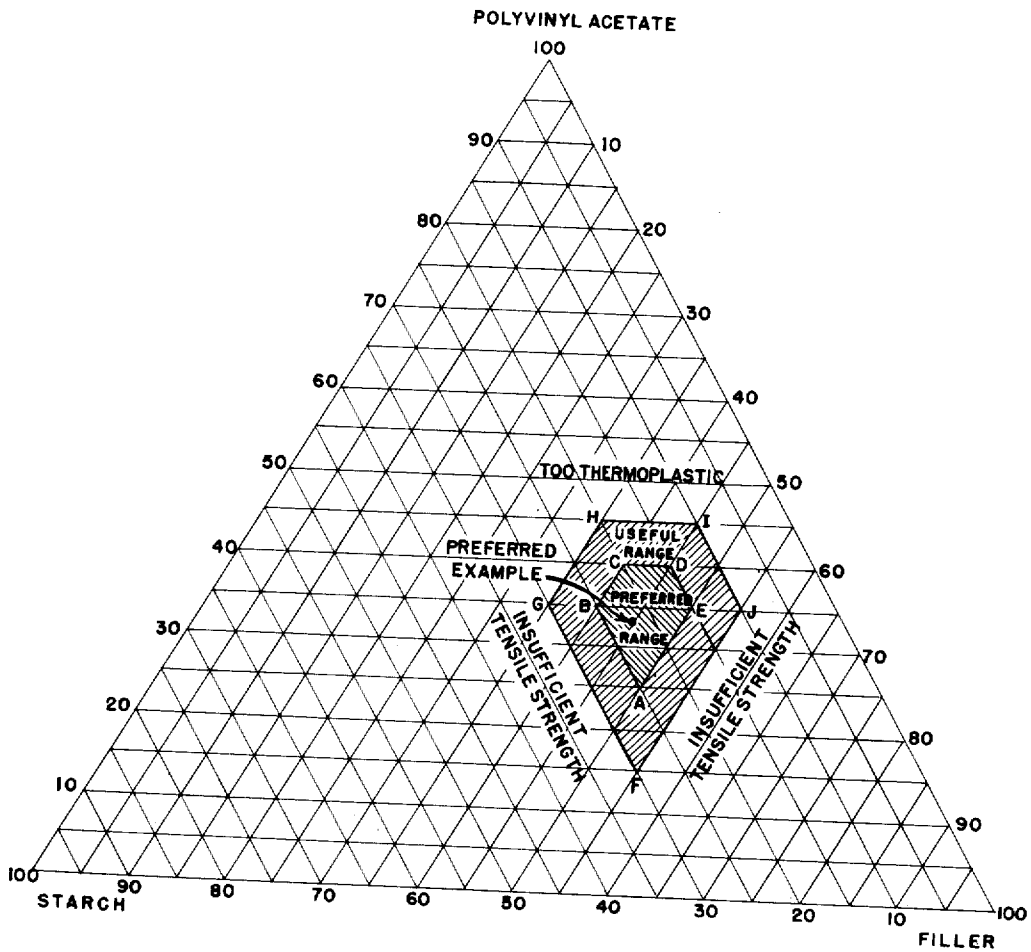


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COATING MATERIAL, COATED FABRIC, AND
PROCESS FOR PRODUCING IT
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COATING MATERIAL, COATED FABRIC, AND
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This invention relates to coated fabrics and compositions therefor, particularly to pyroxylin coated and/or impregnated fabrics useful for the binding of books and more particularly to such fabrics with a size applied to the untreated side of the pyroxylin coated and/or impregnated fabric.

Heretofore a variety of film formers have been employed for fabric coatings in the manufacture of book covers. Of the various types of coatings employed for this purpose, pyroxylin represents one of the most important where high quality materials are required, such as, e. g., text books, catalogues or reference books. In the manufacture of book covers a normal procedure is to cut the pyroxylin coated fabric to size and adhere the uncoated side to cardboard with water soluble glues or adhesives to form the book covers, often referred to as book cases.

