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Description

Background and summary of the present invention

1. Introduction

The present invention generally relates to a process and apparatus for coloring textile yarns to produce a tone-on-tone or striated appearance when such yarns are utilized to form a woven fabric. Thus, when woven into a fabric, the yarns of the present invention produce a very noticeable and aesthetically pleasing tone-on-tone, striated, or heather-like appearance. Fabrics of this type find particular utility for window shades and vertical blinds, or as facings for wall covering or other decorative purposes.

In accordance with the present invention, a textile yarn is coated or otherwise brought into contact with a colorant-containing liquid. Subsequently, the coated yarn is dried so that one portion of the yarn surface is dried at a faster rate than the drying rate of another portion of the yarn surface. Such a differential drying rate between the yarn surface portions will effect migration of the colorant to that portion of the yarn surface dried at a faster drying rate to a degree sufficient to achieve a visually perceptible darker color hue thereat when compared to other yarn surface portions. Twisting of the yarn during packaging and/or weaving will randomly distribute the darker color hue surface along the yarn's length. Thus, woven fabrics of the twisted yarn will be visually striated in coloring appearance.

Other methods capable of producing multi-colored or tone-on-tone effects on fabrics or yarn exist. One conventional process utilized in Europe reportedly involves the package dyeing of glass sliver yarns to produce a tone-on-tone colored yarn. Package dyeing is a process in which a dyebath is pumped under pressure through a package of yarn wound on a perforated tube. The dyebath solution is thus forceably pumped through the cross-section of the yarn package. The yarn produced in this conventional manner is not without its problems, however. Considerable variation in color over the cross-section of the yarn package may occur, the color becoming progressively lighter towards the low pressure side of the yarn package. Since the yarn packages are small (e.g. averaging about 4—5 pounds) there may also be undesirable color variation from package to package.

Other attempts at achieving striated tone-on-tone yarn or fabric appearances exist in the patent literature as evidenced by United States Patent Nos. 3,775,054 to DeVinney; 3,950,132 to Somers et al; 4,087,242 to Frank et al; 4,246,668 to Spillmann et al; 2,823,092 to Spencer; 3,644,969 to Guillermand et al; and 3,726,640 to Takriti et al.

United States Patent 3,775,054 discloses a process whereby yarns with random color variation can be produced by applying dye using a rotating brush member. The differential speed between the linear speed of the rotating brush tips and the linear speed of the moving yarns determines the

blending effect of the applied dye with respect to the basic color characteristics of the yarns.

United States Patent 3,950,132 disclose a random dyeing method wherein the yarns are laid in a zig-zag fashion and passed through a pair of dye-application rollers.

United States Patent 4,087,242 relates to a method of providing variegated dyed yarns which includes, in a preliminary step, passing a partially oriented polyester feeder yarn over a surface which is wetted with a liquid reagent. The liquid reagent alters the affinity of the yarn to a disperse dye and thus when the feeder yarn is dyed, the area treated with the reagent will be intermittently darker due to the increased dye affinity thereof.

United States Patent 4,246,668 discloses a process wherein a number of webs of material are guided in a side-by-side fashion between treatment rollers. The treatment pressure is set differently at individual longitudinal portions of the roller nip so that the web of material is exposed to different treatment pressure at different points with the result that dye or other finishes are forced out of those portions of the web subjected to the greatest pressure and into those portions subjected to the least pressure.

United States Patent 2,823,092 discloses a method whereby so-called "marbled" open-width cloth can be produced by compressing the cloth width-wise into a rope form and subsequently passing the compressed cloth while in such rope form lengthwise through a padding zone. The surface of a cloth in the padding zone will therefore acquire a random localized application of multi-tone color in spaced isolated portions thereof so as to establish the "marbled" appearance when the cloth is subsequently reopened to its full width.

United States Patent 3,644,969 discloses a method whereby thermoplastic yarn can be fed into a confined space so as to form a long stack of uniform cross-section of folded yarn. A dye solution is then fed at different locations to the same cross-section of the stack so the resulting intensity of the color of the yarn due to each dye falls off across the stack from the point of application.

United States Patent 3,726,640 discloses a method wherein color patterns can be formed on e.g. carpets by application of dye droplets in an equal volume over the surface of the carpet breadth.

In a first aspect of the invention, there is provided a method of producing a colored textile yarn comprising the steps of:

(a) applying a colorant-containing liquid to the surfaces of said one and other side of the yarn;

(b) drying said one side of the yarn at a drying rate which is faster than the drying rate of said other side of the yarn to establish a drying rate gradient between said one and other sides; and

(c) allowing the colorant in the liquid applied according to step (a) to migrate to said one side of the yarn by virtue of the drying rate gradient established according to step (b), said migration effecting a darker colour hue on said one side when compared to said other side.

The method of the present invention is capable of providing a novel process for producing striated or tone-on-tone colored textile yarns for weaving into fabrics so that the resulting woven fabrics exhibit a notable tone-on-tone, striated, or heather-like appearance. In accordance with the present invention therefore, a striated colored yarn which is consistent in color and which exhibits a large degree of contrast between the dark and light areas of the yarn can be produced. Moreover, various weights and yarn sizes can be processed to produce a striated colored textile yarn of the present invention.

The striated colored textile yarn of the present invention can be produced in virtually unlimited package sizes and exhibits good light fastness and heat stability. Other desired properties including durability to washing, flame retardancy, water, stain and abrasion resistances can be imparted to the yarn in dependence upon the selected components of the yarn treatment bath.

