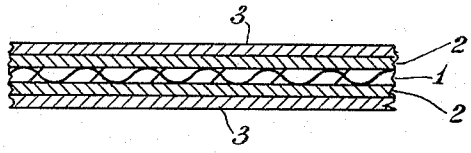
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OPAQUE WINDOW SHADE MATERIAL

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OPAQUE WINDOW SHADE MATERIAL

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

Shade cloth comprising a fabric coated with a cellulose ester composition has been known in the art for a considerable time. There are two distinct types of window shade material now used for the spring roller type of window shades; namely, the opaque and translucent variety.

For use in hotels, school rooms, and similar installations there has been a demand for shade cloth in the light colors with absolute opaqueness. In the past, products of this type have been manufactured by first coating both sides of the fabric with sufficient pigmented composition to impart opaqueness. In the case of light colors a great number of coats on each side of the fabric were necessary to produce an opaque shade cloth material. This resulted in an overcoated product which was expensive to make, liable to curl, bulky and generally unsatisfactory.

An object of this invention is to provide an improved opaque window shade cloth. A further object is to provide an opaque window shade in light colors. A still further object is to provide an opaque window shade which is not overcoated and has great resistance to curling. A still further object is to provide an economical method of making an opaque window shade. Other objects and a general advance in the art will be apparent from the description of the invention given hereinafter.

The objects of this invention are accomplished by applying a suitable coating composition containing metallic particles in flake or plate form to both sides of a textile fabric and further coating both sides of the textile fabric with a suitable coating composition containing non-metallic pigments to produce the desired color.

In the single figure of the accompanying drawing is shown a cross-sectional view of a piece of shade cloth prepared according to the preferred method of this invention. The sheet of textile fabric 1 has applied to both sides a coating composition 2 containing flakes or plates of metallic particles to form an opaque layer, as shown in the drawing. The numeral 3 denotes a second coating containing non-metallic pigments applied on both sides of the textile fabric to impart the desired color.

The following examples are given to illustrate the preferred embodiment of the invention although it is to be understood that the invention is in no way limited to these particular examples. In the formulae the parts are given by weight. Throughout the examples the proportions of the ingredients on a solids basis (i. e., in the absence of volatile solvents or diluents) are indicated by enclosing the percent of each solid material in parenthesis.

Example I

A synthetic fabric free from nap, lint 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 six turns per inch, the number of threads in the warp direction being 80 and the number of threads in the filler direction being 72, and weighing 3.0 ounces per square yard was selected for the base material for the improved opaque window shade. The synthetic fabric was coated on both sides with the following composition:

First coating

		Per cent	
65% solution of urea-formaldehyde resin in isobutanol		26.2	(23)
Mill base	Bone black pigment 25.0% Barytes pigment 12.5% Resin A—60% solution in toluol 62.5%	68.5	(69.8)
Aluminum flakes		5.3	(7.2)

Sufficient first coating composition was applied to deposit approximately 1 ounce of non-volatile components per square yard which corresponds to a total of approximately 2.0 ounces per square yard of non-volatile ingredients of the first coating on both sides of the fabric. This was accomplished by one coat on each side of the fabric. The volatile solvents were expelled after each successive coat by passing the material through a heated chamber.

Following the application of one coat of the first coating composition on both sides of the fabric and subsequently drying, the material was further coated on each side with an ecru colored

second coating composition the formula of which was as follows:

Second coating

		Per cent	
65% solution of urea-formaldehyde resin in isobutanol		26.0	(21.5)
Mill base	Resin A—60% solution in toluol 45.4%	67.5	(70.30)
	Bone black 1.5%		
	Zinc oxide 50.3%		
	Chrome yellow 1.5%		
	Chrome orange 1.3%		
25% solution of P_2O_5 in ethyl alcohol		.2	(.06)
Flatting agent		6.3	(8.14)

Sufficient amount of the second coating composition was applied with one coat on each side of the fabric to conceal the color of the first coating composition. This required approximately 1 ounce per square yard of the non-volatile components on each side of the fabric. The volatile solvents were expelled after each successive coat by passing the material through a heated chamber. The purpose of the flatting agent, which may be diatomaceous earth, is to impart a dull or mat finish to the dried coating. The purpose of the P_2O_5 solution is to improve and hasten the drying of the urea-formaldehyde resin.

It will be observed that the first coating composition contains 73.7% of non-volatile ingredients and the second coating composition contains 78.9% of non-volatile ingredients. These compositions are sufficiently fluid for doctor knife coating and a maximum amount of non-volatile ingredients are deposited in a minimum number of coats. This is a very important economic advantage which will be readily recognized by those skilled in the art.

