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PRODUCTION OF COATED FABRICS

Filed Dec. 29, 1958

FIG. 1

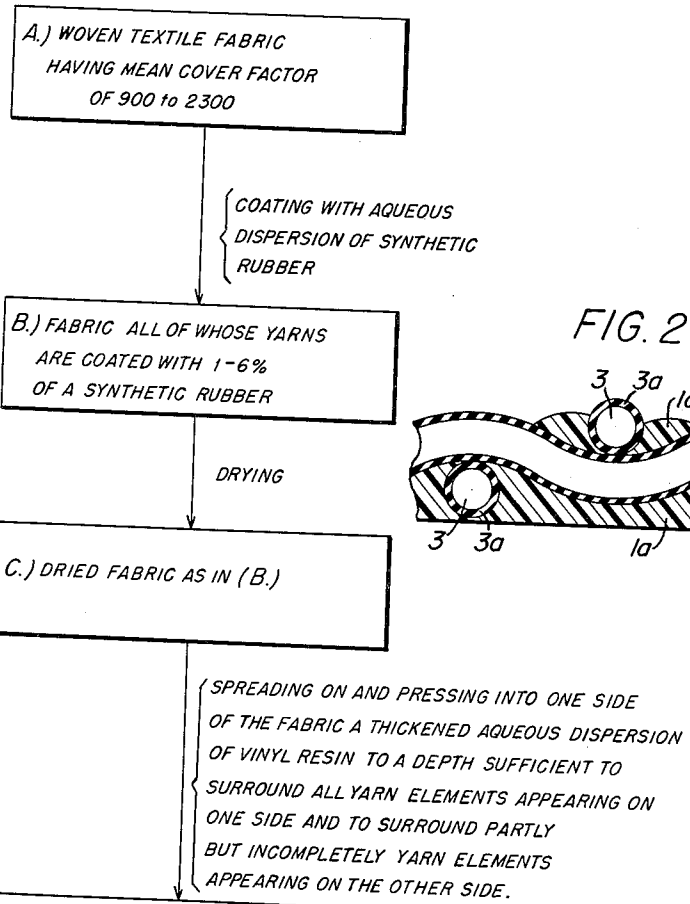

FIG. 2

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PRODUCTION OF COATED FABRICS

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14 Claims. (Cl. 28—80)

This invention relates to the production of resin-coated fabrics.

The object of this invention is to produce a resin-coated fabric which is particularly suitable for use in upholstery and furnishings, and especially a resin coated fabric which combines exceedingly good resistance to wear with the appearance associated with a textile fabric.

The basic fabric used for preparing the coated fabric of this invention is a fabric which is more loosely woven than normal upholstery fabrics; the interstices in the fabric used in this invention are made sufficiently large that when the resin coating is applied in the manner described below, an adequate keying of the resin to the fabric is obtained. For the purposes of this invention the looseness of the fabric is quantitatively defined by the cover factor (C.F.) of the fabric which is given by the expression

$$C.F.=N\sqrt{d}$$

where N is the number of threads per inch and d is the denier of the threads. For any fabric there will be two cover factors, one in the warp direction and the other in the weft direction. The basic fabrics used in this invention must have a mean cover factor, that is to say the mean value between the warp and weft cover factors, of between 900 and 2,300; such fabrics are ordinarily regarded as being quite unsuitable for use as upholstery fabrics.

The next step in this invention is to apply to the loosely woven fabric an emulsion of a vinyl resin; the emulsion is applied to one side only of the fabric and the viscosity of the emulsion must be so adjusted, if necessary by the addition of thickening agent, to such a viscosity that it will flow through the interstices of the fabric to bond the warp and weft threads together but will not strike through the fabric beyond the opposite face to cause the emulsion to bleb or spread across this opposite face. By increasing the viscosity of the resin emulsion it is possible to reach a range of viscosities at which, when the emulsion is applied to the faric, the emulsion will strike through sufficiently to bond all warp and weft threads together without striking through to the opposite face. A suitable range of viscosities for the fabrics defined above is 1,250 to 1,750 centipoises. At viscosities above this range the emulsion is so viscous that it does not penetrate the fabric interstices at all and it then forms a coating on one side of the fabric only.

As already stated, the thickened resin emulsion is applied to one side only of the fabric and the method used to apply the emulsion must apply a certain amount of pressure to the emulsion so as to force it through the fabric interstices. The method preferably used for applying the emulsion is that using a spreader bar or doctor blade under which the fabric is moved, if desired with a little clearance between the fabric and the bar or blade, and a bank of the resin emulsion is maintained behind the bar or blade.