Virtually all textile yarns can be treated in the manner of the present invention. For example, natural yarns of cotton, synthetic yarns of polyester or nylon and blends of such natural and synthetic yarns can be advantageously treated in accordance with the present invention so long as the textile yarns are capable of absorbing a colorant-containing liquid.

The "colorant" in the liquid can be either a dyestuff (natural and/or synthetic) or a pigment. When pigments are utilized as a colorant, it is typically desirable to include a resin component in the liquid to act as a binder for the pigments to ensure proper adhesion to the textile yarn. For example, when treating glass sliver yarns in accordance with the present invention, it is particularly preferred to utilize a pigmented liquid resin.

The glass sliver yarns are preferably contacted with a pigmented resin bath comprising an acrylic resin, suitable pigments for coloring, and other auxiliary chemical components including silane, surfactants, and softeners. The yarns are then dried according to the present invention, for example, by means of a heated cylinder, to promote pigment migration to that side of the yarn in direct contact with the cylinder. The colored yarn exiting the drying cylinder has a ribbon-like form with one side being noticeably darker in color hue when compared to the other side thereof. However, as indicated above, other synthetic and natural textile yarns could also be treated by a nonresinous dye bath suitable for the particular yarns utilized so long as the "differential" drying rate is maintained to cause colorant migration towards the heat source (e.g. to the yarn side adjacent the heated drum).

The treated yarn is then wound on a conventional package (e.g. yarn package core) suitable for weaving. When woven into a fabric, a very pleasing randomly striated, tone-on-tone, or heather-like appearance is achieved. Varying degrees of color contrast can be achieved by altering the components in the pigmented liquid

bath and by utilizing different temperatures on the drying cylinder.

Reference will hereinafter be made to the accompanying drawings wherein like reference numerals denote like elements throughout the various figures, and wherein:

Figure 1 is a schematic perspective view showing a preferred apparatus of the present invention for coloring textile yarns;

Figure 2 is a schematic representation of a single glass sliver yarn, partially twisted, showing dark and light pigmented areas achieved by the present invention; and

Figure 3 is a photograph of a fabric sample woven with the yarn schematically depicted in Figure 2.

The process for producing a striated or tone-on-tone colored textile yarn is dependent on the ability of the colorant component of the liquid to migrate to specific areas of the yarn. The term "migration" as used herein is meant to refer to the movement of dye or pigment from one area of the yarn or fabric to another. Many factors have been found to influence colorant migration, including the affinity of the yarn for the dye or pigment, the nature of the dyes or pigments involved, the nature of the finish components, the manner in which the finish is applied, and most important, the manner in which the material is dried and the drying temperature.

For example, since glass yarns do not have a natural affinity for dyes or pigments, it is preferred to use a water-based resin bonded pigment system to color the glass yarns since the resin or binder holds the pigments on the glass filaments. The technique for dyeing glass yarns is not unlike that of painting except that a pigmented resin bath for textile purposes is more fluid compared to a latex paint and the bath components are selected for desired effects.

Various resins or binders may be advantageously used according to the present invention including polymers or copolymers of polyvinylchloride, polyvinylacetate, polyvinyl acrylates and latexes of butadiene styrene, polyester, polyethylene vinyl acetate, chlorinated polyethylene vinyl acetate, water based silicone elastomers or any combination of these. Particularly preferred binders are selected from the acrylic copolymer group typically termed acrylic resins or latex resins. Acrylic latexes have good adhesion to glass, are noted for good heat stability and light-fastness, and are also good pigment binders. A wide variety of acrylic latexes are commercially available and may be selected for specific properties such as a soft hand, durability to washing or drycleaning, or for abrasion resistance.

When using glass sliver yarns, the acrylic latex chosen may affect the degree of color migration. If the acrylic latex is cationic in nature, it will have an affinity for the negatively charged glass surface and be less prone to migrate. If the acrylic is too reactive at low temperatures, it may cure before the moisture is completely removed and

before adequate migration is achieved. Preferred acrylic latexes should therefore be anionic or non-ionic in nature and should not cure at temperatures below 250°F (120°C). At 250°F (120°C), the water will have evaporated and pigment migration will essentially be complete. The concentration of the acrylic latex may also influence migration. A pigmented resin bath of 95 percent acrylic latex resin and 5 percent pigments will tend to migrate considerably less than a bath consisting of 4 percent resin and 5 percent pigments when processed in a similar manner. Preferred concentrations of acrylic resin for treating e.g. glass sliver yarns according to the process of the present invention range from between about 2—25 percent (based upon the weight of the solids in the bath) with a more preferred range of between about 4—10 percent.

The primary purpose of the pigments is, of course, to achieve a desired color. Organic pigments with good lightfastness including the phthalocyanine blues and greens, quinacridone reds, benzidine yellows, and carbon blacks are particularly preferred. Inorganic pigments including iron oxide yellows, iron oxide reds, cadmium or chrome yellows and cobalt blues may also be used, but such inorganic pigments migrate under the conditions of the present invention to lesser degree than organic pigments.

Auxiliary chemicals may be added to the resin bath for improved processing or for added properties. Softeners including polyethylene emulsions, silicones, expoxidized soybean oil and waxes may be added to improve the final hand of the yarn. It is often desirable with glass yarns to add small amounts of a silane coupling agent to help bond the resin and pigments to the glass surface for improved durability to crocking, abrasion, and washing. Wetting agents, defoamers, delustering agents, fluorochemicals for water and stain repellancy, and various hand modifiers may be added to achieve desired results. These additives should not be used in excess otherwise the migration properties of the pigments in the bath may be masked.

