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CAMILLE DREYFUS, OF NEW YORK, N. Y., AND GEORGE SCHNEIDER, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO CELANESE CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

DISCHARGE PRINTING AND FABRIC PRODUCED THEREBY

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This invention relates to method of producing differential color effects on fabrics, and particularly fabrics containing organic derivatives of cellulose, by discharge printing with an oxidizing agent.

An object of our invention is to produce discharge prints on fabrics containing organic derivatives of cellulose, and particularly those fabrics which have been colored with dyestuffs that cannot be discharged by the ordinary methods now employed.

A further object of our invention is to discharge print fabrics by means of pastes or other compositions containing oxidizing agents. Further objects of our invention will appear from the following detailed description.

The production of designs on colored backgrounds on fabrics containing organic derivatives of cellulose and particularly cellulose acetate, has heretofore offered serious difficulties, since many of the dyes that color such fabrics cannot be discharged by the ordinary discharge methods that employ reducing agents such as hyposulphites, formaldehyde sulphoxylates, etc. This is particularly true of the dark color dyestuffs such as the blues and reds. However, we have found that such dyestuffs may be discharged by means of oxidizing agents.

In accordance with our invention, we discharge print fabrics, and particularly fabrics containing yarns of organic derivatives of cellulose, which have been dyed with a suitable dye, whose color may be discharged by oxidizing agents. The paste that we employ for discharge printing should contain an oxidizing agent, preferably together with a suitable stabilizer when unstable oxidizing agents are used, and a suitable thickening agent.

While any fabric may be treated in accordance with our invention, it is particularly applicable to the treatment of fabric containing yarns of organic derivatives of cellulose, such as organic esters of cellulose and cellulose ethers. Examples of such organic esters of cellulose are cellulose acetate, cellulose formate, cellulose propionate and cellulose butyrate. Representatives cellulose ethers are ethyl cellulose, methyl cellulose and benzyl cellulose. The fabric may consist wholly of yarns containing one or more organic derivatives of cellulose, or it may be a mixed fabric containing yarns of organic derivatives of cellulose and yarns of other fibres. Examples of such mixed fabrics are mixed cellulose acetate and reconstituted cellulose, mixed cellulose acetate and cotton, and mixed cellulose acetate and wool.

The fabric to be treated with the discharge paste is previously dyed or colored with any suitable dye whose color may be discharged by oxidizing agents. When the fabric contains yarns of organic derivatives of cellulose, it is preferably dyed with dyes that are normally insoluble in water, but which are dispersed or solubilized by a dispersing agent such as a sulfo fatty acid, particularly sulfo ricinoleic acid (Turkey red oil). We have found that water insoluble coloring bodies generally corresponding to the dyes of the anthraquinone series in unreduced state, are particularly amenable to this process. These anthraquinone bodies are preferably amino compounds, which may have other radicals (except the sulfonic acid radical) substituted for one or more hydrogens of the anthraquinone. Examples of such compounds are 1.4 dimethyldiamino anthraquinone (blue), 1 hydroxy 4 amino anthraquinone (red).

The oxidizing agent employed in the printing paste may be any compound that is suitable for discharging the color of the particular dye employed. We have found that hydrogen peroxide in concentrated solution, say 30%, gives satisfactory results. Among the other oxidizing agents that may be employed, the following are mentioned: silver peroxide (formed, for instance, by mixing solutions of sodium persulfate and silver nitrate in the presence of a small quantity of nitric acid), nitric acid or material capable of liberating nitric acid, such as a mixture of sodium nitrate or potassium nitrate with sodium or potassium acid sulphate, permanganates of alkali metals in acid solution, and sodium peroxide. However, for most pur-

poses, we prefer to use oxygen acids of the halogens, such as hypochlorous acid, chlorous acid, chloric acid or perchloric acid. These acids may be used as such, but they are preferably generated on the fabric. This may be done by applying the salts of these acids in the printing paste and then subsequently applying a weak acid solution to liberate the acids. Examples of such salts are the hypochlorites of calcium, magnesium, sodium or potassium. Any suitable acid may be used to liberate the hypochlorous acid, examples of which are solutions of organic acids such as citric acid, tartaric acid, acetic acid, or dilute aqueous solutions of mineral acids, such as hydrochloric acids and sulfuric acid. However, it is not necessary to add acids to the hypochlorite, since the metallic hypochlorites alone may be employed in the paste, since fabric printed with such paste will discharge upon heating. It is preferable to add a suitable stabilizer to many of the oxidizing agents, such as the hypochlorites. Examples of such stabilizers are alkalies, borax, sodium chloride and/or hydrogen peroxide.

