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WINDOW SHADE MATERIAL

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This invention relates to the production of coated fabric and more particularly to the production of shade cloth for window shades, and the like, having improved properties.

Window shade cloth comprising a woven cotton fabric coated with a cellulose derivative composition has been known in the art for a considerable time. Shade material to be satisfactory must be easy to clean, durable and have great resistance to deterioration on exposure to water, actinic rays, heat, etc. In addition to such properties it must be of satisfactory appearance, that is, it must possess a clearness when viewed by transmitted light, have a high degree of uniformity of translucency, a generally pleasing appearance and a so-called smooth feel. The present invention is particularly concerned with the production of shade cloth of improved appearance including such features as translucency, uniformity of light transmittal, clearness and related characteristics which contribute to the general appearance of the shade.

Heretofore known shade cloth of the translucent type made on a woven cotton fabric base composed of a threads of spun cotton staples has been fairly satisfactory as far as wearing qualities are concerned but in appearance the cloth lacks uniformity of translucency and clearness when viewed by transmitted light. Window shade materials made heretofore having a woven cotton fabric base do not have these properties due to the unevenness of the woven cotton fabric. The cotton threads are spun from short staples of cotton by twisting them together and the ends of cotton staples inevitably protrude from the thread and form what is commonly referred to as "nap." It is impossible to obtain a woven cotton fabric with the individual threads of a uniform denier and entirely free from slugs, misweaves and other fabric imperfections. These fabric imperfections are accentuated when viewed by transmitted light, and while these defects might be overlooked in a low priced window shade, they are not acceptable in a high grade window shade. Consequently a premium has been paid in the past for fabric having a minimum of slugs, misweaves, etc.

An object of the present invention therefore is to provide a window shade of improved clearness when viewed by transmitted light, and having a high degree of uniformity of translucency, which has not heretofore been produced in a window shade.

A further object is to provide a window shade having a smooth feel, generally improved appearance, and one having greater durability. A still further object is to provide a translucent window shade having the appearance of ground or frosted glass when viewed by transmitted light. Other

objects will appear hereinafter as the description proceeds.

It has now been discovered that the aforementioned objects may be attained by employing a fabric woven from continuous filaments of uniform denier and high tenacity and free from nap and fabric imperfections, such as, e. g., slugs, misweaves, etc., for the base of the new and improved window shade material, and filling the interstices of the said fabric with a pigmented composition having approximately the same light transmission as the filaments of uniform denier making up the fabric and applying a second coating with a different pigment content to obtain the desired color effects.

By the term "high tenacity" a yarn is intended to be designated which has a tenacity of over 2.5 grams per denier and an elongation at the breaking load of not more than 12%. Such a yarn when prepared from regenerated cellulose is described in U. S. Patent 2,083,252 granted to Bradshaw and Hoff.

Further explanation of the invention is given in the following detailed description and illustrative specific examples.

EXAMPLE I

A synthetic fabric, free from nap and fabric imperfections, woven from continuous filaments of regenerated cellulose both warp and filler threads comprising 150 denier and 60 filaments per thread, having a left twist and 6 turns per inch, the number of threads per inch in the warp direction being 80 and the number of threads in the filler direction being 72, was selected as the base material for the improved window shade. The synthetic fabric was coated on both sides with the following translucent composition by means of a doctor knife:

First coating

	Per cent by weight
Cellulose nitrate.....	16.6
Ethyl alcohol.....	32.1
Ethyl acetate.....	32.1
Zinc oxide.....	10.0
Dibutyl Cellosolve phthalate.....	9.2

The pigment content of the first coating composition was adjusted so that it had approximately the same light transmission as the synthetic fabric. The first coating was deposited in the interstices of the fabric which produced the desirable uniform appearance so the individual threads of the synthetic fabric could not be distinguished when viewed by transmitted light.

Approximately 1.4 ounces per square yard of the first coating composition are applied on each side of the fabric in one or more coats which corresponds to .5 ounce of the non-volatile components on each side of the fabric or a total of

1.0 ounce of the dry composition per square yard on both sides of the fabric. The volatile solvents were expelled after each successive coat by passing the material through a heated chamber. The pigment content of first coating composition was adjusted so that the coating composition had approximately the same light transmission as the synthetic fabric per se. Following the application of the first coating composition to both sides of the synthetic fabric and subsequent drying, the coated material was passed between pressure rollers one of which was heated and engraved in a shallow grain, known as "Skiver". Following the pressure treatment the coated material was further coated on each side with a second coating as follows:

Second coating

	Per cent by weight
Cellulose nitrate	13.7
Ethyl alcohol	27.7
Ethyl acetate	27.7
Zinc oxide	20.6
Dibutyl Cellosolve phthalate	10.3

Approximately 1.2 ounces per square yard of the second coating composition was applied to each side which corresponds to .5 ounce of the non-volatile components on each side of the fabric or a total of 1.0 ounce of the dry composition per square yard on both sides of the fabric.

