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PRINTING TEXTILE MATERIALS CONTAINING ORGANIC DERIVATIVES OF CELLULOSE

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This invention relates to the production of textile yarns and fabrics having color imparted thereto and to the colored textile yarns and fabrics. This invention relates more particularly to the production of fabrics made of or containing organic derivatives of cellulose having a printed colored design thereon.

An object of this invention is the production of printed patterns on fabrics made of or containing an organic derivative of cellulose without substantially weakening the same. Another object of the invention is the method of printing fabrics containing an organic derivative of cellulose wherein good penetration of the dyestuff is obtained without a substantial reduction in the tensile strength of the fabric. Other objects of the invention will appear from the following detailed description.

Fabrics containing organic derivatives of cellulose have been printed by applying thereto dyestuffs having an affinity for the organic derivative of cellulose and then steaming the fabric to effect a penetration of the dyestuff, later scouring the fabric to remove the carriers employed in the printing paste. Tendering or weakening was occurring on these printed fabrics. This tendering or weakening appeared to be particularly associated with fabrics that were printed with a deep brown color but were present also to a lesser extent with other colors. To remedy this defect in printing there have been employed many expedients such as, for example, partially saponifying the organic derivative of cellulose and printing with cotton dyestuffs or by adding to the dyestuffs materials such as benzyl ethyl aniline and/or morpholine compounds. These expedients aid in maintaining the strength of the fabrics but introduce special operations and expensive reagents into the printing operation. I have found that these expedients are not necessary for the production of a strong fabric with a clear deeply penetrated, printed design thereon if the quality of steam and the conditions of steaming are maintained in accordance with this invention.

By employing this invention, good prints and strong fabrics are obtained without the aid of costly reagents and extra processing steps. Also, by employing this invention, fabrics containing organic derivative of cellulose yarns can be printed with any suitable dyestuff having an affinity for organic derivative of cellulose materials. Sharp outlines and deep penetration are obtained without substantially weakening the fabric.

In accordance with my invention, I produce fabrics containing organic derivatives of cellulose having printed colored patterns thereon by applying to the fabric dyestuffs having an affinity for organic derivatives of cellulose and then effecting a penetration of the dyestuff into the organic derivative of cellulose and a development of the color thereon by steaming the printed fabric in saturated steam at below atmospheric pressure or at atmospheric pressure or above with saturated air maintained below 100° C. As the steam is saturated at below atmospheric pressure its temperature will necessarily be below 100° C. Although this invention primarily deals with the printing of fabrics made of yarns of organic derivatives of cellulose, it is applicable to the coloration of other articles containing organic derivatives of cellulose such as single yarns or yarns in the form of bands or warps, staple fibres, films, etc. The fabrics may be made by weaving, knitting, warp knitting, netting or knotting yarns or filaments of organic derivatives of cellulose in any suitable manner.

The yarns employed to form the fabric, or at least a part of the yarns, may be formed of any suitable organic derivative of cellulose such as the organic esters of cellulose and the cellulose ethers. Examples of the organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate, while examples of the cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose.

The yarns may contain, besides cellulose derivatives, effect materials such as pigments or filling materials, dyes or lakes, fire retardants, plasticizers, sizes and lubricants. The yarns prior to printing may be scoured free of any coating material or they may contain various types of dressings such as light mineral oil, sulphonated vegetable oils, vegetable oils, sulphonated alcohols, polyhydric alcohols or mixtures of these.

The dyes that may be employed are those that are insoluble or only slightly soluble in water and that have an affinity for the material to be dyed. Thus, in coloring cellulose derivatives, any insoluble or difficultly soluble coloring material or organic compound having an affinity for cellulose ester or ether material under treatment or capable of coloring the same may be utilized for the purpose of the present process in printing designs on fabrics containing cellulose derivatives. As instances of suitable bodies or materials may be mentioned coloring materials or organic compounds of the classes of coloring materials or compounds referred to in U. S. Patents

Nos. 1,618,413, 1,545,819, 1,600,277, 1,641,965, 1,618,415, 1,694,414 and 1,679,935, the coloring materials of U. S. Patent No. 1,986,883 containing one or more keto-acidyl groups and particularly acetoacetyl groups, the nitrodiarylamines specified in U. S. Patent No. 1,947,038, the unsulphonated thiazole derivatives of U. S. Patent No. 1,871,673, the azo dyes containing xanthene or thioxanthene nucleus of U. S. Patent No. 1,935,205 and those containing the anthraquinone nucleus of U. S. Patent No. 1,935,623.

Any of the above coloring materials or mixtures of the same or their equivalents and similar substances or coloring materials may be mixed with suitable carriers to form printing pastes to be applied to the fabric by means of any suitable devices for applying printing pastes. The carriers to be employed with the coloring materials to form printing pastes may be one or a mixture of water, glycerine, Turkey red oil, organic acids and like materials along with a body giving substance such as gums, resins, water soluble derivatives of cellulose, starch, sugar, dextrin and the like. The printing paste may be formed in any suitable manner, for instance, in the manner in which they were formed prior to this invention. However, it is advisable to employ slightly smaller amounts of hygroscopic materials such as glycols, glycerines, etc.