The material thus produced was of a light brown (ecru) color and absolutely opaque. The material did not have an excessive amount of coating, did not curl, was smooth, was easily wound and unwound on a spring roller.

EXAMPLE II

An opaque window shade of light brown color (ecru) was prepared in the manner described in Example I, by coating a synthetic fabric woven from continuous filaments of uniform denier weighing 3.0 ounces per square yard; the warp and filler threads were 150 denier; the number of filaments in the filler thread was 90, and the number of filaments in the warp thread was 40. The compositions employed were as follows:

First coating

	Percent	
65% solution of urea-formaldehyde resin in isobutanol	19.3	(17.2)
Resin A—60% solution in toluol	51.9	(43.0)
Aluminum flakes	28.8	(39.8)

Second coating

65% solution of urea-formaldehyde resin in isobutanol		17.9	(14.60)
Mill base	Resin A—60% solution in toluol 45.4%	77.5	(79.80)
	Zinc oxide 50.3%		
	Bone black 1.5%		
	Chrome yellow 1.5%		
	Chrome orange 1.3%		
25% solution of P_2O_5 in ethyl alcohol		.2	(.06)
Flatting agent		4.4	(5.54)

The material thus produced was absolutely opaque, light weight, light color, dull finish, and was easily wound and unwound on a spring roller. Due to the increased amount of aluminum flakes in the first coating composition over that employed in Example I, less coating was required to obtain complete opacity.

EXAMPLE III

An opaque shade having a light brown color was prepared by coating the fabric described in Example I and in the manner described in Example I except the coating compositions were as follows:

First coating

		Percent	
Cellulose nitrate (4.0 to 7.0 second viscosity: 11.35% to 11.75% nitrogen)		12.0	(24.6)
Ethyl acetate		24.0	
Ethyl alcohol		24.0	
Mill base	Bone black 30%	30.0	(55.0)
	Barytes 30%		
	Solvent plasticizer* 30%		
	4.2% solution of cellulose nitrate in ethyl alcohol 1 part and ethyl acetate 1 part 10%		
Aluminum flakes		10.0	(20.4)

*The solvent plasticizer used in this example was di-ethylene glycol monobutyl ether phthalate.

Second coating

65% solution of urea-formaldehyde resin in isobutanol		17.9	(14.6)
Mill base	Resin A—60% solution in toluol 45.4%	77.5	(79.80)
	Zinc oxide 50.3%		
	Bone black 1.5%		
	Chrome yellow 1.5%		
	Chrome orange 1.3%		
25% solution of P_2O_5 in ethyl alcohol		.2	(.06)
Flatting agent		4.4	(5.54)

The material thus produced was absolutely opaque, dull finish, light color, light weight and was easily wound and unwound on a spring roller.

EXAMPLE IV

An opaque window shade having a light brown (ecru) color and dull finish, which was wound and unwound on a spring roller, was prepared by employing the fabric and method described in Example II except that the coating compositions were as follows:

First coating

	Percent	
Cellulose nitrate (4.0 to 7.0 second viscosity 11.35 to 11.75% nitrogen)	13.8	(30.8)
Ethyl acetate	27.6	
Ethyl alcohol	27.6	
Resin A—60% solution in toluol	19.5	(43.5)
Aluminum flakes	11.5	(25.7)

Second coating

Cellulose nitrate (4.0 to 7.0 second viscosity 11.35 to 11.75% nitrogen)		12.2	(23.4)
Ethyl acetate		19.4	
Ethyl alcohol		19.4	
Mill base	Resin A—60% solution in toluol 45.4%	49.0	(76.6)
	Zinc oxide 50.3%		
	Chrome yellow 1.5%		
	Chrome orange 1.3%		
	Bone black 1.5%		

EXAMPLE V

An opaque window shade material having the desirable properties herein set forth was prepared by employing the fabric and method described in Example II except that the following compositions were employed:

First coating

		Percent	
Cellulose nitrate (4.0 to 7.0 second viscosity 11.35 to 11.75% nitrogen)		13.8	(30.8)
Ethyl acetate		27.6	
Ethyl alcohol		27.6	
Resin A—60% solution in toluol		19.5	(43.5)
Aluminum flakes		11.5	(25.7)

Second coating

65% solution of urea-formaldehyde resin in isobutanol			17.9	(14.60)
Mill base: Resin A—60% solution in toluol	45.4%	77.5	(79.80)	
Mill base: Zinc oxide	50.3%			
Mill base: Bone black	1.5%			
Mill base: Chrome yellow	1.5%			
Mill base: Chrome orange	1.3%			
25% solution of P_2O_5 in ethyl alcohol			.2	(.06)
Flatting agent			4.4	(5.54)

It has been discovered that with the varnish type urea-formaldehyde compositions herein mentioned, when applied to a woven cotton fabric the composition penetrates the fabric and tends to flow around each individual protruding fiber commonly referred to as "nap", and produces a very rough surface having the appearance of sandpaper. In the case of a woven cotton fabric base it is necessary to employ a bridging type of film-forming material such as a cellulose derivative composition for the first coating composition and after calendering the dried first coating composition to provide a smooth surface, the second coating composition may be the urea-formaldehyde varnish type or the cellulose derivative bridging type of composition.