An exemplary pigmented resin bath formulation suitable for use in the present invention includes:

Bath component	Weight percent based on total weight of bath
silane coupler	0.1 — 1.0%
wetting agent	0.2 — 1.0
softener	0.5 — 2.0
antifoam	0.05— 0.2
humectant	0.2 — 1.0
acrylic resin	2.0 —15.0
pigments	0.1 — 5.0
water	60.0 —95.0

Particularly preferred yarns suitable for coloring by the process and apparatus of this

invention include glass sliver yarns. A glass sliver yarn is a collection of numerous strands of glass filaments. A particularly suitable glass sliver yarn is identified as 666 TEX and is manufactured by the Schuller Company in Europe and can be commercially obtained in the United States from Manville Sales Corporation. The 666 TEX yarn consists of numerous glass filaments having a nominal diameter of 10 microns and lengths of 18—24 inches (46—41 cm). When these filaments are collected into a single strand, a yarn with a fluffy and almost texturized appearance is produced with random variations in the diameter and bulkiness of the yarn. Another suitable glass sliver yarn is 333 TEX which has a diameter size about one-half that of the 666 TEX yarn.

Although reference has been made and will hereinafter be made to glass sliver yarns as the particularly preferred yarns for treatment in accordance with the present invention, favorable results are also achieved when utilizing natural yarns (e.g. cotton), synthetic yarns (e.g. polyester or nylon) or blends thereof. The particular colorant-containing bath utilized will of course depend upon the type of textile yarn being treated. It may thus be desirable to use a non-resinous dyestuff bath with certain textile yarns. The selection of a particular colorant-containing liquid for treating particular textile yarns is believed well within the skill of those in this art.

Figure 1 shows a dyeing apparatus 10 which is particularly suitable for the practice of the present invention and for describing the sequence of the processing steps involved. The untreated yarn 12 is creeled from a standard yarn package 14 and passed into bath 16 containing the colorant liquid (hereinafter termed "finish"). Excess finish is squeezed from yarn 12 by rubber pad rolls 18, 20 and the wet yarn is then passed onto a heated cylinder 22 which is preferably driven by any suitable means (not shown) to effect movement of the yarn through the various processing stations. The side of the yarn 12 facing away from the cylinder 22 is identified in the accompanying figures as "side a" while the side in direct contact with the cylinder 22 is identified as "side b". While the surface temperature of the cylinder is substantially uniform, the yarn itself is not dried uniformly. Side b of yarn 12 which is in contact with the heated cylinder 22 begins to dry first. As side b dries, the finish and colorants from other portions of the yarn including the center and side a of the yarn 12 migrate towards these initial dry areas. Further drying and migration of the finish occur due to the continued contact of side b with cylinder 22. Side b thus exhibits a darker color hue when compared to side a due to the finish migration thereto by virtue of the contact of side b with heated cylinder 22.

Of course, the yarn 12 does not dry immediately nor is colorant migration instantaneous. For that reason, the yarn 12 is preferably maintained in contact with the heated surface of cylinder 22 until drying of yarn 12 is complete. Since the cylinder 22 is usually not large enough in dia-

meter to complete drying of the yarn 12 in one revolution, the yarn 12 is preferably spiralled on the cylinder 22 for a number of turns. After each turn, the yarn 12 is pulled from cylinder 22 by an offset tensioning roll 24 which aids in tracking the yarn on the cylinder 22.

Side b of yarn 12 is always disposed in contact with the heated cylinder 22 and therefore, the finish and colorants will always migrate towards the cylinder 22 (e.g. from side a to side b). There is little tendency for the yarn 12 to twist on the cylinder 22 since there is sufficient tension by virtue of offset roll 24 to maintain the yarn 12 against cylinder 22. If desired, a small amount of wax for improved weaving lubricity can be applied to yarn 12 by means of a kiss roll 26 before the yarn is wound onto a package 30.

Some twisting of yarn 12 may naturally occur when it is wound onto package 30. Additional twisting of yarn 12 could be achieved, if desired by suitable mechanical twisting means (not shown) so as to further randomly distribute the darker color hue of side b along the length of yarn 12. Thus package 30 may itself exhibit a heather-like appearance from random portions of side b being exposed due to such twisting. Of course, twisting means could also be positioned adjacent to a weaving machine so as to effect desired twisting of yarn 12 when creeled from package 30 during fabric production, if desired.

Figure 2 schematically depicts an exemplary glass sliver yarn 12 colored by the process of the present invention, the yarn 12 being illustrated in a twisted state to show that side b is darker than side a.

A fabric woven with yarn 12 as a filler in the cross machine direction is shown in accompanying Figure 3. In weaving, the yarn of the present invention has a tendency to further twist or turn as it is inserted as fill into the fabric and thus different portions of the upper and lower yarn surfaces are visible on the fabric face. In effect, therefore, the twisting randomizes the dark and light color hues of the upper and lower yarn surfaces to give the pleasing heather-like appearance to the woven fabric. As noted above, twisting of the yarn may also occur as the yarn is transferred from the cylinder 22 to package 30.

