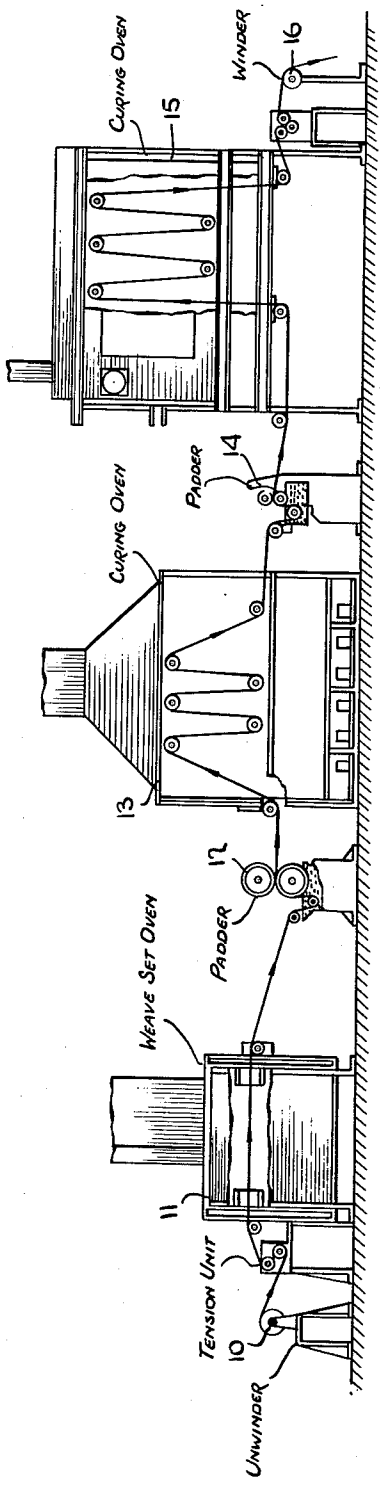
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METHOD OF PRODUCING MULTI-COLORED GLASS FIBER FABRICS

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METHOD OF PRODUCING MULTI-COLORED GLASS FIBER FABRICS

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The present invention relates generally to multi-colored fabrics, and more particularly to a method and apparatus for imparting different color and color tone effects to fabrics formed of fiber glass.

Increasing use is being made of fibrous glass yarns in the manufacture of fabrics intended for curtains, draperies, shower curtains and in many other household applications. Such fabrics have decided advantages over conventional materials, for they need no ironing, cannot shrink and do not burn. Moreover, fiber glass fabrics are readily washed, are stain-resistant and drape well.

The decorative possibilities of glass fiber fabrics have heretofore been distinctly limited as to color, texture and pattern. Accordingly, it is the principal object of the invention to impart new and dramatic decorative dimensions to fiber glass fabrics without detracting from any of the basic features of glass fiber and without resorting to printing systems.

More particularly it is an object of the invention to provide a method for producing decorative fiber glass fabrics having multiple color and color tone effects as well as varied texture and pattern combinations. A significant feature of the invention resides in the fact that it is possible to produce a large spectrum of color combinations ranging from pastels to deep tones, and to achieve salt and pepper motifs, herringbone tweed and plaid effects, ribs and horizontal stripes.

Briefly stated, these objects are attained by the resin-pigment dyeing of a fibrous glass fabric woven or otherwise fabricated from mixed fibrous glass yarns having different surface characteristics resulting from either chemical or mechanical modification of the yarn properties. The multi-color or shade effects arise from the differences in receptivity of the various fibrous glass surfaces in the fabric to the applied pigment.

This difference in color or shade within the fabric can be controlled by careful adjustment of such factors as wetting, pH, pigment particle size, and the type of resin in the resin-pigment dyeing baths. It can also be controlled by the number of colors or shades of resin-pigment bath the fabric is passed through, and by the degree of surface variation of the fibrous glass yarns in the fabric.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description to be read in conjunction with the accompanying drawing.

In the drawing, the single FIGURE schematically shows a preferred form of apparatus for carrying out the method in accordance with the invention.

The invention is based on the use of a glass fiber fabric of the mixed yarn type. Glass yarns are presently available which are constituted by continuous filaments having a smooth surface or by filaments which have been texturized or bulked. Also available are staple glass fiber yarns, spun yarns, boucle or loop yarns and crimped yarns. These yarns differ in their appearance and texture but more importantly from the standpoint of the present invention, they differ in their capillarity or receptivity to pigment-resin systems. Thus the fabric to be decoratively finished is formed by weaving or otherwise interconnecting fibrous glass yarns using two or more yarns of different capillarity in the warp or fill direction. Because of the diversity of yarn surfaces available in glass fibers, a large range of yarn combinations is possible within the scope of the invention.

The first operation in the continuous finishing of the fiber glass fabric is the removal of any organic material on the glass. Most textile glass fabrics are coated with a lubricant and binding agent which is applied as the glass fiber is being produced. A typical treatment, often referred to as the starch-oil size or binder, is necessary to protect the glass fiber during throwing, beaming, quilling, twisting or weaving. The starch used may be of any of the starches familiar to the textile technologist and may include slightly hydrolyzed or dextrinized starches. The oil in the starch-oil binder is generally a lubricating oil of vegetable origin, such as castor, hydrogenated cottonseed, olive, or coconut. In addition to these primary components, the binder may contain in extremely small amounts, one or more substances such as gelatine, borax, polyvinyl alcohol, cationic surface active materials, and dispersing agents. This size is applied to the glass fiber by the yarn producer as the fiber is being formed. These organic solids which must be removed range from 0.5 percent to 4.0 percent on commercial glass yarns with the starch-oil size. In addition to the sizing applied by the yarn producer, any additional organic materials such as warp sizings or oils put on by the weaver must be completely removed.