Of the thickening agents that may be employed in making up the paste, it is preferable to employ such agents that are not appreciably affected by the oxidizing agent used. The following are suitable for certain of the oxidizing agents; gum tragacanth, tragasol, British gum or other dextrines, water soluble cellulose ethers, feculose (acetylates starch), agar agar, starches, such as corn starch, gelatin, glue or isinglass, mineral thickening agents or gelatinous masses, such as those produced by acidifying aqueous solutions or soluble silicate, are very useful for preparing the paste.

If color discharge prints are desired, there may be added to the printing paste, dyestuffs that are not discharged by oxidizing agents, such as basic dyestuffs.

After printing with the discharge paste, the fabric may be given any desired finishing treatment such as drying, steaming, ageing, scouring, washing, etc.

In order further to illustrate our invention, but without being limited to the details thereof, the following specific example is given.

Example

A fabric consisting wholly of cellulose acetate yarns, which fabric has been dyed blue by an aqueous dispersion of 1.4 dimethyldiamino anthraquinone in sulphoricinoleic acid (Turkey red oil) is locally printed by suitable engraved or embossed rolls, plates or blocks with a discharge paste which may be made as follows:

To a solution of 100 parts of chloride of lime in 1,000 parts of water, a concentrated solution containing 70 parts of sodium carbonate is added. The solution is filtered to separate the precipitated calcium carbonate and 10 parts of borax or other stabilizing or buffer salt is added. If desired the solution of chloride of lime may be used directly in making the paste. To this solution sufficient gum tragacanth thickening (30:1) or corn starch thickening is added to make a paste of required consistency.

After printing the fabric with this paste, the fabric has immediately applied thereto by padding or by pin rolls, a solution of citric acid or other acid of about 5% concentration, to liberate nascent chlorine which discharges the color. The fabric is then treated, by padding or with pin rolls or by running over a quetch, with a solution of an anti-chlor, such as sodium sulphite, sodium bisulphite, sodium hydrosulphite, or sodium thiosulphate. The fabric is then run over drying drums. If desired, the fabric may be passed over drying drums directly after the application of the paste containing the hypochlorite without intermediate treatment with the acid and anti-chlor. The fabric may then be given, if desired, any subsequent finishing treatment, such as ageing, scouring, washing, etc. By the use of this process, a fabric having a blue background with a discharged white design is produced.

It is to be understood that the foregoing 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 claim and desire to secure by Letters Patent is:

1. Method of discharge printing a fabric containing organic derivatives of cellulose, which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying thereto an oxidizing agent.

2. Method of discharge printing a fabric containing organic derivatives of cellulose, which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying thereto an oxygen containing halogen acid.

3. Method of discharge printing a fabric containing organic derivatives of cellulose, which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying thereto an oxygen containing chlorine acid.

4. Method of discharge printing a fabric containing organic derivatives of cellulose, which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying hypochlorous acid thereto.

5. Method of discharge printing a fabric containing cellulose acetate which fabric has applied thereto an anthraquinone vat dye in the unreduced state, comprising locally applying an oxidizing agent thereto.

6. Method of discharge printing a fabric containing cellulose acetate which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying thereto an oxygen containing halogen acid.

7. Method of discharge printing a fabric containing cellulose acetate which fabric has applied thereto an anthraquinone dye in the unreduced state, comprising locally applying hypochlorous acid thereto.

8. Method of discharge printing a fabric containing cellulose acetate which fabric has been colored by means of an anthraquinone dye in the unreduced state, comprising locally applying to the fabric a paste containing a hypochlorite and then applying an acid to the printed fabric to liberate hypochlorous acid.

9. Method of discharge printing a fabric containing cellulose acetate which fabric has been colored by means of an amino anthraquinone, comprising locally applying to the fabric a paste containing a hypochlorite and then applying acid to the printed fabric to liberate hypochlorous acid.

10. Method of discharge printing a fabric containing cellulose acetate which fabric has been colored by means of a relatively water insoluble amino anthraquinone solubilized by means of a dispersing agent, comprising locally applying to the fabric a paste containing a hypochlorite and then applying acid to the printed fabric to liberate hypochlorous acid.

11. A discharge printed fabric containing cellulose acetate having differential color effects produced by the discharge printing of the fabric which has been dyed with an anthraquinone dye in the unreduced state, with an oxidizing agent.

In testimony whereof, we have hereunto subscribed our names.

CAMILLE DREYFUS.
GEORGE SCHNEIDER.