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SEMISTIFF COLLAR

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This invention relates to wearing apparel of the type adapted to be laundered, and more particularly to wearing apparel such as shirts, collars, cuffs, plaits, and the like, as forming part of such wearing apparel.

There are several types of fabric garments manufactured according to the present state of the art, as for example, those which are manufactured and worn in the untreated state, that is, the collars and cuffs have no stiffening agent; those having collars and cuffs and similar exposed portions stiffened with a temporary stiffening agent such as starch; those having collar and cuff units stiffened by partial parchmization, by means of suitable reagents, and those in which other interlinings are used as stiffeners. Certain cellulose derivative coated fabrics have also been proposed as stiffening interlinings in collars and cuffs. Garments in which the component fabrics of the collars and cuffs are laminated by means of certain cellulose derivative compositions have also been made and fabrics coated with thermoplastic synthetic resin compositions have been proposed as the stiffening interliners.

Of the various types mentioned, none is entirely satisfactory, especially garments which are made of untreated fabrics, because they soil quickly and wrinkle easily. The starched type, while presenting a very satisfactory initial appearance, is sensitive to spotting by water and soon becomes wilted and wrinkled especially in warm weather. Collars and cuffs of multi-ply constructions, the fabrics of which are laminated and stiffened by partially parchmizing the fabrics with acid, present the disadvantage of lowered tensile strength and consequent unsatisfactory wearing qualities. In the case of the wearing apparel having the pre-stiffened interlinings with starch, for example, the treatment is effective only until the first laundering which removes the starch. While the collar or cuff can, of course, be re-stiffened by treatment with starch, it does not retain its appearance for any length of time, particularly in summer weather. Where certain cellulose derivative coated fabric interlinings are used, the result is much better, but is not entirely satisfactory because of the tendency for the coating to disintegrate and disappear and often to discolor when the garment is subjected to strenuous laundering. The same condition prevails with respect to collars and cuffs in which the component fabrics are laminated directly by means of the common cellulose derivative compositions. The synthetic resin coated fabrics are the closest approach to a sat-

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isfactory interlining but in order to obtain the desired stiffness in the finished collar, it is necessary to employ a relatively stiff coating which results in a coated fabric not readily adapted to collar fabrication.

This invention has as an object the provision of wearing apparel having semi-stiff collars, cuffs and the like which are non-wrinkling, readily cleanable by washing or dry cleaning, and capable of retaining their shape after laundering without being subjected to a subsequent stiffening operation.

A further object is the provision of a two-ply or multi-ply collar or cuff and the like which upon repeated laundering and pressings, will not show "stitch pucker."

A still further object is the production of collars which will resist distorting influences and will tend to resume their original appearance when the distorting force is removed.

A further object is the provision of a method of preparing a relatively soft coated interlining fabric for semi-stiff collars which can be readily turned and fabricated into collars, and after fusing, will result in a relatively stiff laminated assembly.

The objects of this invention are accomplished by applying a coating of a vinyl chloride resin composition to both sides of a fabric base in which the polyvinyl chloride is present in an ungelatinized or only partially gelatinized state together with plasticizer and, if desired, pigments and other coloring matter. The coated fabric is then fused between two plies of uncoated fabric by means of heat and pressure to form a firmly bonded laminated assembly. In case of a two-ply assembly the coating is applied to one side only and the cloth folded upon itself with the coated side forming the inside of the fold, and the uncoated side the outside of the fold, and the two plies are fused by the application of heat and pressure.

The method of fabricating collars by bonding the plies with a resin is well known in the art as described in U. S. Patent 2,083,199 and a further detailed description does not appear to be necessary herein, except to say that the interliner of relatively coarse weave is coated on one or both sides as described hereinafter and is then cut to shape as usual and stitched to the front and back face plies on three sides—the side to be attached to the shirt is not stitched. The assembly is then turned inside out and fused before or after sewing it to the shirt.

The following examples are given by way of illustration and not limitation:

Example I

On each side of a bleached cotton fabric running 3.57 yards per pound per 46½ in. width, having a thread count of 80 per inch in the direction of warp and filler, two coats of the composition described below were applied which deposited 3.5 ozs. of non-volatile coating per square yard distributed on each side of the fabric.