In the case of lightweight pyroxylin impregnated fabrics one of the disadvantages has been the tendency of the cut pieces to curl after the glue or adhesive has been applied to the untreated side and before applying to the cardboard.

A further disadvantage has been that the lightweight impregnated fabrics are too flimsy to be fed through automatic case making machines.

A still further disadvantage is that the lightweight pyroxylin impregnated fabrics with an embossed design do not retain the original depth of embossing during the processing into book covers. If the pyroxylin impregnating composition is altered to overcome these deficiencies other difficulties are encountered due to poor wear, poor gold stamping or poor ink printing.

To minimize these disadvantages it has been the practice to apply a water dispersion of a cooked starch composition to the untreated side of the pyroxylin coated fabric to impart stiffness thereto. While the starch composition on the back of the pyroxylin impregnated fabric overcomes these disadvantages to some extent there is room for still further improvement. The starch sized material is usually embossed by passing the material between heated pressure rolls one of which is steel and has a design engraved on the surface. The embossing breaks down or crazes the starch film on the back side of the

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impregnated fabric and nullifies to some extent the purpose for which the starch size is applied. Further, if the pyroxylin impregnated composition is pushed through the interstices of the fabric during its application to the fabric the adhesion of the subsequently applied starch size to the opposite side of the fabric from which the pyroxylin was applied results in poor adhesion of the starch film to the fabric.

It is an object of this invention to provide lightweight pyroxylin coated and/or impregnated fabrics having improved properties with respect to bookbinding material. A further object is to provide a pyroxylin coated and/or impregnated fabric with improved resistance to wet curl when cut into small pieces and a water dispersion of a glue or adhesive is applied to the side of the fabric opposite the pyroxylin coating. A still further object is to improve the embossability and retention of the embossed pattern in lightweight pyroxylin impregnated fabrics. A still further object is to improve the hand or bulk of such fabrics without altering the desirable bookbinding properties of the pyroxylin coating.

These and other important objects are accomplished according to the present invention by the provision of a sizing composition comprising an aqueous dispersion of polyvinyl acetate, an inorganic inert filler and starch. In the preferred embodiment the polyvinyl acetate-starch-filler size is applied to the untreated side of a pyroxylin impregnated and/or coated fabric.

In the drawing, the single figure is a triangular graph showing the operative and preferred ranges (based on the combined weight of the three essential ingredients). The area delineated by points ABCDE shows the preferred range. The points FGHIJ delineate the operative or useful range.

The invention will now be described more fully by reference to the preferred embodiment which is given by way of illustration and not limitation. In specific formulae the percentages are all on a weight basis.

EXAMPLE I

A lightweight cotton fabric, running 3.60 yards per pound per 39 inch width (4.1 ounces per square yard) having a thread count of 56×60

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in the direction of the warp and filler, respectively, was impregnated from one side with a plurality of coats of the following composition:

Pyroxylin impregnating composition

	Per cent
Cellulose nitrate.....	11.53
Castor oil phthalate.....	13.27
Pigments.....	18.42
Ethyl alcohol.....	18.58
Ethyl acetate.....	18.59
Isobutanol.....	18.15
Toluol.....	1.46
	100.00

The above composition was applied to the fabric by means of a sharp edged doctor knife to force the coating into the interstices of the fabric. After each successive application of the impregnating composition the treated fabric was passed through a heat zone to evaporate the volatile solvents. Two coats were required to deposit 1.5 to 2.0 ounces of dry coating per square yard.

