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PRODUCTION OF FILAMENTS HAVING IMPROVED WHITENESS

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This invention relates to the production of filaments of regenerated cellulose and particularly to the production of filaments of viscose possessing a whiter appearance than those ordinarily produced.

Viscose rayon yarns in their various forms are noted for their uniformity, lowness and stability of price and versatility. Although these yarns produced by the usual method of manufacturing are allegedly white, many end uses wherein the yarn is used directly as received from the producer require yarn of even greater whiteness. Compared to yarn chemically treated to improve its white appearance, the viscose rayon producer's yarn may appear to have a light yellow tinge.

It is, of course, well known that the whiteness of white textile materials having a yellow tint or similar off-white shade may be enhanced by rinsing in water containing a blueing agent. However, upon laundering of these treated materials, the whitening effect in a very short time disappears with the result that the undesirable yellowness becomes visible again.

It has already been disclosed to treat textile materials with other optical bleaching agents or brightening agents which function by virtue of their inherent fluorescence. These agents, to a great extent, have replaced the older blueing substances. However, these known whitening materials do not produce a permanent effect since, among other things, they are unstable to light and oxygen.

It is an object of the present invention to provide a cellulosic spinning composition from which a whiter appearing yarn may be produced.

It is another object of the present invention to provide a new method for producing a filament of regenerated cellulose possessing a whiter appearance than those ordinarily produced.

It is a further object of the present invention to provide a filament of regenerated cellulose possessing a whiter appearance than those ordinatrily produced.

Additional objects will become apparent herein.

In the present invention, it has been found very surprisingly that the above discussed disadvantages of instability and non-durability of the agents heretofore used to impart a whitened appearance to textiles, especially textiles of regenerated cellulose, can be overcome and a whiter producer's yarn of regenerated cellulose can be obtained by providing a cellulosic spinning solution that contains a synergistic combination of colored organic pigments and a white inorganic pigment and thereafter spinning the solution into filaments in a coagulating bath. The pigments are finely divided, insoluble and chemically resistant to reagents, such as caustic soda solution and sulfuric acid.

In order to eliminate the slight yellow tinge which may occur in the manufacturing of regenerated cellulose from, for example, viscose, in accordance with the present invention, it is necessary to add to viscose a white inorganic pigment, such as TiO_2, ZnO or a blend thereof. It is obviously well known that such agents have been incorporated in viscose to subdue the bright luster in viscose rayon yarn. Therefore, it is to be understood that the use of white inorganic pigments in viscose per se forms no part of the present invention, since the invention is applicable to both bright, semi-dull and dull yarn.

However, in the production of yarn having a bright luster, it is essential that the viscose used in the manufacture thereof contain a white inorganic pigment in the amonut of at least 0.001%, and not more than 0.05%, by weight based on the cellulose in the viscose. The presence of the pigment within this range does not of itself produce a dull luster but acts only to make the filament less transparent. It is within the scope of the present invention to employ the pigments in greater amounts sufficient to produce delustered yarns. Therefore, there is no definite upper limit for the amount of the white pigment that may be added to the viscose.

In addition to the white inorganic pigment, it is necessary to the present invention to incorporate in the spinning solution a blue organic pigment and a violet organic pigment in relatively small amounts. The selection of the colored pigments is based upon such considerations as resistance to chemical processing, dry cleaning, heat, laundering and light (fading), compatibility in the alkaline viscose, and tendency to remain permanently diffused and dispersed in the thread. Blue pigments suitable for use in the present invention include Phthalocyanine Blue, Indanthrene Blue, Dianisidine Blue and blends thereof. Suitable violet pigments for the present invention are Indanthrene Bordeaux, Thioindigo Violet and others.

It is essential to the invention that the combination of blue and violet organic pigments be employed, otherwise the whitening effect will not be attained. The cooperative action of the colored pigments is such that their combined effect imparts a whiter appearance to the yarn than either pigment taken independently. For example, employing a blue pigment alone may result in a yarn having a slight greenish appearance.

The amount of each colored organic pigment incorporated in the cellulosic spinning solution, it has been found, should be between 1 and 10 p.p.m. based on the cellulose content. A particular combination employed depends among other things, upon the precise color of the pigments and the spinning conditions employed in the production of the yarn.

The pigments may be admixed with the cellulosic spinning solutions in a variety of ways. For example, the pigments might be prepared together in a mixed suspension or added singularly. It is preferred to prepare the pigments together so that the pigments may be injected or added in definite amounts to a stream of spinning solution shortly before it reaches the spinning jet. When the pigments are injected in the spinning solution while being pumped to the spinning machine, the injected pigments and spinning solution should be thoroughly mixed before spinning the same.

After the pigments are incorporated into the solution in the manner just described, it is spun in the usual manner into a coagulating bath. For example, when the pigment formulation of the present invention is added to viscose, the spinning is carried out according to the normal method for spinning viscose rayon with the after-treating of the spun product being also applied according to usual processes.

The product of the present invention has a white appearance which is substantially permanent since the agents, namely the white inorganic pigment and the combination of colored pigments, are insoluble and intimately associated with and uniformly dispersed in the product.

The following example illustrates the invention in greater detail. Although the invention is shown in connection with the viscose, it is obvious that the principles

thereof are applicable to the cuprammonium process as well.

