Oct. 20, 1970 J. G. GAMBLE 3,535,192

CARPET AND METHOD OF MAKING SAME

Filed April 15, 1968 2 Sheets-Sheet 1

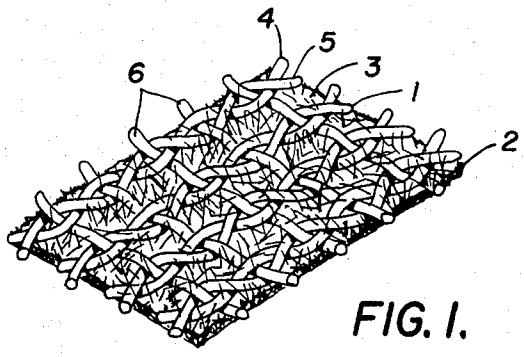

FIG. 1.

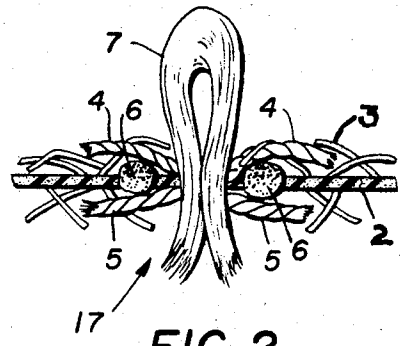

FIG. 2.

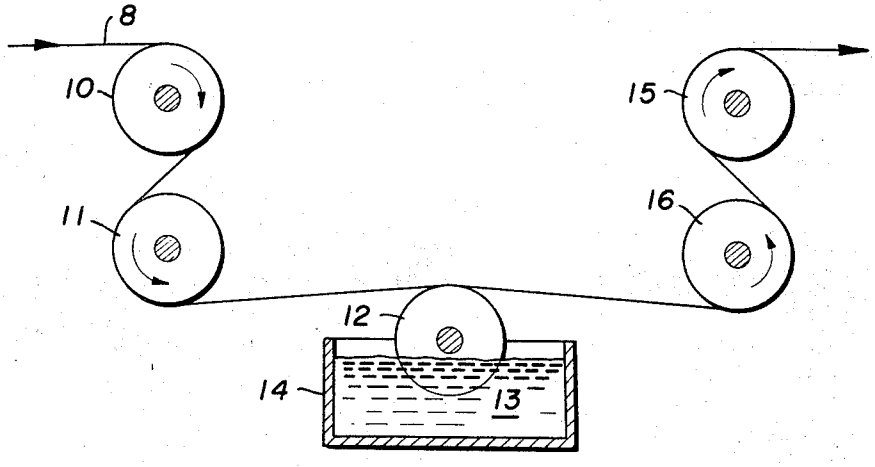

FIG. 3.

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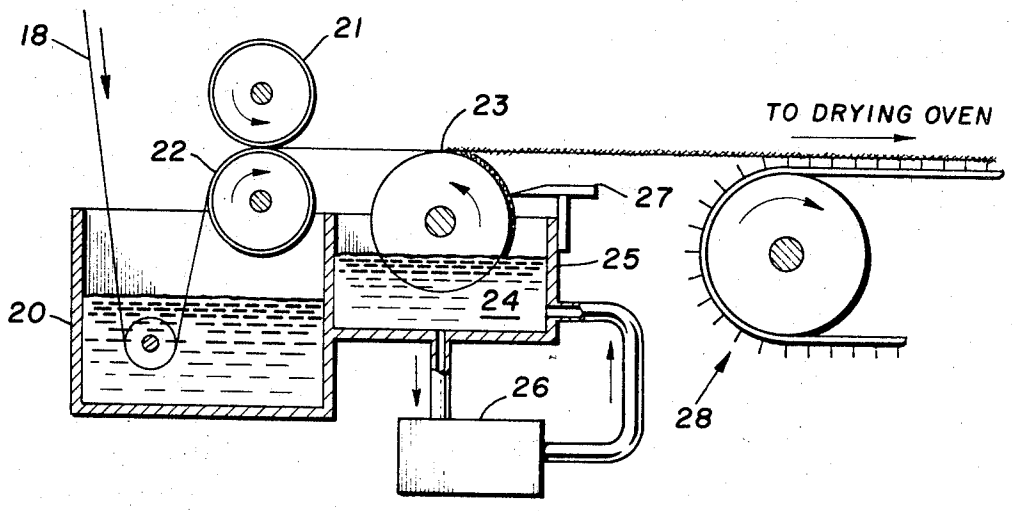

FIG. 4.