To the untreated side of the dry coated fabric was next applied one coat of the following sizing composition:

Sizing composition

	Wet	Dry
	Percent	Percent
Polyvinyl Acetate Aqueous Suspension (55% Solids).....	23.35	32.6
Starch.....	8.54	21.7
China Clay.....	17.10	43.5
Animal Glue.....	.87	2.2
Water.....	50.14	
	100.00	100.0

The above composition was prepared by adding china clay, starch and glue to hot water (heated to boiling temperature—212° F.) and stirring until the materials were thoroughly dispersed. The polyvinyl acetate aqueous suspension was then added to the above dispersion, preferably after it had cooled somewhat.

Sufficient sizing composition was applied to the untreated side of the fabric by means of a single doctor knife application to deposit 0.5–0.8 ounce of dry non-volatile material per square yard. Immediately after the doctor knife application of the sizing composition the treated fabric was passed through a heated zone to evaporate the volatile portion of the sizing composition.

The dry impregnated and sized fabric was next embossed by passing between heated pressure rolls, one of which was steel and had a design engraved on its surface. The other roll was a paper counterroll having a design opposite to the one on the steel roll as commonly employed in the embossing of coated fabrics.

The embossed fabric, put up in roll form, is usually transported to another location for the manufacture of book covers or cases. The coated fabric was cut to size for book covers and a water soluble adhesive commonly used in the bookbinding industry was applied to the sized side of the treated fabric. The tendency for the cut pieces to curl, after the wet adhesive was applied and allowed to stand for a period of time normally required for large scale production, which corresponds to about 2 to 10 minutes, was greatly reduced. The embossed fabric had substantially the same pliability after embossing as before embossing.

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bossing. There was no loss of the character of the embossed design during the fabrication of the treated fabric into book cases.

The impregnated and sized fabric possessed all the desirable qualities of high grade book-binding material, such as good end sheet adhesion, printability, gold stamping and washability. During fabrication into book covers there was no appreciable loss of the character of the embossing. The product had sufficient bulk and stiffness to be fed through automatic case making machines.

The product produced as described above required less glue in adhering the treated fabric to the binder boards than similar material without the back size. The polyvinyl acetate-starch-filler size formed a firm bond to that portion of the pyroxylin impregnating composition pushed through the interstices of the fabric with resultant improvement of adhesion to the binder boards.

EXAMPLE II

In a modification a more fully coated fabric was prepared as described below. A light-weight woven fabric running 6.40 yards per pound per 40" width (2.2 ounces per square yard), having a thread count of 48×48, warp and filler respectively, was coated on one side with one coat of the following composition by means of a doctor knife application.

	Per cent
Pyroxylin.....	13.1
Pigment.....	19.5
Castor oil.....	22.8
Ethyl acetate.....	22.3
Ethyl alcohol.....	22.3
	100.0

after which it was passed through a heated chamber to expel the volatile solvent. The opposite side of the fabric was then coated with the following sizing composition:

Sizing composition

	Wet	Dry
	Percent	Percent
Polyvinyl Acetate Aqueous Emulsion (55% Solids).....	19.79	32.25
Water.....	42.49	
Starch.....	7.24	21.45
China Clay.....	14.49	43.00
Animal Glue.....	0.74	2.18
2.6% Solution of Carboxymethyl Cellulose in Water.....	15.25	1.12
	100.00	100.00

The above sizing composition was prepared in the same manner as described in Example I. Sufficient sizing composition was applied to the fabric in a single doctor knife application to deposit 0.4 to 0.8 ounce of dry film per square yard. The volatile portion was evaporated by passing the sized fabric through a heat zone.

A second coat of the pyroxylin composition was then applied to the same side previously coated with the pyroxylin composition after which the volatile portion of the pyroxylin composition was evaporated by passing the material through a heat zone. Approximately 2.5 ounces of dry pyroxylin coating was applied by the two coats. The coated and sized fabric was thoroughly bridged with essentially no pinholes in the coating.

The coated fabric was then embossed in a deep

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grain by passing between heated pressure rolls, one of which was steel and had a design engraved on its surface and the other was pressed paper carrying a design counter to that on the steel roll. The pliability of the embossed fabric was substantially the same as that of the unembossed fabric.

