and lapel members and the like, than is employed in the body of a garment. The use of fabrics of varying weight in a garment often results in serious color matching, stitching and aesthetic problems.

It is therefore an object of this invention to prepare an abrasion resistant piled fabric that has the proper body and which may be employed in the preparation of garment sections without requiring extensive stitching operations. It is another object of this invention to prepare abrasion resistant garment sections from garment body fabric.

In accordance with this invention, it has now been discovered that an abrasion resistant piled fabric that has the proper body and which is suitable for use in the manufacture of garment members may be prepared by depositing a polymeric composition on those yarns forming the face of a fabric, whereby only the uppermost fibers in these yarns are held tightly together by the polymeric composition, the yarns themselves being relatively free to move, and then forming a continuous piled structure from the treated fabric. While any of a wide variety of coating techniques may be employed to deposit a polymeric composition on a single face of the fabric, a more detailed description of the preferred coating procedure may be seen in U.S. Patent No. 3,141,810. The polymeric composition is preferably a polymeric composition which will maintain its dimensional stability at temperatures above 300° F., that is to say, the polymeric composition should not be effected by those temperatures which are commonly employed in ironing cotton fabrics.

While the invention as described herein is suitable for use with any of the textile fabrics known to garment manufacturers the preferred embodiment of the apparel fabrics such as shirt fabrics and more specifically cotton fabrics, cotton-rayon blend fabrics, cotton-polyester blend fabrics, cellulose ether fabrics, cellulose ester fabrics, rayon fabrics, nylon fabrics, polyester fabrics and the like. The coating composition may also be any coating composition which has the ability to retain its dimensional stability at elevated temperatures. Resins which have been found to be especially suitable for use as coating compositions in this invention are acrylonitrile polymers, particularly blends of acrylic acid with lower alky1 acrylates, such as methyl and ethyl acrylate, polyurethanes, and aldehyde resin modified and alkylene oxide modified polyurethanes. The term polyurethane as employed herein is considered to include polyurethane prepolymers and combinations of reactive ingredients which are capable of forming polyurethanes in situ. In general, the resin coating should be applied to one face of the fabric in amounts of from about 2% by weight of the fabric to about 15% by weight of the fabric.

A better understanding of the invention may be had from a discussion of the drawings which are as follows:

FIGURE 1 is a front view of an abrasion resistant stiffened collar member.

FIGURE 2 is a side view of the abrasion resistant stiffened collar member of FIGURE 1.

FIGURE 3 is a schematic diagram of one means for applying a coating suitable for producing abrasion resistant stiffened properties in a fabric.

In FIGURE 1 a collar member 1 is illustrated, the collar being fashioned from a single fabric blank secured by stitches 2. The fabric blank is coated with an abrasion resistant coating composition on a single face. Collar member 1, therefore, has a coating on that portion of the collar which is below the plying juncture formed at juncture 3 while the tab portion 4 of the collar which is above juncture 3 is free of coating. A better understanding of the disposition of the coated surface may be had from a review of FIGURE 2 of the drawings which is a side view of FIGURE 1 taken along the line II, II. The exposed face of the main portion of collar member 21, that is to say that portion lying below stitch member 22, carries an abrasion resistant coating. That portion of collar member 21 which lies above stitch member 22, that is to say tab member 24, is free of coating material on the exposed face, the coated side having been turned inwardly.

In FIGURE 3 the fabric 31 is passed over suitable guide rolls 32 into a pad bath 33 containing a resinous coating composition. After passage under pad roll 34, the fabric is passed over suitable guide rolls 35 onto a continuous duck conveyor member 36. The fabric by which the fabric is passed over and in contact with an endless duck belt 35 and is dried by means of flash dryer 36. The technique is found to be such that the resinous impregnant migrates to that side opposite a damp duck continuous conveyor 35 and therefore results in a fabric having resin deposited on those yarns forming one face of the collar. The conveyor member 35 is continuously maintained in a damp condition by passage through a water containing pad pan member 37. The finished fabric which is coated on one face is then wound onto takeup reel 38.

It should be understood that other techniques may be employed for depositing the polymeric composition on one face of the fabric such as, for instance by a spraying technique, a knife coating technique or by pressure migration techniques such as spoming and the like. The polymeric composition is preferably dried and at the same time cured at a temperature at which the composition coalesces to hold the fibers of the face yarns tightly together, but at a low enough temperature to avoid undue flowing of the composition into the fabric. The curing temperature, therefore, will generally lie within the range of temperatures at which the polymeric composition is plasticized. For the preferred polymeric compositions suitable for use in accordance with this inven-
tion, drying and curing is preferably effected by flash-drying the treated fabric at these elevated temperatures, preferably between about 100° C. and about 200° C., or even higher, up to about 300° C.