The finished material transmitted 30% of the light striking its surface as determined by Westinghouse's "Trans-O-Meter." In comparison a cotton fabric of similar weight and weave coated with the same compositions in a similar manner transmitted far less of the light striking its surface. Furthermore, the individual threads of the synthetic fabric were not visible when the coated fabric was viewed by transmitted light and the material had the appearance of ground or frosted glass when viewed by transmitted light, a property in window shade material which has been sought for years. The individual threads of the cotton fabric base shade cloth made with the same compositions and method as used for the improved shade cloth above described were visible as well as the fabric imperfections when viewed by transmitted light.

The value of light transmission set out above was determined on perfectly coated material, that is, material free from pinholes in the coating. The light which passes through pinholes in poorly coated material is direct light and not diffused light. Poorly coated material with pinholes obviously transmits more light than properly coated material which is free from pinholes.

EXAMPLE II

A light brown (ecru) translucent window shade having the appearance of ground glass when viewed by transmitted light was prepared in the manner described in Example I by modifying the first and second coating compositions by replacing the zinc oxide pigment pound for pound with the following mixture of pigments in the proportion indicated:

	Per cent
Zinc oxide	90.0
Bone black	2.8
Chrome yellow	3.6
Chrome orange	3.6

EXAMPLE III

A very satisfactory window shade material having the desirable appearance of ground glass

in which case the individual fibers of the synthetic fabric are not visible when viewed by transmitted light was produced by first coating the synthetic fabric having continuous filaments of uniform denier described in Example I on both sides with the following composition:

First coating

	Per cent by weight
Methyl methacrylate polymer	18.0
Methyl ethyl ketone	65.8
Dibutyl phthalate	5.4
Zinc oxide	10.8

The volatile solvents were expelled after each successive coat and the material was subjected to the intermediate pressure treatment as described in Example I. Following the pressure treatment the material was coated on each side with the following composition:

Second coating

	Per cent by weight
Methyl methacrylate polymer	15.9
Methyl ethyl ketone	59.0
Dibutyl phthalate	8.4
Zinc oxide	16.7

The volatile solvents were expelled after each successive coat of the above composition. The amount of the first and second coating applied to each side of the fabric was the same as in the case of Example I.

EXAMPLE IV

A window shade material having the appearance of ground glass when viewed by transmitted light was produced in same manner as described in Example I by employing a fabric woven from continuous filaments of cellulose acetate the warp threads comprising 75 denier and 20 filaments per thread, and the filler threads comprising 150 denier and 40 filaments per thread, the number of threads per inch in the warp direction being 180 and the number of threads per inch in the filler direction being 60, both warp and filler threads having 3 turns per inch with a left twist. In using a cellulose acetate fabric care must be taken to use a solvent mixture in the coating composition which does not cause the cellulose ester fibers to completely dissolve.

EXAMPLE V

A translucent window shade having the appearance of ground glass was prepared by coating a woven glass fabric containing continuous glass filaments of uniform denier, weighing 3.7 ounces per square yard, having a thread count of 60 warp threads per inch and 50 filler threads per inch. The yarn number of both the warp and filler threads was 900 -2/2 and there were 102 filaments per thread. The glass fabric was coated with the methyl methacrylate compositions described in Example III and was coated in the manner described in Example III.

Method of preparing the coating compositions is well known in the art and a detailed description does not appear to be necessary. The film forming ingredient is dispersed in the organic solvents and the pigment is ground in the plasticizer; then the film forming dispersion is added to the pigment ground in the plasticizer; after thorough mixing the composition is ready for spreading.

The coating compositions are best applied by

means of the coating head described in U. S. Patent 1,857,241 and the drying is best accomplished by the apparatus described in U. S. Patent 2,107,275.