EXAMPLE III

The sizing composition of Examples I and II may be replaced with the following size in which the animal glue is omitted since this is not an essential ingredient.

Sizing composition

	Wet	Dry
	Percent	Percent
Polyvinyl Acetate Aqueous Emulsion (55% Solids).....	23.5	33.2
Starch.....	8.8	22.6
Barytes.....	17.2	44.2
Water.....	50.5	
	100.0	100.0

The advantages of the invention are accomplished by blending the ingredients of the sizing composition within certain definite proportions. The essential ingredients in the dry size coating are polyvinyl acetate, starch and an inert filler. It is important that the essential ingredients be present within the ranges set forth below to obtain a well balanced size. The polyvinyl acetate is present in amount sufficient to impart film strength to prevent the film from breaking down during embossing and provide a film which will adhere to the pyroxylin coating pushed through the interstices of the fabric. The inert filler is present in amount sufficient to provide the desired bulk and to reduce the thermoplasticity in order that the size may not adhere to the pressure rolls during embossing. The starch is present in amount sufficient to impart hydrophilic properties to the dry size and to thicken the sizing composition in order that it can be applied to the surface of the fabric. The following are the preferred and useful ranges of the three essential ingredients, based on their combined weights.

	Preferred Range	Useful Range
	Percent	Percent
Polyvinyl Acetate.....	25 to 40	15 to 45
Inert Filler.....	40 to 50	35 to 55
Starch.....	15 to 25	10 to 30

The starch used in preparing the composition of this invention may be obtained from a variety of plant sources, such as, e. g., corn, potato, cassava (tapioca), rice or wheat.

The carboxymethyl cellulose is present in Example II to improve the bridging properties of the sizing composition and while it represents a component in a preferred embodiment it is not essential.

The animal glue in the preferred embodiment is present to increase the hydrophilic properties of the dry size film but is also not essential for practicing the invention.

The invention is not to be limited to any particular pyroxylin impregnating composition since it may be varied over rather wide limits as to percentage formula. Also, various plasticizers and pigments for the pyroxylin composition may be used without departing from the scope of this invention. For best bookbinding properties

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it is desirable that a plasticizer for the pyroxylin composition be selected which will not exude to the surface during the embossing operation, since this interferes with the drying of printing inks employed in decorating the book covers. Suitable plasticizers for this purpose include polymeric resinous materials, such as, e. g., polypropylene glycol sebacate and castor oil modified glyceryl sebacate, and blown vegetable oils, such as, e. g., cottonseed, soya, castor and corn.

In the specific examples china clay is used as the inert filler. Other finely divided inorganic fillers, such as, e. g., calcium carbonate, barytes, mica and diatomaceous earth may be used with satisfactory results.

If desired, coloring materials such as dyes and pigments may be incorporated in the sizing composition.

The polyvinyl acetate-starch-filler size applied on the back or untreated side of the pyroxylin impregnated fabric represents a considerable improvement over the conventional starch sizes formerly used to stiffen and bulk lightweight pyroxylin impregnated book cloth. The polyvinyl acetate-starch-filler size has considerably more film strength than a conventional starch size and when the products of this invention are embossed by heat and pressure the pliability or "hand" is not altered by the embossing operation. In the case of conventional starch sizes applied on the back of the lightweight pyroxylin impregnated fabrics, the embossing will break up the starch size and will nullify, at least to some extent, the stiffness and bulkiness obtained by the starch size. Lightweight pyroxylin impregnated and/or coated fabrics sized on the untreated side with the polyvinyl acetate-starch-filler compositions of this invention will take and hold a grain or embossed design better than prior art material sized with conventional starch sizes. The polyvinyl acetate-starch-filler size when applied to a textile fabric will readily yield to heat and pressure since it is thermoplastic whereas the conventional starch sizes are not thermoplastic and the latter are broken up and film properties destroyed by embossing operations.