In the drawings:

FIG. 1 is a flow diagram of the process according to the invention;

FIG. 2 is a schematic view in cross section, greatly enlarged, of a fabric made in accordance with the invention.

Referring to FIG. 2, it will be seen the coating 1*a* has flowed through the fabric interstices sufficiently to bond

all weft threads 3 to the warp 2. This effect is clearly seen in fabrics obtained by this invention using a binocular microscope. It will be seen that all portions of the yarn appearing on the side of the fabric to which the vinyl resin has been applied are substantially completely surrounded by the said resin while portions of yarn appearing on the other side are only partly surrounded by the resin. In other words, though all the yarns of the fabric are bonded to other yarns, along substantially the whole of their length those elements of yarn visible from one side of the fabric are free from resin on their visible sides and the said side of the fabric has substantially the appearance associated with the original base fabric.

The preferred resins for use in this invention are those which are polymers of esters of acrylic acid or alpha substituted acrylic acids e.g. methacrylic acid, for example, methyl acrylate, methyl methacrylate or ethyl methacrylate but particularly ethyl acrylate. However the resins may be polymers or co-polymers of other vinyl compounds, for example vinyl chloride.

The resin is preferably applied to the base fabric in an amount giving from ¾ to 3 ounces, and preferably 1 to 1½ ounces, of dry resin per square yard of fabric.

The desired viscosity of the resin emulsion may be obtained in any convenient manner for example by adding known thickening agents such as water-soluble cellulose ethers, for example methyl cellulose, hydroxyethyl cellulose and sodium carboxymethyl cellulose, and water-soluble salts of polyacrylic acid such as ammonium polyacrylate. It is important that the emulsion used in the present invention be of controlled viscosity. When a very viscous resin emulsion is used the resin coating is confined to one side of the warp threads and only the weft threads on that side of the fabric are bonded; the weft threads on the other side of the fabric are unaffected by the coating.

The fabric obtained by applying an acrylic ester resin or other vinyl resin to a loosely woven base fabric as described above has many desirable properties, for example flexibility and high resistance to abrasion, rendering it suitable for use as an upholstery or furnishing fabric. However, in accordance with a further embodiment of this invention still further improved fabrics can be obtained by applying other types of finishing agents to the base fabric before the resin is applied to one side of the fabric. In particular, fabrics having improved wear resistance properties can be produced by applying to the fabric, in the form of an aqueous emulsion, a synthetic rubber such as a butadiene-acrylonitrile or butadiene-styrene copolymer, such copolymers generally containing 60–80% by weight of butadiene. Such a coating is identified as 2*a* and 3*a* in FIG. 2. The fabric may also be given an enhanced water-repellency and/or resistance to permanent staining by writing ink, fruit juices and similar substances, by treating the base fabric with an emulsion of a wax.

The synthetic rubber or wax types of finish are best applied in such a way that all the yarns or even the individual fibres of the fabric are coated with the synthetic rubber or wax. Thus the fabric may be thoroughly impregnated with the synthetic rubber or wax dispersion as by passage through the dispersion and squeezing; the fabric may then be dried. The treatment of the fabric with a synthetic rubber emulsion and a wax emulsion may be combined into one operation.

The preferred amount of synthetic rubber applied to the fabric is from 1 to 6 percent of dry material, based on the weight of the fabric; particularly good results have been obtained by applying from 2–4 percent of a butadiene-acrylonitrile copolymer to the base fabric.

The preferred amount of wax applied to the fabric is

from 1 to 4 percent of wax based on the weight of the fabric. Satisfactory water-proofing properties have been obtained by applying from 1½ to 2½ percent of wax to the fabric.

In accordance with the preferred form of the invention, a loosely-woven fabric as defined is first immersed in an emulsion containing both a synthetic rubber and a wax, for example by running a roll of fabric in a continuous manner through a bath of the emulsion, squeezing, and drying the fabric and then applying the thickened resin emulsion by means of a spreading device and again drying the fabric. A fabric produced in this way and containing about 3% of a butadiene-acrylonitrile copolymer and about 2 percent of a wax and coated with 1–1½ ounces (per square yard of fabric) of an ethyl acrylate resin substantially as shown in FIG. 2 of the accompanying drawings has proved to be an outstanding upholstery fabric as regards its resistance to wear, abrasion, water, dirt, stains and insects such as moths.