The preferred examples describe specific fabrics made from continuous filaments of uniform denier and of various constructions. The invention is not to be limited to the use of fabrics woven from continuous filaments of regenerated cellulose, cellulose acetate and similar filaments, but also includes other filaments of natural or synthetic origin so long as the filament is of a uniform denier. It is also within the purview of this invention to include fabrics woven from continuous filaments of synthetic resins and other polymerized materials, for example from resins disclosed in U. S. Patent No. 2,071,250. It is also within the scope of this patent to eliminate the second coating entirely and produce a window shade material with only one coating having approximately the same degree of light transmission as the synthetic fabric.

By using fabrics of varying composition, such as pigmented filaments, it is necessary to modify the pigment content of the coating composition to balance the translucency of coating with that of the fabric in order that the individual fibres will not be visible when the coated material is viewed by transmitted light.

In addition to the cellulose nitrate type of coating, other cellulose derivatives may be used, such as, e. g., cellulose acetate as well as methyl cellulose, ethyl cellulose, and benzyl cellulose or mixtures thereof. In addition to the methyl methacrylate coating composition other resinous materials may be used, e. g., alkyd resins, phenol formaldehyde resins, urea-formaldehyde resins or any other material capable of forming a film and withstanding continued exposure to sunlight.

Variations in the ingredients of the coating compositions within the scope of this invention will be apparent to those skilled in the art. The choice of a suitable coating composition as well as the degree of pigmentation of the second coating composition, is governed by the degree of translucency and other properties desired in the finished product. In place of the zinc oxide used in the examples other suitable fillers or pigments may be used as, for example, barytes, certain types of diatomaceous earth, silica gel, etc. Any pigment or filler which will produce from the coating composition a film having substantially the same refractive index as the base fabric may be used. Such substances as casein, starch, drying oils, natural resins, synthetic resins other than those mentioned above, where desired, may be used as components of the coating composition. Appropriate modification and the amounts of the ingredients of the coating composition to produce desired properties, will be readily apparent to those skilled in the art, and when desired, the importance of variation in coating composition formulae may be readily determined empirically.

The amount of coating composition may vary according to the desired needs. Material which has as low as .5 ounce of solid coating applied on one side or 1.0 ounce of solid coating applied on both sides and as high as 1.5 ounces of solid coating applied on one side or 3.0 ounces of solid coating applied on both sides, has been found satisfactory for certain needs. It is not intended to limit the amount of solid coating which

may be applied to the synthetic fabric by specifically mentioning this range.

For special color effects it is sometimes desirable to dye the synthetic fabric having continuous filaments of uniform denier with a fast dye and coat the dyed fabric with a coating composition having approximately the same light transmission as the dyed fabric.

The material herein described having a high degree of uniform light transmittal is useful for not only window shades, but is also extremely useful for illuminated signs such as are on street cars, busses, etc. For use as illuminated signs the lettering or design is applied by stencil or other means; the sign is covered with an opaque non-light transmitting ink with portions in the form of letters or designs remaining uncovered with the said ink, so that when the sign is illuminated from the rear the portion covered with the opaque ink will not transmit the light and the balance of sign or unprinted (lettered) portion will transmit the light uniformly from the rear. The material of this invention may also be used for translucent movie screens adapted for rear projection.

A primary advantage of the material disclosed in this invention is clearness and uniformity of translucency of the coated fabric which has an appearance which is characteristic, but is somewhat difficult to describe. Its appearance may be compared to what is commonly called "opal" glass and is not unlike ground or frosted glass. Heretofore it has never been possible to prepare window shades from cotton fabrics having the appearance of ground glass when viewed by transmitted light.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof; it is to be understood the invention is not to be limited to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. A translucent window shade having the appearance of ground glass when viewed by transmitted light comprising a synthetic fabric base the threads of which comprise continuous filaments of uniform denier, the interstices of the said fabric filled with a pigmented film forming composition having approximately the same light transmission as said fabric, a second coating applied over the first mentioned coating, said second coating comprising approximately twice the amount of pigment as the said first coating.

2. A window shade material having a base woven from continuous filaments of regenerated cellulose both warp and filler threads of which are of approximately 150 denier and 60 filaments per thread, and two coats of a film forming cellulose derivative composition the first having a ratio of about 16 to 10 of film forming cellulose derivative and zinc oxide, and the second having a ratio of about 14 to 20 cellulose derivative and zinc oxide, said first coating having substantially the same translucency as said base material.

3. The product of claim 1 in which both coatings contain a film forming material selected from the group consisting of cellulose nitrate, cellulose acetate, methyl cellulose, ethyl cellulose, benzyl cellulose, methyl methacrylate, alkyd resins, phenol formaldehyde resins, and urea-formaldehyde resins.

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