As shown in the drawing, the greige fabric taken from an unwinder roll **10** is passed through an oven **11** operating at about 1200 degrees Fahrenheit into which air or oxygen is bled carefully, at such a rate that the organic material is ignited and completely burned from the glass. The high heat of the combustion process softens and relaxes the glass, setting the glass yarn permanently in the configuration of the weave. This crimping effect, the most important feature of the heat treating process, results in a wrinkle-proof glass fabric. As the glass comes out of the heat cleaning oven **11**, it is completely devoid of inter-fiber protection. A protective coating must be applied at once.

The fabric from which the size has been removed is then fed through a first padder **12** in which the fabric passes through a bath of water soluble or dispersible resins, pigments, plasticizers, softeners and water-repellants. The pick-up of the resin pigment dye varies as a result of selective capillarity of the various yarn form in the fabric. This results in a finish with two or more shades of the color of the bath. Thus the fabric may exhibit a light tone on the relatively smooth yarn surfaces and a deeper or richer tone of the same color on the yarns having a hairier and more absorbent surface.

From the first padder **12** the fabric is fed through a first curing oven **13** operating at about 320° Fahrenheit, the heat acting to cure the resin on the cloth.

If it is desired to impart additional color effects to the fabric, it is conveyed from the first curing oven into a second padder **14** containing a bath with a different pigment whose color is combined with the color introduced in the first padder to produce multi-hued effects and the fabric is again cured in curing oven **15** from which it is rolled on a winder **16**.

The water-repellant treatment may be carried out separately from the application of the finish in the first padder, in which event the water-repellant is applied in the second padder.

Example I

A glass fiber fabric, composed of mixed yarns such as boucle and bulk yarn, is passed through a first bath having the following composition:

(*a*) 40% water dispersion—9½ qts. Hycar PA 450 (polyacrylonitrite)

(*b*) 30% water dispersion—6 qts. Teflon (polytetrafluoroethylene)
(*c*) 4 qts. Syton DS (colloidal silica)
(*d*) Dyestuff as required
(*e*) Add water to the above until a 50 gallon solution is obtained.

After the resin-pigment system has been padded on the fabric and cured, the fabric is then passed through a bath of a water-repellant to ensure washfastness. The material preferably used for this purpose is 1 to 5% of Quilon S (a stearato chromic chloride complex) the amount depending on the degree of water-repellancy desired. This water-repellant may, in the alternative, be introduced in the first bath when using a non-ionic dispersion therein.

The glass fiber fabric so treated exhibited a multi-colored effect.

The pigment colors are discrete particles of color material dispersed by means of emulsifying agents in the water solution containing the resin or binder, the resin anchoring the pigment to the fiber. Among the pigments which may be used are Azo coloring matter, nitroso dyes, vat dyes in the oxidized state and phthalocyanine blue and green. Inorganic pigments may be used such as precipitated iron oxide and ultramarine blue.

The resultant composition in the dried film state is, in percent by weight, as follows:

	Percent
Polyacrylonitrile	35
Polytetrafluoroethylene	35
Colloidal silica	15
Pigment	15

Additions to this formulation might also include polyethylene and silicone softeners.

Example II

The formulation of the bath is as follows:

(*a*) 40% dispersion—9 qts. Hycar PA 4501
(*b*) 30% dispersion —2 qts. Syton DS
(*c*) 12 oz. ammonia 26° Baumé
(*d*) Dyestuff as required
(*e*) Water added to provide 50 gallons in tank

In the event a non-ionic dispersion is used, the water-repellant (2% Quilon S) may be added directly to the above, omitting the ammonia.

The dyed fabric employing the formulation of this example exhibited a multi-colored effect.

While there has been shown what is considered to be a preferred embodiment of the invention, it will be manifest that many changes and modifications may be made therein without departing from the essential spirit of the invention. It is intended, therefore, in the annexed claims to cover all such changes and modifications as fall within the true scope of the invention.

What is claimed is:

1. The method of producing and finishing a decorative fabric comprising the steps of fabricating a fabric composed of mixed glass fiber yarns having different capillarity, passing said fabric through at least one bath of a pigment-resin system to coat said mixed yarns with pigment which is absorbed thereon to an extent depending on said capillarity, and curing the coated yarns.

2. In the method of finishing a decorative fabric composed of mixed glass fiber yarns having different capillarity, the steps of passing said fabric through at least one bath of a pigment-resin system to coat said mixed yarns with pigment which is absorbed therein to an extent depending on said capillarity, and curing the coated yarns to provide a multi-tone effect.

3. The method of producing and finishing a decorative fabric comprising the steps of fabricating a fabric composed of mixed glass fiber yarns having different surface characteristics and capillarity, passing said fabric through successive baths of a pigment-resin system to coat said mixed yarns with pigments of different color which are absorbed therein to an extent depending on said capillarity, and curing the coated yarns to provide multi-color and multi-tone effects.

4. The method of producing and finishing a decorative fabric comprising the steps of fabricating a fabric composed of mixed glass fiber yarns having different capillarity, passing said fabric through at least one bath of a pigment-resin system to coat said mixed yarns with pigment which is absorbed therein to an extent depending on said capillarity, and curing the coated yarns, said pigment-resin system being constituted by a water solution of polyacrylonitrite, polytetrafluoroethylene, colloidal silica, and pigment.

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