The temperature of the heated cylinder 22 is an important factor in determining the degree of colorant migration and thus ultimately the degree of contrast between the dark and light areas in the colored yarn. Too low a surface temperature will result in little, if any, migration since the yarn would effectively be dried uniformly. Uniform drying of the yarn is to be avoided in accordance with the present invention. Too high a temperature on the other hand may destabilize the finish on the wet yarn and, for example, may cause the colorant to separate from the glass yarn surface when glass sliver yarns are utilized. The high temperature may also discolor some of the finish components or the starch-based binder typically applied to some yarns during manufacturing. A preferred range of temperatures for colorant mig-

ration to occur in accordance with the present invention is about 250 degrees to about 450 degrees Fahrenheit (120 to 230°C) and an even more preferred temperature range is between about 300 degrees to about 350 degrees Fahrenheit (150 to 180°C).

Cylinder 22 shown in accompanying Figure 1 preferably has a diameter of about 30 inches although larger or smaller diameters can be employed, if desirable. The surface of cylinder 22 is heated by means of steam in accordance with well known techniques. Depending on the steam pressure utilized, temperatures of 300—350 degrees Fahrenheit (150 to 180°C) can be obtained and controlled without difficulty employing control techniques believed well known to those in this art.

The present invention will be further understood by reference to the following non-limiting examples.

Example I

In the following example, a pigmented resin bath of the below formulation was utilized:

380 grams	A-187 silane (Union Carbide)
500 grams	Ammonia (28% concentrated)
40 grams	Antifoam DB-110 (Dow Corning)
1000 grams	Dyescour HS (Burlington Industries)
4 gallons (15 l)	Rhoplex TR-934 (Rohm & Haas)
1020 grams	Imperon yel QGL (American Hoechst)
257 grams	Imperon red KGC (American Hoechst)
125 grams	Imperon black QRA (American Hoechst)
45 gallons (170 l)	Water

A 666 TEX glass sliver yarn obtained from Manville Sales Corporation, Denver, Colorado was padded with the above resin bath formula on an apparatus similar to that shown in accompanying Figure 1 at a pad pressure of 25 lbs/sq. in (170 kPa). The heated cylinder 22 (steam can) was set at a temperature of 310°F (155°C) and the yarn was wrapped around the cylinder for the required number of turns so as to be in contact with the heated cylinder for a period of 2 minutes. The completely dried and cured yarn was then wound onto a package.

The treated yarn was observed to be beige-tan in color and was about 30% darker in color on one side (e.g. the side that came into contact with the heated cylinder) when compared to the other side. When the yarn treated in this example was woven into a fabric style identified as Burlington Industries S/16003/666 (see Figure 3), the result was a fabric exhibiting a highly striated or tone-on-tone tan color.

Example II

A pigmented resin bath of the below composition was used:

190 grams	A-187 silane (Union Carbide)	5
250 grams	Ammonia (28% concentrated)	
20 grams	Antifoam DB-110 (Dow Corning)	10
500 grams	Dyescour HS (Burlington Industries)	
2 gallons (7,5 l)	Phoplex TR-934 (Rohm & Haas)	
1020 grams	Imperon QGL (American Hoechst)	15
257 grams	Imperon red KGC (American Hoechst)	
125 grams	Imperon black QRA (American Hoechst)	20
45 gallons (170 l)	Water	

The following textile yarns were each brought into contact with the above-formulated pigmented liquid bath and dried in a manner similar to Example I above with running times (ie. time in contact with the heated cylinder) adjusted to account for variance in the amount of pigmented liquid absorbed:

Yarn No.	Type	
1	100% Polyester roving 1.10 HR	
2	60/40 Cotton/polyester roving 2.75 HR	35
3	Nylon carpet yarn—code 8534, Anso 1V, HP, 7K51, Comingled, Tritone, (Allied) Bright BCF Nylon with Halofresh, 3840/l filament	40
4	Nylon carpet Yarn—4000/l filament, Antron, 362A (DuPont), Code 9377	45

Visual inspection revealed that each yarn Nos. 1—4 exhibited a beige-tan color and was significantly darker on that portion of the yarn which came into contact with the heated cylinder. Although the amount of pigment migration varied among the yarn Nos. 1—4, each exhibited a visually perceptible color hue difference thereby rendering such yarns suitable for forming woven fabrics having a striated appearance similar to Figure 3.

It is understood that various modifications will be apparent to those skilled in the art without departing from the scope and spirit of this invention. For example, other methods of drying the yarn, such as electrical heat, may be utilized to induce and encourage migration of the pigments. The colorant liquid bath may also be applied by

means other than padding, for example, by spraying, kiss-coating, or printing onto the yarn.

Claims

1. A method of coloring textile yarn so as to produce yarn having a darker colour hue on one side thereof when compared to the other side of the yarn, said method comprising the steps of:

(a) applying a colorant-containing liquid to the surfaces of said one and other side of the yarn;

(b) drying said one side of the yarn at a drying rate which is faster than the drying rate of said other side of the yarn to establish a drying rate gradient between said one and other sides; and

(c) allowing the colorant in the liquid applied according to step (a) to migrate to said one side of the yarn by virtue of the drying rate gradient established according to step (b), said migration effecting a darker colour hue on said one side when compared to said other side.

2. A method as in Claim 1 wherein step (b) is practiced by the steps of:

(i) providing a drum having a cylindrical outer surface;

(ii) heating the drum surface; and

(iii) bringing the one side of the yarn into contact with the heated drum surface so that the one side of the yarn is dried at a rate faster than the other portion of the yarn to thereby cause the colorant to migrate to the one side.