In this regard, it is preferred that the undried fabric does not contact an unyielding surface, such as a guide roll, since the pressure will effect migration of the polymeric composition into the fabric, thereby necessitating more specialized drying techniques to obtain even fair results.

The location of the polymeric composition on the face yarns is facilitated in a specialized technique wherein one of the two faces of the coated fabric is dried more rapidly. When this technique is utilized, the polymeric composition migrates only to the face yarns during the flash drying operation presumably because of the drying and temperature differentials between the faces of the fabric. It is believed that for this reason, the migration effect occurs to provide a fabric having the polymeric composition in the desired location.

The flash-drying medium may be any conventional drying apparatus, such as hot air ovens or infrared lamp arrays. Preferably an air circulating means is provided so that hot air is circulated through the fabric during drying.

Great care must be taken in applying the polymeric composition to the fabrics to insure that the material will be deposited properly on the face yarns. Total immersion of the fabric for extended periods of time, for example, invariably causes substantial compaction and impregnation of the fabric and the desirable characteristics of the fabric of this invention are not generally obtained. Spray techniques have been used with success but process conditions must be very carefully controlled. It is difficult, for example, to prevent the polymeric composition from flowing between the face yarns and into the fabric when this procedure is utilized. Clogging of the spray valves is not too uncommon, either, thereby resulting in uneven distribution of the polymeric composition on the fabric. By utilizing a polymeric composition medium of fairly low solids content, e.g., from about 1% to about 5% by weight solids, and by spraying the material onto a rapidly moving fabric, e.g., about 20-30 yds. per minute, the desired location of the polymeric composition may be obtained. The sprayed fabric is taken immediately from the spray chamber into an oven, heated to a temperature approximating the boiling point of the polymeric composition to fix the polymeric composition in the desired location and to assist in preventing the migration of the polymeric composition into the fabric. The spraying procedure may be greatly facilitated by running the fabric in a vertical manner and spraying the polymeric composition onto the vertically moving fabric from horizontally displaced spray guns.

The difficulties in controlling the spraying techniques are obviated, however, by applying the material, by means of a trough apparatus including an open-ended trough lined with a porous material, preferably of nylon, in such a manner that the porous material extends through the open end of the trough to form a bag-like protruberance. The lining material is of such a weave that the polymeric composition will not flow through except upon contact with the fabric to be treated. The pressure on the material caused by the running fabric is sufficient to release a limited amount of the polymeric composition evenly onto the fabric surface which contacts the bag. The fabric is then passed immediately into a curing zone and the polymeric composition is rapidly cured before undue impregnation of the fabric can occur.

Generally, it is preferred to apply the polymeric composition as an aqueous medium, such as an aqueous solution or emulsion. Improved drying is realized in some instances by dissolving or emulsifying the polymeric composition in an organic medium, such as the lower alkylic alcohols, methanol, ethanol and the like.

The following examples are given for purposes of illustration and should not be considered as limiting the spirit or scope of this invention:

**Example I**

A plain woven cotton broadcloth fabric of 136 by 64 construction having a weight of about 2.65 yards per lb. is knitted coated at a 0 micrometer setting with a gardener knife employing a coating composition comprising 20% by weight Unithane 550 solids (polyurethane prepolymer marketed by Thiolek Chemical Company) and 10% by weight Unithane F5 solids (polyurethane prepolymer marketed by Thiolek Chemical Company) the knife coating technique being carried out in a manner such that one face of the fabric is completely coated with out any of the coating composition striking through to the opposite face. The pickup of solids coating composition is about 11% by weight on the dry weight of the fabric. The fabric is then dried and collar blanks are cut from the coated fabric. The collar blanks are then folded approximately in one half the edge portion of the blanks being folded down to the central dividing portion in manner such that one-half presents two faces which expose the coating while the other half presents two faces which are free of coating. A tab member furnished by the blank is then stitched so as to secure the coated fabric in a manner whereby the coated surfaces form a garment collar while the uncoated surface forms a collar band. Collars prepared in this manner are found to have resilient abrasion resistant characteristics without being stiff. The collars are also found to withstand washing and ironing operations without any loss of their resilient characteristics.

**Example II**

The procedure of Example I was repeated with the exception that the coating composition was applied to a woven cotton oxford cloth shirting fabric of 88 by 50 construction having a weight of 2.85 yards per lb. Coating carried out in a manner such that a pickup of 14% by weight solids is obtained based on the dry weight of the fabric. The collars made from this material were also found to be able to withstand washing and ironing operations without any substantial loss in their resilient characteristics.