The printing paste may be applied over the entire area of the fabric to form a fabric of a solid color or it may be applied locally to form a design on the fabric. When employing multiple color printing machines several different colors may be applied to the fabric, for instance one forming the background covering from 60-90% of the fabric and other colors forming local designs in the spaces not occupied by the ground color. It is also within the scope of this invention to employ discharge printing wherein the fabric is dyed or printed a solid color and then the printed pattern placed thereon by discharging a portion of the color and redyeing or recoloring with a dyestuff not effected by the discharge. In this respect the coloring material and discharging reagent may be mixed together into a single paste.

After printing, the fabric is preferably hanked and placed in a Cottage steamer although other methods of steaming the fabric may be employed, for instance, in an ager that steams the fabric while it travels through the same. Other methods of steaming may be employed such as steaming towers, drawing steam through bolts or spools of the fabric, etc. The time during which the fabric is steamed will depend to a great extent upon the construction of the cloth and the particular dyestuff employed and may vary from 20 to 60 minutes. The duration of steam treatment in the majority of cases does not vary materially from the duration of steam treatment employed in the steaming treatment used prior to this invention.

The steam employed should be saturated or contain but very little superheat and should also be maintained at below atmospheric pressure. The temperature of the steam will vary from 88° C.-100° C. and preferably from about 94° C.-97° C. under which temperature the full development of shade is obtained in the usual length of time of from 20 to 60 minutes. Although there is less weakening and tendering of the fabric when lower temperatures and pressures of the steam are employed, a temperature below 94° requires a longer period of steam treatment to

make a full development of the shade. The pressure of the steam to which the fabric is subjected may be just below atmospheric pressure to a vacuum of 13" of mercury. When employing Cottage steamers it is preferable to place the fabric in the steamer, evacuate the air to a reasonable degree and then inject the steam maintaining sufficient suction on the exit pipe to maintain a slightly reduced pressure.

In another modification of my invention I employ, instead of steam under reduced pressure, a mixture of steam and air under atmospheric pressure or slightly higher under conditions such that the mixture is saturated and maintained at below 100° C., say from 88° C. to just about 100° C. This modification is particularly applicable for use in continuous agers.

As an illustration of this invention, but without being limited thereto, the following example is given:

EXAMPLE

An all cellulose acetate taffeta fabric is printed with a design by applying a printing paste of the following composition:

Dark brown

	Parts
2.4 dinitro 4' hydroxy-diphenylamine-----	128
1 diacetyl amino anthraquinone-----	96
1.4 methyl amino 5.8 amino anthraquinone---	30
Water -----	240
Hydroxy ethyl ether of cellulose (water-soluble) -----	416
Glycerine -----	24
Turkey red oil-----	24
Acetic acid-----	1
pH value 6.5.	

After printing, the fabric is hanked and placed in a Cottage steamer, the air is evacuated and saturated steam injected therein with the evacuation and injection of steam being regulated to maintain a temperature of 94° in the Cottage steamer for 20 minutes. The fabric is then turned and given a similar treatment for another 20 minutes. The fabric is then removed from the Cottage steamer and washed with water, Gardinol and rinsed with water to remove the carriers employed in the printing paste. The fabric is found to have a well developed shade, the dyestuff is penetrated deeply into the fabric and the tensile strength of the fabric in those places colored by the dyestuff is substantially that of the uncolored portion of the fabric. There is a slight loss in tensile strength at the colored portions but it is so small as to be commercially negligible.

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

Having described my invention, what I desire to secure by Letters Patent is:

1. In a method of producing printed colored patterns on fabrics containing organic derivatives of cellulose, which comprises the steps of applying to the fabric a printing paste containing a dyestuff having an affinity for the organic derivative of cellulose and steaming the fabric in an atmosphere saturated with water vapor at a temperature of 88 to 100° C.

2. In a method of producing printed colored patterns on fabrics containing cellulose acetate, which comprises the steps of applying to the fabric a printing paste containing a dyestuff having an affinity for the cellulose acetate and steam-

ing the fabric in an atmosphere saturated with water vapor at a temperature of 88 to 100° C.

5 3. In a method of producing printed colored patterns on fabrics containing cellulose acetate, which comprises the steps of applying to the fabric a printing paste containing a dyestuff having an affinity for the cellulose acetate and steaming the fabric in an atmosphere of saturated steam maintained at 88 to 100° C. for 20 to 60 minutes.

10 4. In a method of producing printed colored patterns on fabrics containing cellulose acetate, which comprises the steps of applying to the fabric a printing paste containing a dyestuff having an affinity for the cellulose acetate and steaming the fabric in an atmosphere of saturated steam maintained at 94° to 97° C. for 20 to 60 minutes.

5. In a method of producing printed colored patterns on fabrics containing cellulose acetate, which comprises the steps of applying to the fabric a printing paste containing a dyestuff having an affinity for the cellulose acetate, 5 steaming the fabric in an atmosphere saturated with water vapor at a temperature of 88 to 100° C. and scouring the fabric.

6. In a method of producing printed colored patterns on fabrics containing cellulose acetate, 10 which comprises applying to the fabric a printing paste containing a dyestuff having an affinity for the cellulose acetate, steaming the fabric in an atmosphere consisting of a mixture of steam and air saturated with moisture at a temperature of 15 88 to 100 C.

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