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CARPET AND METHOD OF MAKING SAME

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U.S. Cl. 161—66 7 Claims

ABSTRACT OF THE DISCLOSURE

An improved lamina especially useful for structural support in a needled textile fabric is provided. The lamina is composed of a woven scrim, preferably of leno-type weave, substantially embedded into a flexible film-forming substance bridging the interstices of the fabric and having dispersed throughout short length reinforcing fibers. When yarn is needled into the lamina, more secured anchoring thereof is obtained with reduced permeability of liquid through the lamina. This substance finds excellent use as a primary backing in the construction of tufted textile products, such as carpets.

BACKGROUND OF THE INVENTION

Needled textile fabrics have found increasingly wide acceptance by consumers. Such fabrics include upholstery, blankets, and soft floor covering with the latter product being in greatest use; but all employ a structure supporting the pile yarn which may be of loop or cut construction.

The present invention will be described with particular reference to tufted floor covering, i.e. carpets, although other needled fabrics are contemplated. A tufted carpet normally is made of a composite structure in which loops of yarn are sewed or needled into a base fabric called a primary backing. A common substance used in constructing such backing is burlap, although woven and non-woven fabrics of man-made fibers and filaments have been suggested for use as a carpet backing material. The loops of yarn projecting a short distance on the underside of the backing are secured thereto in commercial operation by coating the underside and loops with a suitable binder or adhesive. Latex rubber dispersions and the like have found widespread use for this purpose. Where the backing is loosely woven material, and economics obviously favor the use of such material for primary carpet backing, the adhesive being in the nature of a liquid often penetrates the backing and migrates to visible portions of the pile, thereby giving rise to undesirable product quality. The present invention provides a backing for pile fabric such that the underside can be coated with a loop-locking adhesive with substantially no penetration of the adhesive to the visible and normally used surface of the pile fabric.

SUMMARY OF THE INVENTION

In general, a structural lamina for use in a needled textile fabric, especially tufted carpets, is formed from a woven scrim fabric. A coating of a flexible film-forming substance bridges the interstices and embeds the scrim therein. Short length fibers are dispersed through the film-forming substance to reinforce the film-forming matrix. When yarn is needled into the structure, a more secure anchoring of tufts is obtained and a barrier to the penetration of liquid therethrough is provided. The scrim is preferably of a leno weave and the film-forming substance is preferably latex rubber or other elastomeric resin. Best results have been obtained when the scrim is woven from continuous man-made thermoplastic filaments such as nylon, polyester and the like and when the

short length reinforcing fibers are similar man-made fibers having lengths of about 0.01 to 0.5 inch and a denier of 0.1 to 25 and composing about 75 to 85 weight percent of the film substance.

The structure adapted for receiving tufts of yarn can be made by providing a woven scrim fabric preferably of the leno weave type and applying to the fabric a thin liquid coating of a film-forming substance having uniformly dispersed therethrough short length reinforcing fibers to bridge the spaces of the fabric with a thin film to substantially embed the fabric therein. Then, the liquid is solidified. The process is most advantageously carried out in a continuous manner wherein the fabric is moved longitudinally and its film-forming substance is continuously applied by passing the fabric over a liquid applying roll, under a spray, or in other obviously equivalent ways. The fabric is then continously heated to dry or solidify the film-forming substance.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of the structure element for use in a needled textile fabric.

FIG. 2 is a cross section of a segment of the structure of FIG. 1 carrying a tufted loop of yarn.

FIG. 3 is a schematic view illustrating apparatus for carrying out the method for making the structural element.

FIG. 4 is a second and preferred embodiment of apparatus for carrying out the invention.

DESCRIPTION OF THE INVENTION

In FIG. 1 there is shown a scrim fabric **1** partially embedded in a thin flat film **2**. Throughout the film short length reinforcing fibers **3** are dispersed. The fabric is constructed of a conventional leno weave. Obviously variations of the leno weave wherein more than one warp filament crossovers between the filling picks can also be used. As is well known in the art, leno weave is a weaving process in which warp yarns are arranged in pairs. Two harnesses and two warp sheets are required. The warp sheets form the ground threads and the doup threads. The filling extends straight across the fabric as in a plain weave, but the warp threads are alternately twisted, crossing before each pick is inserted. This weave gives firmness and strength to an open weave cloth, minimizing slipping and displacements of the warp and filling yarns.