For the production of coloured fabrics in accordance with this invention, the fabric may be dyed before the finishing materials such as wax, synthetic rubber or the resin are applied. In the preferred form of the invention for producing coloured fabrics, the base fabric is woven from spun-dyed fibres, that is to say fibres which have been produced from spinning solutions, such as viscose or cellulose acetate solutions, containing colouring matters.

A combination which has been found very satisfactory is a base fabric constructed with a warp of yarns made from spun-dyed staple fibres e.g. viscose rayon staple fibres and with a weft of yarns of spun dyed continuous filaments, e.g. of viscose rayon. Where the base fabric is constructed of natural fibres such as cotton, the fabric may be dyed as required before the coating operation. Two or more colour effects may be obtained by using differently coloured spun-dyed yarns in constructing the base fabric, or by using a mixture of yarns which can be dyed to give differential colour effects, e.g. a warp of yarns of viscose rayon staple fibres and a weft of yarns of continuous filaments of cellulose acetate.

The invention is illustrated by the following example:

Example

The construction of the base fabric was as follows:

Warp:

2/22's (483 denier) yarn from spun-dyed viscose rayon staple.

Rate—60 ends per inch.

Weft:

900 denier/100 filament spun-dyed continuous filament viscose rayon.

28 picks per inch.

Cover factors—warp 1318 $(60\sqrt{483})$

—weft 840 $(28\sqrt{900})$

—mean 1079.

The fabric from a roll was first padded in an aqueous emulsion containing about 3 percent by weight of a butadiene-acrylonitrile copolymer and dried on drying cylinders; the take-up of the dry copolymer by the fabric was approximately 3 percent by weight. The emulsion was prepared by dilution of the concentrated butadiene-acrylonitrile polymer emulsion sold as Hycar 1562 by British Geon Ltd.

The fabric was then padded through an emulsion of wax containing about 2 percent of wax and again dried on drying cylinders. The take-up of the wax (dry weight) by the fabric was about 2 percent by weight. The wax emulsion was prepared by dilution of the concentrated wax emulsion sold as Mystolene PS by Catomance Ltd.

The fabric was then schreinered, stentered to width, and coated on one side using a rubber-spreading machine with an emulsion containing 30 percent of an ethyl acrylate polymer resin (as sold under the name Primal B15 by Rohm and Haas) and thickened by means of methyl cellulose or other thickening agent to a viscosity of about 1,500 centipoises. In the case of Primal B15 very satisfactory thickening can also be obtained merely by adding ammonia. The setting of the spreader bar was such that about 4 ounces of the emulsion was applied per square yard of fabric. The coated fabric was then stentered to width and heated in a stenter at 320° F. to dry the fabric and fix the resin.

A cross section of the fabric is similar to FIGURE 2 of the drawings. It will be noted that all portions of the yarn appearing on the side of the fabric to which the acrylate resin has been applied are substantially completely surrounded by the said resin while portions of yarn appearing on the other side are only partly surrounded by the resin. In this way all the yarns in the fabric are secured against displacement when the coated fabric is subjected to rubbing forces; nevertheless the portions of yarns appearing on one side of the fabric are free from resin on their visible side and, when viewed from that side, the fabric has substantially the appearance associated with the original base fabric.

The step of treating the fabric with the wax emulsion may be omitted but the product obtained has somewhat inferior water repellency properties and resistance to staining.

What we claim is:

1. A process for the production of a fabric of good resistance to abrasion and wear, which comprises coating the whole of all the yarns of a woven textile fabric having a mean cover factor of 900 to 2,300 with from about 1 to about 6% of a synthetic rubber by applying the synthetic rubber as an aqueous dispersion and drying, spreading on and pressing into one side of the fabric a thickened aqueous dispersion of a vinyl resin to a depth sufficient to surround substantially all elements of yarns appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric, the vinyl resin being a polymer of a compound selected from the group consisting of the methyl and ethyl esters of acrylic and methacrylic acids, and again drying the fabric.

2. A process according to claim 7, wherein the weight of acrylate resin applied is from ¾ to 3 ounces per square yard of fabric.

3. A process according to claim 1, wherein the synthetic rubber is a copolymer of butadiene with acrylonitrile containing from 20 to 40 percent of acrylonitrile.

4. A process according to claim 1, wherein the individual yarns of the woven fabric are also coated with a wax by impregnating the said woven fabric with an aqueous dispersion of a wax followed by drying, the weight of wax being from about 1 to about 4% based on the weight of the base fabric.