The coating composition was prepared by kneading the following ingredients in a heavy duty slow speed Werner & Pfleiderer type mixer:

Parts	
Aqueous dispersion of polyvinyl chloride resin (35.0% resin) -----	71.2
Titanium dioxide pigment extended on barytes base ground in dioctyl phthalate in the ratio of 1:1 -----	26.2
Dioctyl phthalate -----	2.6

The above ingredients were thoroughly kneaded until homogeneous and then 3.5 parts of a 20% aqueous solution of aluminum sulfate were added which formed a mushy mass. Then 9.3 parts of V. M. & P. gasoline were added and the kneading continued until a heavy, dough-like mass was obtained. Approximately 89% of the water present separated from the mass and was drained off. The dough-like mass was then applied on each side of the fabric as described above, employing a conventional doctor knife coating head and passing through a drying chamber after each successive coat. The temperature in the drying chamber was approximately 240° F. and the rate of coating was approximately 20 yards per minute. The heat in the drying chamber was sufficient to cause the polyvinyl chloride dough-like coating to fuse partially or coalesce to such a point that the composition would not powder off the fabric. On the other hand it was fused insufficiently to form a continuous film which would be stiff and boardy.

The coated fabric as described above was relatively soft and adapted to fabrication of semi-stiff collars. The coated fabric is then stitched to two layers of broadcloth and turned inside out after which the plies are fused by pressing for 30 seconds at 340° F. The collar was satisfactory with respect to "feel" and adhesion of the plies.

Example II

A laminated assembly similar to that described in Example I was prepared using the following composition formulated as described below:

Parts	
Dry copolymer of 95 parts of vinyl chloride and 5 parts of vinyl acetate -----	40.0
Dibutyl cellosolve phthalate -----	10.0
Titanium pigment extended on a barium sulfate base -----	2.6
Solvent mixture ¹ -----	60.0

Parts	
¹ Solvent mixture:	
Methyl ethyl ketone -----	75.0
Ethyl alcohol -----	25.0

In preparing the above composition, the solvent mixture was prepared separately and thoroughly mixed. The non-volatile ingredients and previously mixed solvent mixture was placed in a porcelain lined ball mill with non-ferrous pebbles and the mill was run for 24 hours after which the composition was discharged and ready

for coating. The composition was of relatively thick and smooth consistency having the appearance of mayonnaise except for color. The composition was then spread on each side of a fabric and in a manner of that described in Example I. The coated fabric was soft and pliable and easily used in making semi-stiff collars as described above. The coated interliner was then fused to two outer plies of broadcloth by pressing at a temperature of 320° F. for 30 seconds. A pull of 11 lbs. on a Scott tensile strength tester was necessary to separate test plies made in this manner. The laminated assembly had just the correct degree of stiffness to make a very satisfactory semi-stiff collar.

Methods of preparing the coating compositions other than described in Examples I and II may be employed, such as, e. g., dispersing dry powdered polyvinyl chloride of a particle size of .01 to 5.0 microns in the plasticizer without the aid of solvents. In such methods it is sometimes desirable to incorporate non-solvents for the resin such as, e. g., ethyl alcohol with the resin-plasticizer mixture to facilitate the spreading of the coating mass on the fabric. Also, it sometimes is desirable to incorporate small proportions of wetting agents such as, e. g., sulfated methyl oleate.

The resin-plasticizer mixture should also have considerable cohesion. This may be provided in part by having the resin particles in an extremely finely divided condition. Measurements of the particle size of the resins in the aqueous dispersions in the examples by an electron microscope photograph show them to be spheres of the order of .05 micron in diameter with only a small degree of agglomeration. In the preferred embodiment of the invention the ultimate unagglomerated particle size of the resin in the aqueous dispersions should be less than about 5 microns and preferably less than about .1 or .5 micron in diameter with little agglomeration so that no settling takes place.