Wtih particular reference to FIG. 1, the warp yarns are denoted by numerals **4** and **5** and may be single or plied. The warp yarns are woven in pairs. In like manner filling yarns **6** may be single or plied. As can be noted one of each pair of warp yarns always crosses over, on top of, the filling yarn and the other always passes under the filling yarn with the result that each filling yarn is locked between the two warp yarns.

The warp and filling yarns are made of thermoplastic man-made fibers and filaments. Preferably the yarn is made of continuous filaments to gain the benefits of the tenacity of filament yarn as compared to staple fiber yarns. The fibers and filaments can be composed of either linear condensation polymer or linear addition polymers. Polyamides such as polyhexamethylene adipamide (nylon-66), polymeric 7-aminocaproic acid (nylon-6) and copolyamides thereof and polyesters such as polyethylene terephthalate and copolyesters of suitable glycols and terephthalic and isophthalic acid are examples of suitable condensation polymers. The fibers and filaments also can be made from acrylonitrile polymers and copolymers thereof, polyethylene and ethylene copolymers, polypropylene and copolymers thereof, polyvinyl chloride, cellulose acetate, etc.

The thin film or sheet **2** can be any suitable film-form-

ing substance which can be applied in liquid form to the fabric **1** with subsequent hardening into an impervious film. Preferably the film-forming material is a conventional latex or other resinous binders including solutions and dispersions thereof which can be applied to the leno weave fabric followed by drying and/or curing. Some useful compositions include polyvinyl acetate, natural latex, butadiene-styrene copolymers and butadiene-acrylonitrile copolymers. The film-forming substance should adhere well to the fabric. The film is applied in liquid form and may be solidified by curing or heated drying; or the substance may be selected to be a thermosetting resin in which case it may be cured to a solid condition by heat and/or catalyst. Other useable material includes polyvinyl chloride, polyurethanes, acrylates, butyl rubber ethylene-propylene rubber, chlorosulfonated polyethylene, bis-polyisoprene, fluorocarbon rubbers, etc.

Before the thin film is formed and solidified, short length reinforcing fibers are prepared. They can be made by cutting, breaking, granulating fibers or filaments of the type above described as composing the leno weave fabric. The short fibers are blended intimately into the film-forming substance. The mixture is then applied to the woven fabric in a sufficient amount to assure bridging of the spaces between the warps and filling yarns with a thin film.

The coated fabric is excellent for use in a tufted product such as a carpet. In FIG. 2 a single tuft of yarn **7** is shown as having been needled through the film **2** of resin reinforced with a fibrous substance. The warp and filling yarns are denoted by numerals **4** and **5**, and **6**, respectively.

FIG. 3 shows schematically a method for producing the articles of the invention. A scrim **8** is forwarded from a source in a continuous manner by rolls **10** and **11**. The fabric passes over the film-forming substance applying surface of roll **12** which rotatably dips into the liquid **13** held by container **14**. The liquid preferably is a solution or dispersion of rubber or the like. The fabric picks up a sufficient amount of the liquid and is then passed around rolls **15** and **16** which can be heated to cure and solidify the film-forming substance. The coated fabric is now ready to receive tufts of yarn.

When tufts of yarn are placed in the coated fabric, the rupture formed by the needle is filled with the yarn. The film is reinforced against tear and the puncture of the tufting needle is clean-cut with the hole tending to be self-closing. Hence, an almost complete barrier to permeation of liquid from the underside **17** of the fabric to the pile side is provided. Hence, when a heavy coating of adhesive material is applied to the underside to firmly lock the underside protruding yarn into place, penetration thereof which would spoil the upper surface is prevented.

With reference now to FIG. 4, a scrim **18** is wetted prior to receiving the adhesive coating. This is accomplished by passing the scrim through bath **20** containing a suitable dilute sizing. From this bath the wetted scrim is squeezed between rolls **21** and **22** to remove excess sizing. Next the scrim is passed over the surface of roll **23** from which the film-form substance is applied to the scrim. Roll **23** rotatably dips into the liquid **24** held by container **25**. The scrim picks up a sufficient amount of the fibers and coating material. Slurry pump **26** is employed to prevent sedimentation of the suspended fibers. A doctor blade **27** is used to wipe any excess mixture from roll **23**. The coated scrim is moved to a tenter frame **28** to insure that the scrim is dried to proper size. The frame consists of a pair of continuous traveling chains fitted with fine pins (or clips) on horizontal tracks. The fabric is held firmly at the selvages by the two chains and is carried through a heated chamber (not shown) to dry the same.