5. A process for the production of a fabric of good resistance to abrasion and wear, which comprises coating the whole of all the yarns of a woven textile fabric having a mean cover factor of 900 to 2,300 with both a synthetic rubber in an amount of from about 1 to about 6 percent based on the weight of the fabric and a wax in an amount of from about 1 to about 4 percent based on the weight of the fabric by applying the synthetic rubber as an aqueous emulsion and the wax as an aqueous emulsion, spreading on and pressing in to one side of the fabric a thickened aqueous dispersion of a vinyl resin to a depth sufficient to surround substantially all elements of yarns appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric, the vinyl resin being a polymer of a compound selected from the group consisting of the methyl and ethyl esters of acrylic and methacrylic acids, and again drying the fabric.

6. A process for the production of a fabric of good resistance to abrasion and wear, which comprises pad-

ding a woven textile fabric having a mean cover factor of 900 to 2,300 with an aqueous emulsion of a synthetic rubber to leave the fabric impregnated throughout with a quantity of the emulsion containing from about 1 to about 6 percent of the synthetic rubber based on the weight of the fabric, drying the fabric, padding the fabric with an aqueous emulsion of a wax to leave thereon a quantity of emulsion containing from about 1 to about 4 percent of wax based on the weight of the fabric, again drying the fabric, spreading on and pressing in to one side of the fabric a thickened aqueous dispersion of a vinyl resin to a depth sufficient to surround substantially all elements of yarn appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric, the vinyl resin being a polymer of a compound selected from the group consisting of the methyl and ethyl esters of acrylic and methacrylic acids, and again drying the fabric.

7. A process for the production of a fabric of good resistance to abrasion and wear, which comprises coating the whole of all the yarns of a woven textile fabric having a mean cover factor of 900 to 2,300 with from about 1 to about 6% of a synthetic rubber by applying the synthetic rubber as an aqueous dispersion and drying, spreading on and pressing into one side of the fabric a thickened aqueous dispersion of a vinyl resin to a depth sufficient to surround substantially all elements of yarn appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric, and again drying the fabric.

8. A fabric of good resistance to abrasion and wear, comprising a woven base fabric having a mean cover factor of 900 to 2,300, the whole of all the yarns of said fabric being coated with a synthetic rubber to the extent of about 1 to about 6% based on the weight of the base fabric, and said base fabric being provided on one side only with a coating of a vinyl resin to a depth sufficient to surround substantially all the elements of yarn appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric.

9. A fabric according to claim 8, wherein the resin is a polymer of an ester of acrylic acid or an alpha-substituted acrylic acid.

10. A fabric according to claim 8 wherein the synthetic rubber is a copolymer of butadiene with acrylonitrile.

11. A fabric according to claim 9, wherein the resin is present to the extent of 1 to 1½ ounces per square yard of fabric.

12. A fabric according to claim 10, wherein the woven fabric is coated with both a synthetic rubber and wax, the latter being present in an amount from about 1 to about 4% based on the weight of the base fabric.

13. A fabric according to claim 12, wherein the woven base fabric has a warp of regenerated cellulose staple fibre yarns and a weft of regenerated cellulose continuous filament yarns.

14. A fabric of good resistance to abrasion and wear, comprising a woven base fabric having a mean cover factor of 900 to 2,300, the whole of all the yarns of said fabric being coated with a synthetic rubber to the extent of about 1 to about 6 percent based on the weight of the base fabric and a wax to the extent of about 1 to about 4 percent based on the weight of the base fabric, and said base fabric being provided on one side only with a coating of a vinyl resin to a depth sufficient to surround substantially all elements of yarn appearing on one side of the fabric and to surround partly but incompletely elements of yarns appearing on the other side of the fabric, the vinyl resin being a polymer of a compound selected from the group consisting of the methyl and ethyl esters of acrylic and methacrylic acids.

References Cited in the file of this patent

UNITED STATES PATENTS

2,575,577	Beauchamp	Nov. 20, 1951
2,630,620	Rand	Mar. 10, 1953
2,704,730	Glatt	Mar. 22, 1955
2,857,654	Sexton	Oct. 28, 1958
2,887,403	Wolf	May 19, 1959

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,023,482 March 6, 1962

Eric William Francis Gilboy et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 44, for the claim reference numeral "7" read -- 1 --.

Signed and sealed this 3rd day of July 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents