

UNITED STATES PATENT OFFICE

2,113,935

TEXTILE MATERIAL CONTAINING ORGANIC
DERIVATIVES OF CELLULOSE

Camille Dreyfus, New York, N. Y., and Herbert
Platt and Arthur Lyem, Cumberland, Md., as-
signors to Celanese Corporation of America, a
corporation of Delaware

No Drawing. Application October 16, 1935,
Serial No. 45,268

9 Claims. (Cl. 8-5)

This invention relates to textile materials containing organic derivatives of cellulose, an outstanding example of which is cellulose acetate, and more particularly to textile materials containing organic derivatives of cellulose that have a modified affinity for dyestuffs.

An object of the invention is the production of textile materials containing an organic derivative of cellulose, such as cellulose acetate, which are resistant to dyes or resistant to dyes in at least localized areas. A further object of the invention is the production of textile materials made wholly of organic derivatives of cellulose, which materials are adaptable to cross dyeing processes. Other objects of the invention will appear from the following detailed description.

It is known that textile materials of organic derivatives of cellulose may be dyed only with certain dyestuffs which have an affinity therefor, which dyestuffs usually have no permanent coloring effect on cotton, wool and the like. It is also known that if the organic derivative of cellulose is given a saponifying treatment, it may be dyed with direct acid and neutral dyestuffs, the shade depending upon the degree of saponification, that is, the greater the degree of saponification, the deeper the color produced by the direct acid and neutral dyestuffs. The depth of color imparted by dyestuffs having affinity for normal organic derivatives of cellulose is inversely proportional to the degree of saponification. Furthermore, it is known that if the organic derivative of cellulose is heavily weighted, especially when a compound of silicon is employed, it then has affinity for practically all coloring materials. We have now found that if the textile material of organic derivative of cellulose is subjected to a high temperature prior to treating it with dyestuffs, it becomes resistant to the dyestuffs.

In accordance with our invention, we form textile materials containing an organic derivative of cellulose and subject at least a part thereof to a high temperature, such as by contacting it with a hot iron, whereby the part subjected to the high temperature has its affinity for dyestuffs altered. Further, in accordance with our invention, we form textile materials containing an organic derivative of cellulose, then weight the said material with a weighting compound to produce a material capable of being colored by any type of dyestuff and then treat this material with heat to make it resistant to all dyestuffs.

Although this invention is applicable to the production of textile materials containing any suitable organic derivative of cellulose, it will be

described with particular reference to cellulose acetate. Examples of other suitable organic derivatives of cellulose are the other organic esters of cellulose, such as cellulose formate, cellulose propionate and cellulose butyrate, and the cellulose ethers, such as ethyl cellulose, methyl cellulose and benzyl cellulose.

This invention is applicable to textile materials, such as filaments and yarns, or fabric made from the same, that contain an organic derivative of cellulose. In accordance with one form of our invention, the filaments may be treated with heat prior to twisting them into yarns, or the yarns may be treated with heat prior to processing them into a fabric. In another form of our invention the filaments containing an organic derivative of cellulose may be treated with heat after they have been formed into a fabric. In the latter modification, when applying the invention to fabrics containing filaments other than those of an organic derivative of cellulose, the other filaments or fibers are unaffected although they may receive the same heat treatment.

Any suitable means may be employed for heat treating the textile materials in accordance with this invention. For example, the filaments, yarns or fabric may be treated by passing them over a heated roller or they may be intermittently treated during a winding operation by causing them to periodically contact with one or more heated rollers that may or may not be heated to the same temperature. The filaments, yarns or fabrics may also be treated by passing them between nip rollers, at least one of which is maintained at an elevated temperature. Furthermore, the filaments, yarns or fabrics may be treated over their entire area or merely in local areas by subjecting them to ironing with a hand iron or by stamping designs and patterns thereon by means of a heated stamp.

Fabrics, or warps to be formed into fabrics, may be treated on devices with heated elements to form designs thereon, which devices may be similar to those used in printing, except that the elements contacting the textile material are heated and do not necessarily carry a dyestuff or printing color. In the subsequent dyeing of the material the depth of the shade produced by the dyestuff on each increment will be inversely proportional to the amount of heat it receives.

Fabric of an organic derivative of cellulose that has been weighted with a suitable weighting compound may be heated locally or over the entire area to produce a fabric, the affinity of which for direct and neutral dyestuff decreases or disap-

pears according to the heat received. The phenomenon is governed by the amount of heat, pressure and time of treatment. Thus by passing a weighted fabric of organic derivative of cellulose between nip rollers, one of which is engraved and heated, the design of the roller is produced on the fabric after said fabric is dyed. It is possible to create accurate photographic designs and delicate shadings when a weighted cellulose acetate fabric is exposed to a heated pattern and subsequently dyed with direct colors.