Additional examples employing a cotton fabric base are as follows:

EXAMPLE VI

A woven cotton fabric weighing 2.5 ounces per square yard and having a thread count of 68 x 72 was coated with the following compositions in the manner described in the foregoing examples:

First coating

		Percent	
Cellulose nitrate (4.0 to 7.0 second viscosity 11.35% to 11.75% nitrogen)		12.0	(24.6)
Ethyl acetate		24.0	
Ethyl alochol		24.0	
Mill base: Bone black	30%		
Mill base: Barytes	30%		
Mill base: Solvent plasticizer*	30%		
Mill base: 4.2% solution of cellulose nitrate in ethyl alcohol 1 part	10%	30.0	(55.0)
Aluminum flakes		10.0	(20.4)

*The solvent plasticizer used in this example was di-ethylene glycol monobutyl ether phthalate.

Following the application of one coat of the above composition to each side of the fabric, the same amount being deposited as described in Example I, the material was passed through a hydraulic calender twice, one time through one side contacting a heated steel calender roll and the other time through the other side contacting the heated steel calender roll. The pressure applied was 40 to 50 tons on the axis of the heated steel roll.

The second coating was as follows:

Second coating

65% solution of urea-formaldehyde resin in isobutanol			Percent 17.9	(14.60)
Mill base: Resin A in 60% solution of toluol	45.4%	77.5	(79.80)	
Mill base: Zinc oxide	50.3%			
Mill base: Bone black	1.5%			
Mill base: Chrome yellow	1.5%			
Mill base: Chrome orange	1.3%			
25% solution of P_2O_5 in ethyl alcohol			.2	(.06)
Flatting agent			4.4	(5.54)

The amount and manner in which the second coating was applied was the same as described in Example I. The material was applied the same as described in Example I. The material was smooth, absolutely opaque, had a dull finish and was easily wound and unwound on a spring roller.

EXAMPLE VII

A satisfactory smooth, absolutely opaque window shade which was easily wound and unwound on a spring roller was prepared in the manner described in Example VI except that the coating compositions were as follows:

First coating

	Percent	
Cellulose nitrate (4.0 to 7.0 second viscosity 11.35 to 11.75% nitrogen)	13.8	(30.8)
Ethyl acetate	27.6	
Ethyl alcohol	27.6	
Resin A—60% solution in toluol	19.5	(43.5)
Aluminum flakes	11.5	(25.7)

Second coating

Cellulose nitrate (4.0 to 7.0 second viscosity 11.35 to 11.75% nitrogen)			Percent 12.2	(23.4)
Ethyl acetate			19.4	
Ethyl alcohol			19.4	
Mill base: Resin A—60% solution in toluol	45.4%	49.0	(76.6)	
Mill base: Zinc oxide	50.3%			
Mill base: Chrome yellow	1.5%			
Mill base: Chrome orange	1.3%			
Mill base: Bone black	1.5%			

The urea-formaldehyde resin used throughout in the above examples is that described in co-pending application S. N. 58,000, filed January 7, 1936.

"Resin A" called for in the examples is a castor oil modified glycerol sebacate mixed with two-thirds its weight of toluene. It is a product well known in commerce, being available in the open market under the trade name "Paraplex RG2 Resin". Other plasticizers for the urea-formaldehyde resin and cellulose derivatives which may be used with equal results include blown castor oil, blown cottonseed oil, butyl ricinoleate, tricresyl phosphate, a mixture of ortho and para toluene ethyl sulfonamides, linseed diglyceride, dibutyl phthalate, dimethyl Cellosolve phthalate, dibutyl Cellosolve phthalate and dimethyl phthalate.

Flatting agents may be China clay, aluminum stearate, calcium stearate, silica gel, or diatomaceous earth, e. g., that sold as "Celite CF110".

Other pigments may be blended in various ratios to obtain the desired color. These include

chrome green, red oxide, scarlet lakes, yellow ochre, ultramarine blue, zinc yellow, titanium oxide, etc. Obviously the choice of pigments is extremely wide and includes those commonly used in the industry, or combinations of several pigments, depending upon the color of the shade cloth desired. It is sometimes desired to apply a second coating of different color on each side of the fabric such as a light colored second coating on one side and a dark colored second coating on the other side.