Example

An aqueous suspension containing 0.032% TiO_2, 0.0031% Phthalocyanine Blue and 0.0026% Indanthrene Bordeaux was prepared. This suspension was then injected and mixed as described in copending application Serial No. 655,004, filed April 25, 1957, and having common ownership herewith, into a mature viscose composition containing 7.4% cellulose and 5.6% sodium hydroxide in such an amount that the viscose contained approximately 0.01% TiO_2 by weight based on the cellulose, 4 p.p.m. Phthalocyanine Blue based on the cellulose content and 8 p.p.m. Indanthrene Bordeaux, also based on the cellulose content. The viscose was thereafter spun into 300 denier 60 filament yarn in a normal textile spinbath containing 11.0% H_2SO_4, 17.5% Na_2SO_4, 5.0% $MgSO_4$ and 1.0% $ZnSO_4$ and taken up in a conventional rotating spinpot in cake form.

The freshly spun cake was purified in the usual manner by pressure washing with the following aqueous solutions for half-hour periods: soft water, 0.12% sulfuric acid, soft water, a mixture of 0.5% sodium sulfide and 0.10% sodium hydroxide at 50° C., soft water, sodium hypochlorite (0.20% available chlorine), soft water, 0.1% sodium thiosulfate, soft water, 0.5% hydrochloric acid, soft water, 0.5% sodium bicarbonate and finally soft water. All the solutions except the sodium sulfide mixture were maintained at 30° C. The cake was then finished with an aqueous emulsion containing about 2% refined mineral oil. After being hydroextracted, the cake was dried in a tunnel dryer.

For comparison purposes, normal yarn was produced in the same manner just described except that no pigment had been incorporated in the yarn.

Visual examination of and comparison with bottle bobbins, swatches and cones of the pigmented yarn and the normal yarn showed that the yarn produced in accordance with the present invention was whiter. The whitening effect of the method of the present invention was further confirmed by plotting I.C.I. chromaticity coordinate values on a standard chromaticity diagram around illuminant "C" according to the I.C.I. color coordinate method. These coordinate values were calculated from light reflectance readings obtained by using a Beckman model D.U. spectrophotometer in a known manner.

The whiteness of the pigmented yarn was uniform throughout its length and remained substantially unchanged after repeated laundering and extended exposure to light. The pigments did not affect the yarn physical properties and dyeing uniformity.

Other spinnings were conducted wherein the pigments were added during the dissolving of the xanthate crumbs and the resulting viscose spun into yarns of various deniers and filament counts. These yarns were also whiter in appearance as compared to normally produced yarn.

While the invention has been described with particular reference to a preferred method of carrying out its practice, other embodiments will be apparent to those skilled in the art. It is therefore intended to limit the invention only by the scope of the appended claims.

What is claimed is:

1. A viscose spinning composition containing titanium dioxide in the amount of at least 0.001% by weight based on the cellulose in the viscose, a blue organic pigment in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, and a violet organic pigment in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, said organic pigments being compatible with said spinning composition and being present in a synergistic mixture that imparts a whitening effect to filaments which when spun from said composition otherwise would have a slight yellow tinge.

2. A viscose spinning composition containing titanium dioxide in the amount of about 0.01% by weight based on the cellulose in the viscose, the organic pigment Phthalocyanine Blue in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, and the organic pigment Indanthrene Bordeaux in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, said organic pigments being compatible with said spinning composition and being present in a synergistic mixture sufficient to impart a whitening effect to filaments which when spun from said composition otherwise would have a slight yellow tinge.

3. A white appearing viscose rayon filament having incorporated therein a white inorganic pigment in the amount of at least 0.001% by weight and in quantities of 1 to 10 p.p.m., a blue organic pigment and a violet organic pigment.

4. A white appearing viscose rayon filament having incorporated therein titanium dioxide in the amount of at least 0.001% by weight and in quantities of 1 to 10 p.p.m., Phthalocyanine Blue and Indanthrene Bordeaux.

5. A method of producing viscose rayon filaments having improved whiteness comprising spinning a viscose containing titanium dioxide in the amount of at least 0.001% by weight based on the cellulose in the viscose, a blue organic pigment in the amount of 1 to 10 p.p.m based on the cellulose in the viscose, and a violet organic pigment in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, into an aqueous acidic spinbath, said organic pigments being compatible with said spinning composition and being present in a synergistic mixture that imparts a whitening effect to filaments which otherwise would have a slight yellow tinge.

6. A method of producing viscose rayon filaments having improved whiteness comprising incorporating in viscose titanium dioxide in the amount of about 0.01% by weight based on the cellulose in the viscose, the organic pigment of Phthalocyanine Blue in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose and the organic pigment of Indanthrene Bordeaux in the amount of 1 to 10 p.p.m. based on the cellulose in the viscose, said organic pigments being compatible with said spinning composition and being present in a synergistic mixture that imparts a whitening effect to filaments which otherwise would have a slight yellow tinge, and thereafter spinning the viscose into filaments in an aqueous acidic bath.

References Cited in the file of this patent

UNITED STATES PATENTS

2,191,947	Allen et al.	Feb. 27, 1940
2,424,778	Tainsh	July 29, 1947
2,563,493	Scalera et al.	Aug. 7, 1951
2,690,398	Guertler et al.	Sept. 28, 1954
2,706,689	Agulhon	Apr. 19, 1955

FOREIGN PATENTS

611,510	Great Britain	Nov. 1, 1948

OTHER REFERENCES

Siegrist: Soap and Chemical Specialties, volume 31, No. 11, November 1955, page 44.