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(54) White blackout fabric.

(57) A white blackout fabric is formed from fibers substantially without blending, the fibers including core components having .001-.002 weight % of carbon black as a light blocking substance therein so as to substantially prevent the transmission of light therethrough, and sheath components having 1.0-2.0 weight % of TiO_2 as a whitening agent therein, the core components and the sheath components having a weight of approximately 3 denier. Additionally, a white blackout fiber is provided which includes a core and a sheath. The core includes carbon black and titanium dioxide, and the sheath includes titanium dioxide. The ratio of titanium dioxide to carbon black is approximately 1,000 to 1 and the percentage by weight of titanium dioxide in the sheath to the weight of polyester is in the approximate range of 0-4%.

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WHITE BLACKOUT FABRIC

This invention relates generally to fabrics, and more particularly, is directed to a white blackout drapery fabric.

Totally opaque fabrics used primarily for completely darkening or blacking out a window are well known in the art. Basically, such blackout fabrics are commercially manufactured according to one of two methods.

According to the first method, a fabric is backed with a first coat of white acrylic foam, followed by a second coat of an acrylic foam having an opaque color, and finally, by a third coat of white acrylic foam. In accordance with the second known method, a thin vinyl or polyester sheeting having a white color is laminated to the fabric, followed by a second thin vinyl or polyester sheeting having an opaque color which is laminated thereto, and finally, by a third thin vinyl or polyester sheeting having a white color that is also laminated thereto.

However, the blackout fabrics created by these known methods present numerous disadvantages. Specifically, such blackout fabrics are bulky and stiff. In addition, such blackout fabrics drape poorly and are difficult to launder. Still further, such blackout fabrics have a tendency to come apart or delaminate. It is also difficult to make such blackout fabrics fire retardant. Further, it is difficult to stitch such fabrics, and there is a high cost of production of such blackout fabrics.

It has been proposed that a blackout fabric without the aforementioned drawbacks can be made from yarns comprised of core and sheath components in which the core components have a black color and the sheath components have a white color. However, the black core components tend to show through, producing a black or gray appearance, thereby rendering the blackout fabric unsatisfactory from an aesthetic viewpoint. The use of sheath and core components is taught generally in U.S. Patent No. 3,616,167 to Gosden; U.S. Patent No. 3,700,544 to Matsui; U.S. Patent No. 4,075,378 to Anton et al; U.S. Patent No. 3,316,336 to Smith; U.S. Patent No. 2,932,079 to Horn et al; and U.S. Patent No. 4,059,949 to Lee.

As an aside, it is desirable in many instances to reduce or prevent the build-up of static electricity in fabrics. Accordingly, it is known to use core components containing carbon black to construct core and sheath fibers. Such components function to discharge static electricity build-up, and have particular utility in certain textile products, such as carpets. However, a large amount of carbon black is required to achieve the desired electrical properties so that the fabric will sufficiently discharge static electricity. Accordingly, such fibers tend to be too dark, and therefore, the final product tends to be unsatisfactory from an aesthetic viewpoint. The static discharging fibers are used in blends with regular white fibers to minimize their blackness, i.e., are usually in a quantity of 1% or less.

In view of this latter problem, various methods have been proposed to inhibit the blackness of the fibers. For example, one proposal has been to make the core in multi-faceted configurations so that light is better deflected. In this regard, U.S. Patent No. 3,968,307 to Matsui et al discloses a multi-component mixed filament in which at least two spinning materials having poor affinity are mixed in a unitary filament in a nebular configuration. The patent teaches that, by using fibers composed of polyester and polyamide, the filament itself is opaque since polyamide and polyester have different refractive indexes. Accordingly, light is reflected irregularly due to the nebular configuration and the filament is delustered.

Another proposal has been to add TiO_2 or other whitening agents to the sheath components. However, in all such cases, the final product must contain more than 50% sheath components and these fibers must be of a heavy duty, for example, greater than 15 denier. As such, such fibers are too stiff, and therefore, cannot be used with a standard drapery or with apparel.