The temperature to which it is necessary to subject the material will depend to some extent upon the type of material employed and the degree of resistance to dyestuffs desired. For instance, in treating textile materials of cellulose acetate, normally employed in the manufacture of artificial silk, the temperatures may be from 180° C. to 275° C., preferably about 220° C. When the textile materials are made of cellulose acetate containing from 10 to 20%, based on the weight of cellulose acetate present, of a metallic weighting compound, such as that produced in the yarns by treating the same consecutively with stannic chloride, sodium biphosphate and sodium silicate, the temperatures may be increased, i. e. to vary from 210° C. to 310° C. Any other suitable weighting compound or method of weighting may be employed. For instance, compounds containing antimony, lead, zinc, titanium, etc. may be employed. As the temperature employed in either of the above specified cases is above the melting point of the cellulose acetate, it is necessary that the period of treatment be relatively short, e. g. a period of sufficiently short duration to prevent a fusing together of the filaments of the material. The length of heat treatment when applied to textiles of weighted cellulose acetate need not be of as relatively a short duration as when treating normal cellulose acetate. Although the temperature prescribed for treating weighted textile materials is far above the melting point of cellulose acetate, there is no tendency of the material to coalesce, apparently due to the weighting substances contained therein. In the treatment of weighted cellulose acetate textile material, the same may be made totally resistant to all dyestuffs. By regulating the temperature to which the material is subjected and/or the duration of time during which the material is subjected to the heat treatment, the textile materials may be caused, in a future dyeing operation, to take on any desired depth of shade. The depth of the color will be inversely proportional to the amount of heat applied.

The treatment of the textile materials is preferably carried out with the aid of dry heat, such as by contacting the textile material with a heated metallic element. When dry heat is applied, as stated above, there is no appreciable change in the luster, appearance or hand of the textile material. However, this invention is not limited to the use of dry heat, and moisture may be present, for example, by treating dampened textile materials or applying steam or a wetting agent to the textile materials simultaneously with the heat.

As illustrations of our invention, and not as limitations, the following examples are given:

Example I

Cellulose acetate yarns of about 150 denier are wound from one bobbin to another at a rate of from 10 to 30 meters per minute and the same

is caused to contact with about half the periphery of a three inch roller heated to 220° C. The yarn thus treated when dyed in dye baths having affinity for normal cellulose acetate are, so to say, unaffected, i. e. it is not dyed or it is only slightly dyed by the dyestuff at the parts which have been heated.

Example II

A fabric consisting of yarns of cellulose acetate which have been weighted with from 15 to 20% on the weight of the cellulose acetate of metallic weighting compound containing silicon, is passed between nip rollers, one of which is engraved with a design and heated to 310° C. The fabric is caused to travel between the nip rollers at a speed of about 15 meters per minute. The material is then subjected to a dyeing operation in a bath containing direct acid or neutral dyestuffs. That part of the fabric contacted by the raised heated design of the nip roller is substantially colorless, while the remaining part of the fabric takes on the shade of color that the same dyestuff would impart to unheated weighted cellulose acetate.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of an organic derivative of cellulose to a local dry heat treatment at a temperature above the fusing temperature of the organic derivative of cellulose, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the organic derivative of cellulose, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

2. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of cellulose acetate to a local dry heat treatment at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

3. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of an organic derivative of cellulose to a dry heat treatment, in a pattern, at a temperature above the fusing temperature of the organic derivative of cellulose, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the organic derivative of cellulose, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

4. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of an organic derivative of cellulose to a differential heat treatment with dry heat, in a pattern, at a temperature above the fusing temperature of the organic derivative of cellulose, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the organic derivative of cellulose, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

5. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of cellulose acetate to a differential heat treatment with dry heat, in a pattern, at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

6. Process for the production of textile materials of improved properties, which comprises subjecting materials, containing filaments of cellulose acetate weighted with from 10 to 20% of a metallic weighting compound, to a dry heat treatment, in a pattern, at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate, whereby there is produced a material which, when dyed, exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

7. Process for the production of textile materials of improved properties, which comprises subjecting weighted textile materials containing filaments of cellulose acetate to a dry heat treatment, in a pattern, at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate, and dyeing the so-treated textile material, whereby there is produced a material which exhibits colored pattern effects by virtue of the reduced dye affinity of the heat-treated portions.

8. Process for the production of textile materials of improved properties, which comprises subjecting portions of yarn containing weighted filaments of cellulose acetate to a dry heat treatment at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate, whereby the yarn has portions of lower dye affinity than the untreated portions of the yarn.

9. Process for the production of textile materials of improved properties, which comprises subjecting portions of yarn containing weighted filaments of cellulose acetate to a dry heat treatment at a temperature above the fusing temperature of the cellulose acetate, said temperature falling within the temperature range of 210° to 310° C., for a period of time which is insufficient to cause the filaments to fuse together but which is sufficient to reduce the dye affinity of the cellulose acetate whereby there is produced a yarn which, when combined with other yarns and dyed, produces differential colored effects by virtue of the reduced dye affinity of the heat-treated portions.

CAMILLE DREYFUS.
HERBERT PLATT.
ARTHUR LYEM.