3. A method as in Claim 2 wherein step (ii) is practiced by heating the drum surface to between about 250°F to about 450°F (120° to 240°C).

4. A method as in Claim 1 wherein said textile yarn is a cotton, polyester, nylon or glass sliver yarns.

5. A method as in any one of the preceding claims wherein step (a) is practiced by bringing the yarn into contact with a bath having the colorant-containing liquid contained therein.

6. A method as in Claim 5 wherein said colorant-containing liquid consists essentially of an organic pigment and at least one resin component selected from the group consisting of polymers and copolymers of polyvinyl chloride, polyvinylacetate, polyvinylacrylate, and latexes of butadiene, styrene, polyester, polyethylene vinyl acetate, chlorinated polyethylene vinyl acetate, and water based silicone elastomers.

7. A method as in any one of the preceding claims wherein said textile yarn is a glass sliver yarn.

8. A weaving package of a coloured yarn produced by:—

(a) applying a colorant-containing liquid to the surfaces of said one and other side of the yarn;

(b) drying said one side of the yarn at a drying rate which is faster than the drying rate of said other side of the yarn to establish a drying rate gradient between said one and other sides; and

(c) allowing the colorant in the liquid applied according to step (a) to migrate to said one side of the yarn by virtue of the drying rate gradient established according to step (b), said migration

effecting a darker colour hue on said one side when compared to said other side.

9. A method of producing a woven textile fabric comprising the steps of:

(a) colouring textile yarns having upper and lower yarn surfaces so that the lower yarn surface exhibits a visually perceptible darker color hue when compared with the upper yarn surface, said coloring being practiced by the steps of;

(i) applying a pigment-containing liquid to the upper and lower yarn surfaces; and

(ii) drying the lower yarn surface at a rate faster than the drying rate of the upper yarn surface to cause the pigments to migrate to the lower yarn surface to a degree sufficient to create a visually perceptible darker color hue on the lower surface when compared to the upper surface;

(b) weaving the colored yarns to form a woven textile fabric.

10. A method as in Claim 9 further comprising the step (c) twisting the colored yarns so that the darker color hue of the lower yarn surface is visually randomly distributed along the length of the yarns.

11. A woven textile fabric produced by colouring textile yarns having upper and lower yarn surfaces so that the lower yarn surface exhibits a visually perceptible darker color hue when compared with the upper yarn surface, said coloring being practiced by the steps of,

colouring textile yarns having upper and lower yarn surfaces so that the lower yarn surface exhibits a visually perceptible darker color hue when compared with the upper yarn surface, said coloring being practiced by the steps of;

(i) applying a pigment-containing liquid to the upper and lower yarn surfaces; and

(ii) drying the lower yarn surface at a rate faster than the drying rate of the upper yarn surface to cause the pigments to migrate to the lower yarn surface to a degree sufficient to create a visually perceptible darker color hue on the lower surface when compared to the upper surface;

optionally twisting the colored yarns so that the darker color hue of the lower yarn surface is visually randomly distributed along the length of the yarns, and

weaving the coloured yarns to form a woven textile fabric.

12. An apparatus for producing textile yarn having one surface which exhibits a visually perceptible darker color hue when compared to another surface of the yarn, said apparatus comprising in combination:

coating means for coating said one and another surfaces of the yarn with a colorant-containing liquid; and

drying means downstream of said coating means for drying said one surface of the yarn at a drying rate faster than said another surface of the yarn to establish a drying rate gradient between said one and another yarn surfaces to responsively encourage migration of a substantial portion of said colorants in said liquid to said one yarn surface so that said one yarn surface exhibits

a visually perceptible darker color hue by virtue of the colorant migration thereto when compared to said another yarn surface.

13. An apparatus as in Claim 12 further comprising creeling means upstream of said coating means for creeling said yarn to said coating means, and means downstream of said drying means for winding said yarn into a yarn package.

14. An apparatus as in Claim 12 or 13 wherein said drying means includes a rotatable drum defining an external cylindrical surface, and means for heating said drum surface.

15. An apparatus as in Claim 14 further comprising tensioning means spaced from the said drum for maintaining said one yarn surface in tensioned contact with said external cylindrical surface.

Patentansprüche

1. Verfahren zum Färben von Textilgarn für die Erzeugung eines Garns mit einer dunkleren Farbe auf einer Seite im Vergleich zur anderen Seite des Garnes, wobei das Verfahren die Schritte aufweist:

(a) Aufbringen einer farbbaltigen Flüssigkeit auf die Oberflächen der einen und anderen Seite des Garns;

(b) Trocknen der einen Seite des Garns mit einer Trocknungsgeschwindigkeit, die schneller als die Trocknungsgeschwindigkeit der anderen Seite des Garns ist, um einen Trocknungsgeschwindigkeitsgradienten zwischen der einen und anderen Seite einzurichten; und

(c) Zulassen, daß der im Schritt (a) der Flüssigkeit zugesetzte Farbstoff aufgrund des Trocknungsgeschwindigkeitsgradienten, der im Schritt (b) eingerichtet wurde, zu der anderen Seite des Garns wandert, wobei diese Wanderung einen dunkleren Farbton auf der einen Seite gegenüber der anderen Seite bewirkt.