An example of such core and sheath components is disclosed in U.S. Patent No. 3,803,453 to Hull. Specifically, it is taught in this patent to use core and sheath components to reduce static electricity by dispersing an electrically conductive carbon black in a thermoplastic synthetic polymer, with the sheath comprising at least 50% of the filament cross-sectional area. In addition, TiO_2 is used with the sheath components. It is taught that the denier of the filaments should be lower than 50 and preferably less than 25 dpf. However, the lowest denier of the components taught in any example of the patent is 17.2 in Example V, with the denier being as high as 110.6 in Table 3 of the patent. Accordingly, as discussed above, such fibers are too stiff and could not be used with a standard drapery.

U.S. Patent No. 4,216,264 to Naruse et al discloses a similar arrangement of using carbon black and TiO_2, for use with core and sheath components. Accordingly, the denier is again rather large, for example, 20 denier/3 filaments.

U.S. Patent No. 3,531,368 to Okamoto et al discloses, in Example IV thereof, the use of two polyethylene terephthalates having an intrinsic vis-

cosity of 0.68 and 0.50, respectively, which are used as the polymers to make up a very fine filament part, in which the first polyethylene terephthalate contains 0.05% of TiO_2 and 0.55 of carbon black, and the second polyethylene terephthalate has a high brilliancy. The drawn yarn consists of 16 filaments, each of which is 3.0 denier. The polyethylene terephthalate containing carbon black is uniformly dispersed in the polyethylene terephthalate having a brilliancy when the filament is viewed in cross-section. However, the filament is deep black in color and has a brilliancy, which is undesirable for producing a white blackout fabric.

Other references which are less relevant than those discussed above are U.S. Patent No. 3,051,545 to Media; U.S. Patent No. 2,880,056 to Carr et al which discloses synthetic components having a natural crimp; and U.S. Patent No. 3,249,669 to Jamieson.

A further drawback with prior art bi-component fibers is that such fibers, by themselves, cannot be used to make a fabric because of their blackness. As a consequence of this, a fabric made with prior art bi-component fibers has generally been blended with other fibers to give the fabric a whiteness.

Accordingly, it is an object of the present invention to provide a blackout fabric that overcomes the aforementioned problems.

It is another object of the present invention to provide a blackout fabric made substantially from bi-component core and sheath components.

It is still another object of the present invention to provide a blackout fabric that is totally opaque to light.

It is yet another object of the present invention to provide a blackout fabric that is aesthetically pleasing.

It is a further object of the present invention to provide a fiber in which the core components are sufficiently dark to prevent the transmission of light therethrough and the sheath components are sufficiently opaque to prevent viewing of the darker core components.

It is a still further object of the present invention to provide a blackout fabric having particular utility with drapery linings, printed and solid color hotel and motel draperies, theatre curtains, and woven and non-woven vertical blinds.

It is a yet further object of the present invention to provide a blackout fabric that presents a white, rather than gray or black, appearance.

It is another object of the present invention to provide a blackout fiber that can be used with fabrics that are woven, knit, stitch bonded, needled, wet laid, dry laid, spun bonded and spun laced.

It is still another object of the present invention to provide a blackout fabric that is soft.

It is yet another object of the present invention to provide a blackout fabric that can be easily draped.

It is a further object of the present invention to provide a blackout fabric that can be dyed and printed on.

In accordance with an aspect of the present invention, a white blackout fabric consists essentially of fibers formed from a plurality of core components having a light blocking substance therein that substantially prevents the transmission of light therethrough; and a plurality of sheath components having a whitening agent therein; the sheath components and the core components being combined to form the fibers.

In accordance with another aspect of the present invention, a white blackout yarn includes a plurality of fibers with core components having a light blocking substance therein that substantially prevents the transmission of light therethrough, the light blocking substance being present in an amount equal to approximately .001-.002 weight % of the core components; and a plurality of sheath components having a whitening agent therein, the whitening agent being present in an amount equal to approximately 1.0-2.0 weight % of the sheath components.

The above and other objects, features and advantages of the present invention will become readily apparent from the following detailed description.