It is generally preferred to add one or more plasticizers, and to incorporate suitable pigments, fillers, and coloring matter to produce the desired color. The kind and amount of plasticizer, pigment, filler and coloring matter to be added will depend upon the desired degree of plasticization, cost, and color effect desired, and such will be apparent to those skilled in the art in preparing resin coating compositions. Such properties as oil absorption and bulking value will influence the selection of pigments and fillers to be employed in practicing this invention. Usually compositions containing less than one-third as much solvent plasticizer as resin are of little commercial importance since they are difficult to fuse at ironing temperatures and do not form a strong bond by ironing; on the other hand, those containing more than three times as much plasticizer as resin are too thermoplastic for collars and may even cause discoloration. Examples of plasticizers which have been found suitable include esters, such as phthalates, sebacates, adipates, oleates, ricinoleates, fumarates, and organic phosphates. Stabilizing material may also be added if required such as for example phenoxy propylene oxide, lead silicate and lead carbonate.

While straight chain aliphatic hydrocarbons are generally satisfactory as a diluent, other volatile liquids having no appreciable solvent action on the resin and miscible with the plasticizer may be used, such as, e. g., toluol, xylene,

ethyl alcohol, butyl alcohol and other lower aliphatic alcohols.

The vinyl halide resins which may be used for practicing the invention are the polymers of the vinyl halides and their copolymers with other polymerizable substances, which copolymers have a vinyl halide content of more than 50% by weight. The invention is most useful in respect to the more insoluble grades of such polymers and copolymers in which the vinyl halide content is 75% or more by weight. A preferred type of vinyl halide resin is the copolymer of vinyl chloride with diethyl fumarate or other lower saturated alcohol (less than 4 carbon atoms) alkyl esters of vinylene dicarboxylic acids, e. g., methyl fumarate, maleate, etc. Other examples of the copolymers of vinyl chloride are compounds having the group



such as vinyl esters, vinyl ethers, vinyl ketones, acrylic acid, alkacrylic acid, haloacrylic acid; esters and nitriles of such acrylic acids; ethylenic acids, such as maleic, fumaric, and itaconic acid and their esters; and vinylidene chloride and other vinylidene halides. Vinyl halide copolymers of other unsaturated compounds may also be used, for example, copolymers with olefins and halogenated olefins, such as ethylene and trichloroethylene; and dienes and halodienes, such as butadiene, isoprene, and chloroprene. In fact as far as has been determined the invention is adapted to the use of any polymer made by polymerizing an emulsion of the monomers, provided it is in sufficiently finely divided form and is not affected by the plasticizer at ordinary temperatures other than by a slight swelling effect but which coalesces therewith at higher temperatures to form a tough, homogeneous durable film. For the sake of simplicity such polymers are referred to as "vinyl chloride resins" or "vinyl chloride copolymers."

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. The process of preparing semi-stiff collars which comprises coating an interlining fabric with a thermoplastic composition containing a polyvinyl chloride resin and a plasticizer in the amount of from $\frac{1}{3}$ to 3 times the weight of the

resin, the said composition having a dough-like consistency, heating the coated fabric to about 240° F. until the composition is partially but incompletely fused and discontinuous, sewing the coated interliner to a face and back ply, turning the assembly inside out and pressing the collar at about 340° F. until the resin is fused and the plies firmly bonded together.

2. The process of claim 1 in which the vinyl resin composition consists of copolymer of about 95 parts of vinyl chloride and 5 parts of vinyl acetate.

3. The process of claim 1 in which the vinyl resin is a copolymer of about 95 parts vinyl chloride and 5 parts diethyl fumarate.

4. The process of claim 1 in which the polyvinyl chloride has a particle size of from about .01 to 5.0 microns in diameter.

5. The process of making semi-stiff collars which comprises coating a bleached cotton fabric weighing about 3.57 yards per pound per $4\frac{1}{2}$ in. width having a thread count of about 80 per inch in warp and filler with two coats of a composition having approximately the following formula:

	Parts
Aqueous dispersion of polyvinyl chloride resin containing 35.0% resin	71.2
Titanium dioxide pigment ground in dioctyl phthalate in the ratio of 1:1	26.2
Dioctyl phthalate	2.6

heating the coated fabric to about 240° F. until the coating is partially but not completely fused and is still discontinuous, stitching the coated interliner to a face and back ply on three sides, turning the collar inside out so that the interliner lies between the face and back ply and subsequently bonding the three plies together by pressing for about 20 seconds at about 320° F.

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