2. Verfahren nach Anspruch 1, wobei der Schritt (b) durchgeführt wird durch die Schritte:

(i) Vorsehen einer Trommel mit einer zylindrischen Außenfläche;

(ii) Erwärmen der Trommeloberfläche; und

(iii) eine Seite des Garns wird in Kontakt mit der erwärmten Trommeloberfläche gebracht, so daß diese eine Seite des Garns mit einer höheren Geschwindigkeit als die andere Seite des Garns getrocknet wird, damit der Farbstoff zu der anderen Seite wandert.

3. Verfahren nach Anspruch 2, wobei der Schritt (ii) durchgeführt wird, indem die Trommeloberfläche auf zwischen etwa 250°F bis etwa 450°F (120° bis 240°C) erwärmt wird.

4. Verfahren nach Anspruch 1, wobei das textile Garn Baumwolle, Polyester, Nylon oder Glasfasergarn ist.

5. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Schritt (a) durchgeführt wird, indem das Garn in Kontakt mit einem Bad gebracht wird, das eine Farbstoff enthaltende Flüssigkeit enthält.

6. Verfahren nach Anspruch 5, wobei die den

Farbstoff enthaltende Flüssigkeit im wesentlichen aus einem organischen Pigment und mindestens einer Harzkomponente besteht, die aus der Gruppe von Polymeren und Copolymeren von Polyvinylchlorid, Polyvinylacetat, Polyvinylacrylat, und Latices von Butadienstyrol, Polyester, Polyethylenvinylacetat, chloriertes Polyethylenvinylacetat und Silikonelastomeren auf Wasserbasis ausgewählt ist.

7. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Textilgarn ein Glasfaser-garn ist.

8. Eine Webpackung aus gefärbtem Garn, die hergestellt ist durch:—

(a) Anwenden einer farbstoffhaltigen Flüssigkeit auf die Oberflächen der einen und anderen Seite des Garns;

(b) Trocknen der einen Seite des Garns mit einer Trocknungsgeschwindigkeit, die schneller als die Trocknungsgeschwindigkeit der anderen Seite des Garns ist, um einen Trocknungsgeschwindigkeitsgradienten zwischen der einen und anderen Seite einzurichten; und

(c) Zulassen, daß der nach dem Schritt (a) aufgetragene Farbstoff in der Flüssigkeit zu der anderen Seite des Garns aufgrund des Trocknungsgeschwindigkeitsgradienten wandert, der gemäß Schritt (b) eingerichtet wurde, wobei die Wanderung eine dunklere Farbschattierung auf der einen Seite als auf der anderen Seite bewirkt.

9. Verfahren zum Herstellen eines gewebten textilen Gewebes mit den Schritten:

(a) Färben von textilen Garnen mit unteren und oberen Garnseiten, so daß die untere Garnseite eine optisch erkennbare dunklere Farbschattierung als die obere Garnseite hat, wobei das Färben durch die Schritte durchgeführt wird:

(i) Aufbringen einer pigmenthaltigen Flüssigkeit auf die oberen und unteren Garnseiten; und

(ii) Trocknen der unteren Garnseite mit einer Geschwindigkeit, die höher als die Trocknungsgeschwindigkeit der oberen Garnseite ist, damit die Pigmente in einem hinreichenden Maße zur unteren Garnseite wandern, um eine optisch erkennbare dunklere Farbschattierung auf der unteren Seite im Vergleich zur oberen Seite zu schaffen;

(b) Weben der gefärbten Garne zur Bildung eines gewebten textilen Gewebes.

10. Verfahren nach Anspruch 9, ferner mit dem Schritt (c), wobei die gefärbten Garne verdreht werden, so daß die dunklere Farbschattierung der unteren Garnseite optisch zufällig über die gesamte Länge des Garns verteilt ist.

11. Gewebtes textiles Gewebe, das durch Färben von textilen Garnen hergestellt wurde, die obere und untere Garnseiten haben, wobei die untere Garnseite eine optisch erkennbare dunklere Farbschattierung als die obere Garnseite hat, und wobei das Färben durch die Schritte durchgeführt wird:

Färben der textilen Garne, die obere und untere Garnseiten aufweisen, in der Weise, daß die untere Garnseite eine optisch erkennbare dunklere Farbschattierung als die obere Garn-

seite darstellt, wobei das Färben durch die Schritte erfolgt:

(i) Aufbringen einer pigmenthaltigen Flüssigkeit auf die oberen und unteren Garnseiten; und

(ii) Trocknen der unteren Garnseite mit einer höheren Geschwindigkeit als die Trocknungsgeschwindigkeit der oberen Garnseite, damit die Pigmente in einem Ausmaß zur unteren Garnseite wandern, das ausreicht, um eine optisch erkennbare dunklere Farbschattierung auf der unteren Seite im Vergleich zur oberen Seite zu schaffen;

wahlweises Verdrehen der gefärbten Garne, so daß die dunklere Farbschattierung der unteren Garnseite zufällig über die gesamte Länge der Garne verteilt ist, und

Weben der gefärbten Garne zur Bildung eines gewebten textilen Gewebes.