The yarn used for tufting can be any of those normally used for this purpose. Thus, for example, cotton, rayon, wool, acrylic, nylon yarns or mixtures thereof can

be used. Preferably continuous filament nylon yarns having been textured and having a multilobal cross-section is preferred.

The following examples illustrate specific embodiments. A scrim twelve feet is woven with a conventional leno weave and resin coated in a normal manner. The filling yarn is composed of 140 denier-68 filament nylon continuous filament yarn. Each warp is composed of a 70 denier-34 filament nylon yarn. There are 12 picks per inch in the scrim fabric. Nylon-66 staple length fibers are cut into flock averaging 1/16 inch in length. The flocks is intimately mixed in a butadiene-styrene latex coating composition with a curing agent containing 65% solids by weight. The flock constitutes about 50% by weight of the ultimately solid cure film. The mixture of short length fibers and latex composition is padded on the scrim fabric. The coated fabric is then cured for 12 minutes at 280° F., in a circulating hot air oven. Gear-crimped nylon filament yarn having a denier of 3690 with 204 filaments composing the threadline is tufted into the cured coated fabric to form a 26 ounce per square yard pile fabric.

A quantity of carpet backing latex compound with a conventional sulfur curing system is poured on the underside of the tufted fabric and uniformly spread thereacross. This second latex coating is cured as above and securely locked the tufts into the scrim. An examination of the resulting fabric reveals that lo latex material had penetrated the scrim onto the pile face. The resulting product is dyed and molded to the shape of a floorboard of an automobile.

In a second example a thin coating of a polyurethane resin having nylon flock as above described is applied to like scrim material and placed in an oven for a few minutes to cure. Nylon tufts of the same type just described are placed in the coated scrim. Again it is observed that when the latex coating is applied to the bottom of the tufted product, the coated scrim prevented migration thereof from the underside to the face of the pile.

In a third example, not illustrative of the present invention, the same nylon scrim is heat-welded to a polyvinyl chloride sheet. Nylon yarn tufts of the same type are placed in the laminated material. It is observed that the sheet is torn by the tufting to the extent that when the latex coating is applied thereto, the latex migrates to the face of the pile, thereby giving rise to product nonuniformities.

There are numerous advantages of the present invention. An excellent backing for a needled textile product is provided presenting a barrier to passage of liquid from one side thereof to another.

Improved needled products herein include furniture upholstery, blankets and especially carpets. When carpets are made, a standard secondary backing may be used in conjunction with the primary backing provided by the fine-fiber containing film coating the leno weave scrim as herein described. Other textile uses and advantages are readily apparent.

What is claimed is:

1. A carpet composed of:

(a) a woven scrim fabric;

(b) a film composed of short length fiber-reinforced latex bridging the interstices of the fabric fiber and into which the fabric is substantially embedded to form a composite structure; and

(c) a plurality of tufts of yarns needled into the composite structure of the said fabric and scrim; whereby locking of tuft loops is secured with reduced permeability of liquid through the composite structure.

2. The product of claim **1** wherein the scrim fabric is woven from continuous nylon filaments.

3. The product of claim **2** wherein the short length reinforcing fibers are nylon fibers having lengths of about 0.01 to 0.5 inch and a denier of 0.1 to 25 and composing about 15 to 80 weight percent of the film.

4. The product of claim 3 wherein both the continuous filaments of the scrim fabric and the short length latex film reinforcing fibers are made of nylon-66.

5. The product of claim 1 wherein the fabric is of leno weave.

6. A method for making a needled fabric comprising:

(a) providing a woven scrim fabric;

(b) applying to said fabric a liquid coating of a film-forming substance having dispersed therethrough short length reinforcing fibers to bridge the interstices of the fabric with a thin film and to substantially embed the fabric therein;

(c) solidifying the liquid coating; and

(d) needling is a plurality of tufts into the composite structure.

7. A method for making a tufted textile product comprising:

(a) continuously moving a scrim fabric of leno weave from a source;

(b) continuously applying to said farbic a film forming substance composed of liquid latex having short length reinforcing fibers dispersed therethrough;

(c) heating the thus-coated moving fabric to form a solid film made of short length fiber reinforced latex bridging the interstices of the fabric and into which the fabric is substantially embedded; and

(d) needling a plurality of tufts into the composite structure.

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U.S. Cl. X.R.

112—410; 117—98; 156—72; 161—67, 89, 92, 96