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UNITED STATES PATENT OFFICE

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DISCHARGE DYEING

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This invention relates to the art of textile printing and more particularly to the discharged dyed style of printing silk. It specifically contemplates the production of white discharge effects on pure or weighted silk.

In textile printing there is a type of printing known as the "discharged dyed style". In general this process comprises dyeing the fabric uniformly throughout and thereafter printing on certain portions or areas thereof, what is known as a "discharge paste". This paste is a composition comprising some substance capable of removing, destroying or permanently decoloring the dye already affixed to fabric. As is well-known, dyers have not heretofore been able to obtain perfectly white discharge effects on either pure or weighted silk by any commercially available method employing a discharge paste containing sodium hydrosulfite or its addition or condensation products with formaldehyde as the active ingredient. This well-known drawback has been especially prominent in materials dyed in full shade with many readily dischargeable colors. In practically every instance the portion of the dyed fabric which had been subjected to the action of the discharging agent has been stained a faint yellow or brown. Even if it were possible, it has not been practical to remove this stain by washing because to do so would seriously affect the depth of shade of dyed material.

It is an object of this invention to produce silk having white discharge effects. Other objects are to produce practical and commercially available methods of obtaining discharge effects on silk of exceptional purity and clearness, to produce new discharge pastes, to produce new dyestuff compositions, to devise novel processes for accomplishing the above objects, to devise new dyeing methods and sequences, to devise novel dye discharging methods in fabric printing, and in general to improve the prior art. Other objects will appear hereinafter.

These objects are accomplished by the present invention whereby the yellow, brownish or objectionable stain resulting from discharging a dyestuff from fabric is masked or destroyed. Specifically this is accomplished by tinting the areas which appear white in the final product with a blue or green essentially non-dischargeable dye or in certain instances with a dischargeable dye. In the application of this general principle there are five specific methods of operations which are as follows:

(1) The fabric may be tinted, afterwards dyed and finally portions or areas of the dye charged.

(2) The fabric may be dyed, portions or areas of the dye discharged and afterwards the fabric tinted.

(3) The fabric may be dyed, afterwards tinted and finally portions or areas of the dye discharged.

(4) The fabric may be dyed and tinted simultaneously and then portions or areas discharged.

(5) The fabric may be dyed and afterwards portions or areas discharged and tinted simultaneously.

The invention will be further understood from a consideration of the following specific examples:

Example I

One part of a dyestuff known as indocyanine BF was dissolved in 100,000 parts of water and the silk to be dyed dipped into this solution momentarily. As an alternative the silk may be passed through such a solution by means of a suitable padding machine at a rate which will cause the silk to be tinted a faint shade of blue. The silk was then passed into an ordinary dye bath, in this case made up from the dye Chicago blue 6B. As an alternative for this step the tinted fabric may be dried and dyed at any subsequent time. The silk was then discharged in the customary manner with a discharging paste containing sodium hydrosulfite. The above treatment gave a silk having white discharge areas of exceptional purity and clearness.

Example II

In this example silk was dyed a full shade with a dye mixture containing 90% pont-

amine black EX and 10% Erie green WT and afterwards tinted with the indocyanine BF solution described in Example 1, following these treatments the silk was discharged with the usual sodium hydrosulfite containing discharging paste and gave a white discharge area of exceptional clarity and permanency.

Example III

To a charge of pontamine black EX prepared from 276 parts of benzidine in the customary well-known manner was added before filtration of the finished color a solution containing one part of wool fast blue BL dissolved in 50 parts of warm water. After sufficient agitation to disperse the wool fast blue BL throughout the charge the dye mixture was filtered in the usual manner. The press cake was dried and standardized in the usual way. Thereafter silk was dyed with this mixed dye and discharged with an ordinary sodium hydrosulfite containing discharging paste. This procedure gave a white discharge effect of exceptional clarity and permanency.

Example IV

To a charge of a direct green dye known as Erie green WT prepared from 276 parts of benzidine in the manner well-known to those skilled in the art there was added before filtration a solution of 50 parts of warm water containing one part of indocyanine BF and the charge thoroughly agitated, filtered, dried and standardized in the usual way. Thereafter silk was dyed with the mixed dyestuff and discharged with an ordinary sodium hydrosulfite containing discharging paste. Exceptionally clear and permanent white discharge effects were obtained.

Example V

To an ordinary discharging paste was added about one part of indocyanine BF to 100,000 parts of paste. Silk which had been dyed a full shade with pontamine black EX in the customary and well-known manner was treated with the discharging paste just described and it was found that the discharged areas were white, exceptionally clear and permanent.

Example VI

Silk which had been dyed a full shade with pontamine black EX was discharged with an ordinary sodium hydrosulfite containing discharging paste in the customary well known manner. Thereafter the silk was dipped momentarily into a solution containing one part of a dyestuff known as indocyanine BF dissolved in 100,000 parts of water. As an alternative the silk may be passed through the solution by means of a suitable padding machine at such a rate that the silk will be tinted a faint shade of blue. The discharge effect produced by the above treatment gave a silk having a white discharge area of exceptional purity and clearness.

Example VII

In this example silk was dyed a full shade with Chicago blue 6B and afterwards tinted with the indocyanine BF solution described in Example 1. Following these treatments the silk was discharged with the usual sodium hydrosulfite containing discharging paste and gave a white discharge area of exceptional clarity and permanency.