12. Vorrichtung zur Erzeugung von textilem Garn mit einer Seite, die eine optisch erkennbare dunklere Farbschattierung im Vergleich zur anderen Seite des Garns entwickelt, wobei die Vorrichtung in Kombination aufweist:

Beschichtungsmittel zum Beschichten der einen und anderen Seite des Garns mit einer farbstoffhaltigen Flüssigkeit; und

Trocknermittel stromabwärts von dem Beschichtungsmittel zum Trocknen der einen Seite des Garns mit einer höheren Trocknungsgeschwindigkeit als für die andere Seite des Garns, um einen Trocknungsgeschwindigkeitsgradienten zwischen der einen und anderen Garnseite einzurichten und dementsprechend die Wanderung eines wesentlichen Teils der Farbstoffe in der Flüssigkeit zu der anderen Garnseite zu unterstützen, so daß die eine Garnseite eine optisch erkennbare dunklere Farbschattierung aufgrund der Farbstoffwanderung dahin im Vergleich zu der anderen Garnseite entwickelt.

13. Vorrichtung nach Anspruch 12, ferner mit Spulmitteln stromaufwärts von dem Beschichtungsmittel zum Spulen des Garns in das Beschichtungsmittel, und Mittel stromabwärts von dem Trocknungsmittel zum Aufwickeln des Garns zu einem Garnpaket.

14. Vorrichtung nach Anspruch 12 oder 13, wobei das Trocknungsmittel eine drehbare Trommel einschließt, die eine externe Zylinderfläche und Mittel zum Erwärmen der Trommelfläche aufweist.

15. Vorrichtung nach Anspruch 14, ferner mit Spannmitteln, die von der Trommel beabstandet sind, um die eine Garnfläche gespannt in Kontakt mit der äußeren Zylinderoberfläche zu halten.

Revendications

1. Procédé pour teindre ou colorer du fil textile de façon à produire du fil ayant d'un côté une nuance de couleur plus sombre en comparaison de l'autre côté du fil, ledit procédé comprenant les étapes consistant:

(a) à appliquer un liquide, contenant du colorant, aux surfaces de l'un et l'autre côtés précités du fil;

(b) à sécher ledit un côté du fil, à une vitesse de séchage qui est plus rapide que la vitesse de séchage dudit autre côté du fil, afin d'établir un gradient de vitesse de séchage entre lesdits premier et autre côtés; et

(c) à permettre au colorant se trouvant dans le liquide, appliqué selon l'étape (a), de migrer vers ledit premier côté du fil, en raison du gradient de vitesse de séchage établi selon l'étape (b), ladite migration donnant une nuance de couleur plus foncée sur ledit premier côté en comparaison dudit autre côté.

2. Procédé selon la revendication 1, dans lequel on met en pratique l'étape (b) par les opérations consistant à:

(i) prévoir un tambour ayant une surface cylindrique externe;

(ii) chauffer la surface du tambour; et

(iii) mettre un côté du fil en contact avec la surface chauffée du tambour, de façon à sécher ce côté du fil à une vitesse plus rapide que celle de l'autre côté ou autre partie de fil, afin de provoquer la migration du colorant vers l'autre côté.

3. Procédé selon la revendication 2, dans lequel on met en pratique l'opération de l'étape (ii) en chauffant la surface du tambour jusqu'à une valeur comprise entre 120° et 240°C (environ 250°F à environ 450°F).

4. Procédé selon la revendication 1, dans lequel ledit fil textile est un fil de coton, de polyester, de "Nylon" ou est du fil d'un ruban de fibres de verre.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel on met en pratique l'étape (a) en mettant le fil en contact avec un bain contenant le liquide comportant le colorant.

6. Procédé selon la revendication 5, dans lequel ledit liquide comportant du colorant consiste essentiellement en un pigment organique et en au moins un composant résine choisi dans l'ensemble constitué par des polymères et copolymères du type poly(chlorure de vinyle), poly(acétate de vinyle), poly(acrylate de vinyle), et des latex d'élastomères de type butadiène-styrène, polyester, poly(éthylène/acétate de vinyle), poly(éthylène/acétate de vinyle) chloré, et du type silicone à base d'eau.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit fil textile est un fil en forme de ruban de fibres de verre.

8. Bobine d'un fil teint ou coloré pour du tissage, que l'on obtient en:

(a) appliquant un liquide, contenant du colorant, aux surfaces de l'un et de l'autre côté du fil;

(b) séchant ledit un côté du fil à une vitesse de séchage qui est plus rapide que la vitesse de séchage de l'autre côté de fil, afin d'établir entre ce côté et l'autre, un gradient de vitesse de séchage;

(c) laissant le colorant présent dans le liquide appliqué selon l'étape (a) migrer vers ledit un côté du fil en raison du gradient de vitesse de séchage établi selon l'étape (b), ladite migration produisant une nuance de couleur plus foncée sur ledit un côté en comparaison de l'autre côté.

9. Procédé de production d'une étoffe textile tissée, comprenant les étapes consistant à:

(a) colorer ou teindre des fils textiles ayant des surfaces supérieure et inférieure de fil, de sorte que la surface inférieure du fil présente une nuance de couleur visuellement perceptible plus foncée que la surface supérieure de fil, ladite coloration ou teinture étant pratiquée par les étapes consistant;

(i) à appliquer un liquide contenant du pigment aux surfaces supérieure et inférieure de fil, et

(ii) à sécher la surface inférieure du fil à une vitesse plus rapide que la vitesse de séchage de la surface supérieure du fil pour provoquer la migration des pigments vers la surface inférieure du fil, à un degré suffisant pour créer une nuance de couleur perçue visuellement comme plus foncée sur la surface inférieure, en comparaison de la surface supérieure;

(b) tissant les fils ainsi teints pour former une étoffe textile tissée.