A further advantage of the products of this invention is the resistance of the material to wet curl when cut into small pieces and an aqueous glue is applied to the sized side of the fabric. A still further advantage is the increased bulkiness and stiffness without sacrificing desirable bookbinding properties. A still further advantage is that the water soluble glues and adhesives commonly used in the bookbinding industry will more readily anchor and adhere to the polyvinyl acetate-starch-filler size than to the starch sizes used heretofore. A still further advantage is that less glue is required to be applied by hand for adhering the treated fabric to the binder boards.

While the invention has been described with respect to the bookbinding material it will be readily understood by those skilled in the art that the products of this invention will also be useful in other arts, such as, e. g., covering for optical cases, jewelry cases and novelties where the untreated side of the pyroxylin impregnated fabric is adhered to another surface by means of a hydrophilic adhesive or glue.

By the term "lightweight coated fabric" as used throughout the specification and appended claims is meant a coated fabric in which the fabric does not weight more than 5.0 ounces per

square yard and the coating, including the pyroxylin composition and polyvinyl acetate-starch-filler composition, does not weigh more than 5.0 ounces per square yard, viz., a total of not more than 10.0 ounces per square yard.

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. A composition of matter comprising an aqueous suspension of polyvinyl acetate, starch and an inert inorganic filler, said polyvinyl acetate, starch and filler being present in amounts represented by the polygon FGHIJ of the attached figure and producing a hydrophilic product upon drying.

2. A lightweight woven fabric impregnated on one side with a pyroxylin hydrophilic composition and sized on the opposite side with a composition comprising polyvinyl acetate, starch and an inert inorganic filler, said polyvinyl acetate, starch and filler being present in amounts represented by the polygon FGHIJ of the attached figure.

3. A deep embossed lightweight coated fabric having substantially the same pliability after embossing as before embossing comprising a woven fabric coated on one side with a pyroxylin composition and sized on the opposite side with a hydrophilic composition comprising polyvinyl acetate, starch and an inert inorganic filler, said polyvinyl acetate, starch and filler being present in amounts represented by the polygon FGHIJ of the attached figure.

4. The product of claim 1 in which the three essential non-volatile components of the composition are present in amounts represented by the polygon ABCDE of the attached figure.

5. A lightweight textile fabric treated on one side with a pyroxylin composition and on the opposite side with a hydrophilic composition comprising polyvinyl acetate-starch-inert inorganic filler within the range delineated by points ABCDE in the drawing.

6. A lightweight textile fabric treated on one side with a pyroxylin composition and on the opposite side with a hydrophilic composition comprising polyvinyl acetate-starch-inert inorganic filler delineated by points FGHIJ in the drawing.

7. An embossed lightweight impregnated fabric having substantially the same pliability after

embossing as before embossing comprising a fabric base treated on one side with a plasticized and pigmented pyroxylin composition and sized on the opposite side with the following approximate composition:

	Per cent by weight
Polyvinyl acetate -----	32.25
Starch -----	21.45
Filler -----	43.00
Animal glue -----	2.18
Carboxymethyl cellulose -----	1.12
	100.00

8. An embossed lightweight coated fabric having substantially the same pliability after embossing as before embossing comprising a fabric base coated on one side with a plasticized and pigmented pyroxylin composition and on the opposite side with the following approximate composition:

	Per cent by weight
Polyvinyl acetate -----	32.6
Starch -----	21.7
Inert inorganic filler -----	43.5
Animal glue -----	2.2
	100.0

9. Process of preparing a lightweight coated fabric which comprises applying to one side of a lightweight woven fabric a pyroxylin composition, applying on the opposite side of said fabric a second composition comprising an aqueous dispersion of polyvinyl acetate, starch and an inert inorganic filler, said second composition being within the range represented by the polygon FGHIJ of the attached figure and producing a hydrophilic product upon drying.

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