In accordance with the present invention, a white blackout fabric that is totally opaque to light is constructed from a fiber made from core and sheath components. Specifically, the present invention uses the basic technology of using core components that contain carbon black and/or other suitable light blocking substances, and sheath components that contain TiO_2 and/or other suitable whitening agents, with the components preferably having an approximately 3 denier weight with appropriate staple lengths so as to provide bi-component yarns of the desired size. Preferably, an F.R. polyester component is used, although this is not essential to the present invention. For example, other components such as standard polyesters, polyamids or chemical substances suitable for spinning into core and sheath components can be used.

Thus, by minimizing the amount of carbon black in the core components and maximizing the amount of TiO_2 in the sheath components, a white yarn that is totally opaque can be produced according to the present invention. In accordance with the present invention, and based on a 50/50 sheath/core weight %, approximately .001-.002 weight % of carbon black is used, based on the weight of the polyester in the core, and approximately 1.0 - 2.0 weight % of TiO_2 is used, based on the weight of the polyester in the sheath.

These yarns can be achieved in any number of suitable ways. For example, such totally opaque, white yarns can be made by altering the percentage compositions of the core and sheath components. Alternatively, such yarns can be made by altering the amount of carbon black in the core components and/or altering the amount of TiO_2 in the sheath components. Still further, such yarns can be made by maximizing the crimp in the components and/or altering the geometry of the core components to maximize light reflectance and/or light diffusion.

In any case, the crimp and the finish on the components should be satisfactory for carding the same into webs that can be cross lapped and/or carding the components into sliver so that the sliver can be spun on any conventional yarn making system.

Further, the core components could have a lighter gray or brown color, rather than a black color, making the opaqueness of the sheath less critical. For example, the yarn itself could contain 200 individual filaments of 3 denier component, assuming the manufacture of a 9s cotton count or 600 denier equivalent component.

It will be appreciated that the present invention differs from known fabrics that use carbon black primarily to discharge static electricity and not primarily for blackout. In such fabrics, a maximum amount of carbon black is used. Thus, for example, a yarn that is dark gray in color would be produced from a 300 denier yarn incorporating 20 individual strands of uncrimped 50% core and 50% sheath components, fully using the maximum amount of carbon black therein. As a result of the large amount of carbon black used, it is necessary to blend the fibers with white fibers to impart a white appearance. Accordingly, such fibers are primarily used for carpets. The present invention, on the other hand, consists essentially of the core and sheath components, and accordingly, the fabric is produced substantially without blending.

It will be appreciated that other materials other than carbon black and/or TiO_2 can be utilized to construct the core and sheath components according to the present invention. However, the basis of the present invention would remain the same, namely that the core would be sufficiently opaque to prevent light transmission through the fabric and the sheath would be sufficiently white to provide an aesthetically pleasing product.

Further, the core and sheath components according to the present invention can be used to eliminate, or at least substantially diminish, cloudiness that is inherent in all carded webs by utilizing specific percentages of these core and sheath components with regular or standard components.

In order to better understand the present invention, the following specific examples are given in which carbon black and TiO_2 are used in the above recited ranges:

EXAMPLE 1

A fabric can be made from 80 ends of 300 denier texturized polyester warp yarn and 50 picks of 20s cotton count yarn made from core and sheath opaque components woven in a warp sateen configuration and then finished by at least one of the following methods: pre-shrinking, calendering and hydraulically entangling.

EXAMPLE 2

A fabric can be made from 60 ends of 20s cotton count yarn and 50 picks of 20s cotton count yarn, both made from core and sheath opaque components woven in a warp sateen configuration and then finished by at least one of the following methods: pre-shrinking, calendering and hydraulically entangling.

EXAMPLE 3

A fabric can be made from 24 ends of 4s cotton count yarn and 22 picks of 4s cotton count yarn, both made from core and sheath opaque components woven in a warp sateen configuration and then finished by at least one of the following methods: pre-shrinking, calendering and hydraulically entangling.

EXAMPLE 4

A fabric can be made from a five ounce per square yard carded web which is hydraulically entangled and calendered.