The cellulose derivative type of bridging compositions may include in addition to cellulose nitrate, cellulose acetate, cellulose butyrate, ethyl cellulose, butyl cellulose, or mixed ether-ester derivatives such as, e. g., cellulose aceto-butyrate and cellulose aceto-propionate.

The aluminum flakes may be any commercial grade having leafing properties when suspended in certain liquids. The dry aluminum flakes may be incorporated in the coating composition or it may be introduced in the form of a paste.

In the case of the first coating in Example I the aluminum flakes represent 13.4% based on the total pigment content, whereas, in the case of the first coating in Example II the aluminum flakes represent 100% of the total pigment content. It has been found that an absolutely opaque shade can be produced by varying the aluminum flake content of the total amount of pigment in the first coating composition from 10.0 to 100.0%. Obviously less first coating is required to obtain complete opacity with the greater quantities of aluminum flakes. Wherever an aluminum colored window shade is desired the second coating composition may be eliminated entirely since the opacity is accomplished by the first coating.

In the examples, the fabric is a sheeting woven from cotton filaments or filaments of regenerated cellulose, which are the types of fabric employed in the manufacture of shade cloth. Other types of fabric may be employed which are heavier or lighter in weight, depending upon the desired properties of the shade cloth. It is also within the scope of this invention to employ a paper base, such as now used in the manufacture of window shades.

While aluminum flakes are preferred on account of their covering power and light weight, in certain cases they may be substituted by lead flakes or by other metals which are obtainable in flake form and which do not have a deleterious effect on the compositions in which they are incorporated.

The invention has been illustrated by coating the fabric on both sides with a composition containing the metal flakes. However, it is possible to obtain good results by coating the fabric on one side only with the composition containing the metallic flakes.

Heretofore it has been known that heavy fabrics could be prepared by inserting a metal foil between two or more of the layers in the laminated fabric. However, such material is always cumbersome and has sufficient thickness that it would not make a satisfactory window shade. According to the present invention, the fabric must not be over .013 of an inch in thickness. The preferred thickness of the material is about .010 of an inch and seldom is below .007 inch. It has been found that when window shade material is prepared according to the present invention and within this range of thickness, it may be wound upon a window shade roller without cracking or showing any other bad effects for a surprisingly long time.

The material prepared according to the present invention has a light transmission of practically zero. In other words, the usual photoelectric cell used to measure light in foot candles fails to give a reading when the material is placed between the instrument and a window; hence, the material prepared according to the present invention may actually be considered opaque.

The principal advantage of the invention is the production of an absolutely opaque window shade in light colors. A further advantage is the production of an absolutely opaque window shade with a minimum amount of coating. A further advantage is the improved appearance and increased resistance to curl when the material is placed in service.

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. An opaque window shade comprising a woven cotton textile fabric coated on each side with a cellulose derivative coating containing sufficient aluminum flakes to render the said coating opaque, a second pigmented cellulose derivative coating applied over the first mentioned coating, the pigment in the said second coating consisting of non-metallic pigment, said cellulose derivative being selected from the class consisting of cellulose esters, cellulose ethers, and mixed cellulose ether-esters.

2. An opaque window shade comprising a synthetic fabric base, the threads of which comprise continuous filaments of uniform denier, the said fabric coated on both sides with a film-forming composition containing sufficient aluminum flakes to render said coating opaque, a second pigmented film-forming composition applied over the first mentioned film-forming composition, the pigments in the said second coating consisting of non-metallic pigments.

3. An opaque window shade comprising a woven cotton textile fabric weighing approximately 2.5 ounces per square yard, approximately 1.0 ounce of non-volatile components of a cellulose derivative composition disposed on each side of said fabric, the pigment content of said cellulose derivative composition containing 10% to 100% of metallic flakes to render said shade opaque, approximately 1.0 ounce of non-volatile components of a second pigmented cellulose derivative composition applied on each side of the fabric over the first mentioned coating, the pigments in the said second coating consisting of non-metallic pigments, said cellulose derivative being selected from the class consisting of cellulose esters, cellulose ethers, and mixed cellulose ether-esters.

4. An opaque window shade comprising a textile fabric coated on each side with a cellulose derivative coating composition containing sufficient aluminum flakes to render the said coating opaque, a second pigmented cellulose derivative coating applied over the first mentioned coating, the pigment in the said second coating consisting of non-metallic pigment, said cellulose derivative being selected from the class consisting of cellulose esters, cellulose ethers, and mixed cellulose ether-esters.

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