10. Procédé selon la revendication 9, comprenant en outre l'étape (c) consistant à soumettre les fils ainsi teints ou colorés à une torsion de sorte que la nuance de teinte plus foncée de la surface inférieure du fil est visuellement distribuée au hasard le long des fils.

11. Etoffe textile tissée produite par teinture de fils textiles ayant des surfaces supérieure et inférieure de fils, de sorte que la surface inférieure de fil présente une nuance de teinte visuellement perceptible plus foncée en comparaison de la surface supérieure du fil, ladite teinture ou coloration étant mise en pratique par les étapes consistant à:

(i) appliquer un liquide, contenant du pigment, aux surfaces supérieure et inférieure du fil, et

(ii) sécher la surface inférieure du fil à une vitesse supérieure à la vitesse de séchage de la surface supérieure du fil, pour provoquer la migration des pigments vers la surface inférieure du fil, à un degré suffisant pour créer une nuance visuellement perceptible de couleur plus foncée sur la surface inférieure, en comparaison de la surface supérieure; éventuellement à soumettre les fils colorés ou teints à torsion de façon que la nuance plus foncée de teinte de la surface inférieure de fil soit visuellement distribuée au hasard le long des fils, et

tisser les fils teints afin de former une étoffe textile tissée.

12. Appareil pour produire du fil textile ayant une surface présentant une nuance de teinte visuellement perceptible plus foncée en comparaison d'une autre surface du fil, ledit appareil comprenant en combinaison:

un dispositif de revêtement, pour revêtir lesdites une et autre surfaces du fil à l'aide d'un liquide contenant du colorant; et

un dispositif de séchage en aval dudit dispositif de revêtement, pour sécher ladite une ou première surface du fil à une vitesse de séchage supérieure à celle de ladite autre ou seconde surface du fil, afin d'établir un gradient de vitesse de séchage entre lesdites première et seconde

surfaces de fil pour encourager en réponse une migration d'une forte proportion desdits colorants, présents dans ledit liquide, vers ladite première surface de fil, de manière que ladite première surface de fil présente une nuance de teinte visuellement perceptible plus foncée, en raison de la migration de colorant vers cette première surface, en comparaison de ladite autre ou seconde surface de fil.

13. Appareil selon la revendication 12, comprenant en outre, en amont dudit dispositif de revêtement, un dispositif de garnissage pour faire venir ledit fil vers ledit dispositif de revêtement, et, en

aval dudit dispositif de séchage, un dispositif pour enrouler ledit fil en une bobine de fil.

14. Appareil selon la revendication 12 ou 13, dans lequel ledit dispositif de séchage comprend un tambour rotatif délimitant une surface cylindrique externe et un dispositif pour sécher ladite surface de tambour.

15. Appareil selon la revendication 14, comprenant en outre un dispositif tendeur, placé à une certaine distance dudit tambour, pour maintenir ladite première surface de fil en contact sous tension mécanique avec ladite surface cylindrique externe.

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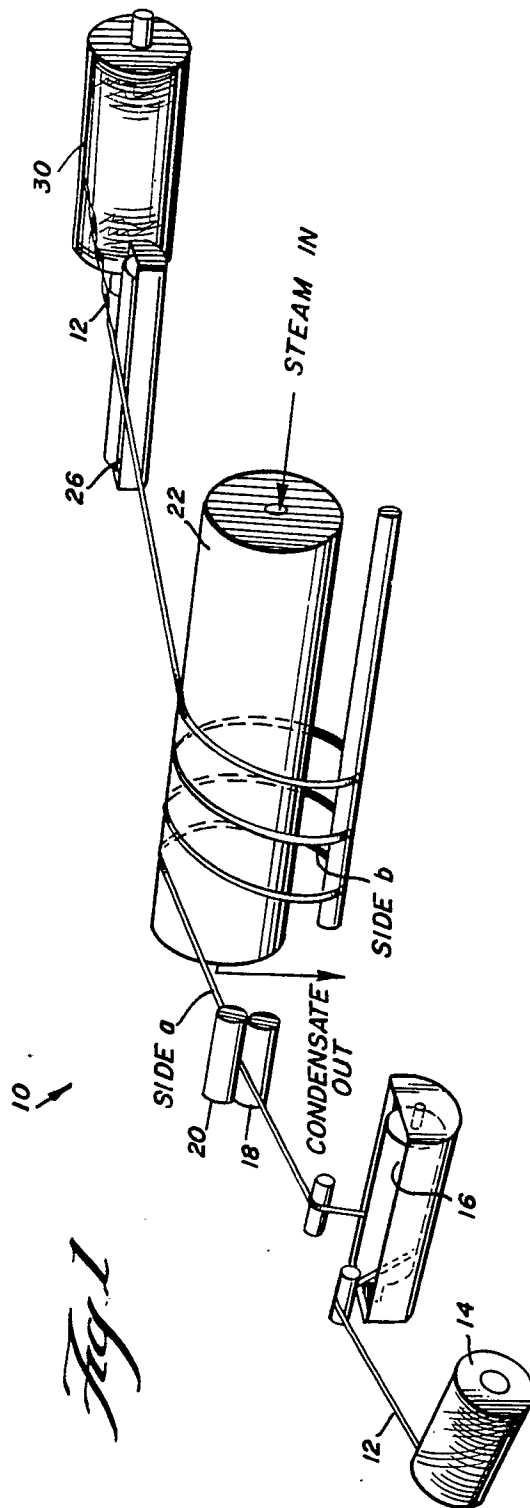


Fig. 3