In a further embodiment of the present invention, titanium dioxide is placed in both the sheath and the core. It is known that the addition of titanium dioxide to a fiber, although dulling the fiber, causes the same to be abrasive on spinning equipment and, above a certain amount, can be so undesirable as to make the fiber unusable in a practical sense.

In accordance with this embodiment of the present invention, titanium dioxide is used in both the sheath and the core, with the amount used in the sheath being approximately 0-4% of the weight of the polyester in the sheath. The weight of the carbon black in the core is approximately .005-.01% and the weight of the TiO_2 in the core is

approximately 5-10%. This provides for dulling the fiber and affords maximum efficiency for yarn spinning and drapability. The total ratio of titanium dioxide to carbon black in both the sheath and the core determining the whiteness of the fiber. It has been found that approximately 1,000 parts titanium dioxide in both the sheath and core to one part carbon black in the core results in fibers that are commercially acceptable while providing appropriate whiteness. The weight of such a fiber should preferably be in the range of 1.5-8 denier.

A textile structure that lends itself to full coverage can be made opaque by using the aforementioned opaque core and sheath components. This is true, regardless of the manner in which the fabric is formed. Thus, the present invention can be used with fabrics that are woven, knit, stitch bonded, needled, wet laid, dry laid, spun bonded and spun laced.

Thus, the present invention provides a white blackout fabric from core and sheath components, and which is totally opaque to light, while being aesthetically pleasing. Specifically, the core components are sufficiently dark to prevent the transmission of light therethrough and the sheath components are sufficiently opaque to prevent viewing of the darker core components.

The present invention thereby has particular utility with drapery linings, printed and solid color hotel and motel draperies, theatre curtains, and woven and non-woven vertical blinds. In this manner, the blackout fabric is soft, can be easily draped, and can be dyed and printed on.

Claims

1. A white blackout fabric consisting essentially of fibers formed from:
a plurality of core components having a light blocking substance therein that substantially prevents the transmission of light therethrough; and
a plurality of sheath components having a whitening agent therein;
said sheath components and said core components being combined to form said fibers.

2. A white blackout fiber comprising:
a pluraiity of core components having a light blocking substance therein that substantially prevents the transmission of light therethrough, said light blockiung substance being present in an amount equal to approximately .001-002 weight % of said core components; and
a plurality of sheath components having a whitening agent therein, said whitening agent being present in an amount equal to approximately 1.0-2.0 weight % of said sheath components.

3. A white blackout fabric or fiber according to claim 1 wherein said sheath components and said core components have a weight of approximately 3 denier.

4. A white blackout fabric or fiber according to claim 1, 2 or 3 wherein said core components and said sheath components are selected from the group consisting essentially of polyesters and polyamides.

5. A white blackout fabric or fiber according to any preceding claim, wherein said light blocking substance is carbon black.

6. A white blackout fabric according to any preceding claim, wherein said whitening agent is TiO_2.

7. A white blackout fiber consisting essentially of fibers formed from a plurality of core components having a light blocking substance therein and a whitening agent therein, and a plurality of sheath components having a whitening agent therein, said sheath components and said core components being combined to form said fibers.

8. A white blackout fiber according to claim 7; wherein said light blocking substance is carbon black.

9. A white blackout fiber according to claim 8; wherein said whitening agent in the core is titanium dioxide.

10. A white blackout fiber according to claim 9; wherein said whitening agent in said sheath is titanium dioxide.

11. A white blackout fiber according to any of claims 7-10 wherein the ratio of said whitening agent in said core and said sheath to said light blocking substance in said core is approximately 1,000 to 1.

12. A white blackout fiber according to any of claim 7-11 wherein said sheath and core components have a weight in the range of 1.5-8 denier.

13. A white blackout fiber according to claim 11; wherein the weight of the carbon black in the core is .005-01% of the weight of the core and the TiO_2 in the core is equal to 5-10% of the weight of the core.

14. A white blackout fabric comprising fibers as claimed in any of claims 7-13.

15. A white blackout fabric comprising a plurality of core components and a plurality of sheath components combined to form the fiber, the sheath components having a whitening agent therein and the core components having a light blocking substance therein in a minimal amount needed for opacity.