**Example III**

A plain woven cotton broadcloth fabric of 136 by 64 construction having a weight of about 2.65 yards per lb. is knitted coated to about 100% wet pickup. The coating composition being 12% by weight Unithane 500 solids (polyurethane prepolymer prepared by Thiolek Chemical Company) and 7.8% Unithane F5 solids (polyurethane prepolymer prepared by Thiolek Chemical Company) in an aqueous carrier. The padded fabric is then placed on a yampack fabric conveyor held on a pin frame and dried at about 160° C. for about 5 minutes in an oven. Samples are then cured at about 160° C. for about 2 minutes. Collar blanks are cut from the coated material which is found to have polyurethane deposited on a single face. The collar blanks are folded approximately in one half the edge portion of the blanks being folded down to the central dividing portion in a manner such that one-half presents two faces which expose the coating while the other half presents two faces which are free of coating. A tab member furnished by the blank is then stitched so as to secure the coating of the fabric in a manner whereby the coated surfaces form a garment collar while the uncoated surface forms a collar band. Collars prepared in this manner are found to have a resilient abrasion resistant characteristic without being stiff.

**Example IV**

The process set forth in Example III was repeated except that the coating operation was conducted on a woven cot-
ton Oxford cloth shirting fabric having a construction of 88 by 50 and a weight of about 2.85 yards per lb. Collars cut from the coated fabrics according to the manner set forth in Example III are found to have a resilient abrasion resistant characteristic without being stiff.

Example V

A polyester-cotton (65% polyester 35% cotton) shirting fabric of 136 by 64 construction was spray coated with a latex composition comprising Rhoplex K3 (aqueous dispersion of acrylic polymers marketed by Rohm and Haas Chemical Company) in a manner such that one face of the fabric is completely coated without any of the coating composition striking through to the opposite face. The coating was carried out in a manner such that a pickup of 8% by weight of latex was obtained on the dry fabrics. The fabric was dried and collar blanks are cut from the coated fabric. The collar blanks are then folded approximately in one half the edge portions of the blanks then being folded down to the central dividing portion in a manner such that one-half presents two faces which experience the test, while the other half presents two faces which are free of coating. A fabric test as set forth in Example IV is prepared, the blank is then stitched so as to secure the coated fabric in a manner whereby the coated surfaces form a garment collar while the uncoated surface forms collar bands. The finished collars are found to have resilient abrasion resistant characteristics without being stiff and to retain these characteristics after repeated washing and ironing operation.

In order to evaluate the abrasion resistant characteristics of the apparel fabrics prepared according to the method of this invention, abrasion tests were conducted according to the tests set forth in ASTM designation D1175D. In the test, fabric specimens are subjected to rotary rubbing action under controlled conditions of pressure and abrasive action. A Tabor abrasion apparatus manufactured by Tabor Instruments Company of North Tonawanda, New York, was employed equipped with a number CS-10 abrasion wheel carrying a 1000 gram load. The tests were run for a visual evaluation with the end point of each test being determined by the first surface yarn break. Tests carried out on the fabric, produced according to Example I, showed no breaks after 300 revolutions; the control, however, which was an identical uncoated broadcloth test surface breaks after 300 revolutions. The Oxford cloth fabric, prepared according to the method set forth in Example II, showed no breaks whatsoever after 300 revolutions, while the controlled fabric which was identical in all respects with the exception that it had not been coated, showed numerous breaks after 300 revolutions. The broadcloth shirting fabric prepared according to the method set forth in Example III showed no significant breaks after 500 revolutions while the control broadcloth fabric, which was identical in all aspects with the exception that the coating was omitted, showed innumerable breaks after 300 revolutions. The Oxford cloth shirting fabric, prepared according to the method set forth in Example IV, showed no significant breaks after 500 revolutions while the Oxford cloth shirting fabric, which was identical in all respects with the exception that it had not been coated, showed numerous breaks after 300 revolutions.

Additional tests were run to evaluate the abrasion resistant characteristics of the apparel fabrics prepared according to the method of this invention. The tests being run according to ASTM Designation D1175-53T (inflated diaphragm method). This method determines the resistance to abrasion of a specimen when the specimen is inflated over a rubber diaphragm under controlled air pressure and rubbed unidirectionally. The test apparatus employs electrical contact pins disposed on either side of the sample, the pins making contact when the unidirectional rubbing causes a break in the fabric thereby stop-
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