It is to be understood that the invention is not limited to the specific dyes set out above. In addition to the readily dischargeable dyes mentioned in the specific examples and which are:

Pontamine black EX_____(C. I. No. 581)
Chicago blue 6B_____(C. I. No. 518)
Erie green WT_____(C. I. No. 583)

Examples of other colors of this general type which are of especial value are:

Pontamine blue BBF_____(C. I. No. 406)
Pontamine blue RW_____(C. I. No. 512)
Pontamine blue AX_____(C. I. No. 502)
Pontamine green BX_____(C. I. No. 593)
Pontamine diazo black BH___(C. I. No. 401)
Pontamine fast red F_____(C. I. No. 419)
Pontamine fast scarlet 4 BS__(C. I. No. 326)

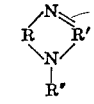
The essentially non-dischargeable dyes mentioned in the specific examples are:

Indocyanine BF (see Fierz-David-J. Soc. Dyers & Colourists 45, 137–8, May 1929).

Wool fast blue BL (C. I. No. 833—Kungstliche Organische Farbstoffe, vol. #3, page 332 by Fierz-David—1926).

It is to be understood, however, that the invention is not limited to these particular dyes. Any essentially non-dischargeable blue or green dye having affinity for silk is suitable for tinting. More specifically, the naphthophenazine dyes are used; in this class the indocyanine dyes are of particular value. At present blue or green dyestuffs of the naphthophenazine series are the most important. Good results may be obtained with dyes which are covered by German Patents Nos. 97,118 and 102,458.

It will be noted that the non-dischargeable dyes disclosed herein, as well as those disclosed in the aforementioned German patents, all contain the following grouping:



in which R, R' and R'' represent radicals of the benzene or naphthalene series. This grouping is quite instrumental in obtaining the superior results comprising one of the objects of the instant invention. Such su-

periority is apparently due to the fact that silk dyes containing this grouping are subject to chemical reduction, but even in their leuco form have considerable affinity for the fiber. This leuco form is immediately oxidized by contact with air, resulting in the production of clear attractive discharge areas. The affinity for the fiber evidenced by leuco forms of silk dyes containing the aforementioned grouping prevents their removal with the discharged dye.

In certain instances mixtures of dyes may be used as will be obvious to those skilled in the art. This is especially true of dischargeable dyes.

In cases falling under the second mode of operation where the tinting is done after discharging, it is not necessary to use a non-dischargeable dye since the tinted areas are not subjected to a discharge paste.

The best results so far have been obtained with the essentially non-dischargeable dyestuffs mentioned in the specific examples.

By the phrase "essentially non-dischargeable" it is intended to designate those dyes or colors which remain on, or give color to, the fibre after discharging with ordinary discharging pastes containing sodium hydrosulfite. In some instances it is probable that the dyestuff is not affected by the discharging paste. In other instances the dyestuff color is probably discharged and is restored by or upon the removal of the discharging paste.

In the specification and claims the term "silk" is intended to cover both pure and weighted silk. Where either of these types of silk is mentioned to the exclusion of the other its full name is employed.

Discharging pastes vary greatly depending upon the manufacturer, the particular dyes to be discharged, the fabric to be treated, etc. This invention deals particularly with those discharging pastes in which sodium hydrosulfite, or its addition or condensation product with formaldehyde, is used as the active discharging agent. As an example of a discharging paste suitable for this invention the following composition is given.

Example VIII

Twenty (20) parts of sulphoxite C and 10 parts of glycerine in a solution of 70 parts of 6% solution of gum tragacanth are heated to a temperature of about 140°–150° F. (60°–65.6° C.) for about thirty minutes or until the combination is homogeneous with the sulphoxite C completely in solution.

Any of the usual forms in which sodium hydrosulfite or its addition or condensation products with formaldehyde occur on the market are suitable for the preparation of the above paste, examples of these are rongalite, sulphoxite C and formopon, (see Analysis of Dyestuffs—Green—1916—page 58, or Organischen Chemie—Bernthsen—1909—page 148).

This invention produces discharge effects on silk of hitherto unknown purity and clearness and gives silks having pleasing white discharge effects.

As many apparently widely different embodiments of this invention may be made without departing from the spirit and scope thereof, it is to be understood that I do not limit myself to the specific embodiments thereof except as defined in the appended claims.

I claim:

1. A dischargeable dye in admixture with a small quantity of a non-dischargeable dyestuff selected from the group consisting of blue and green dyes of the naphthophenazine series.

2. In the process of producing on pure or weighted silk white discharge effects of exceptional purity and clearness the step of tinting the areas of the fabric which are to appear white in the finished product with a member selected from the group consisting of blue and green dyes of the naphthophenazine series.

3. In the process of producing on pure or weighted silk white discharge effects of exceptional purity and clearness the step of tinting the areas of the fabric which appear white in the finished product with a non-dischargeable dye selected from the group consisting of blue and green dyes of the naphthophenazine series, prior to discharging.

4. In the process of producing on pure or weighted silk, white discharge effects of exceptional purity and clearness the step of tinting areas of the fabric which appear white in the finished product with an essentially non-dischargeable blue naphthophenazine dye prior to discharging.

5. In the production of white discharge effects of great purity and clearness on silk the steps of tinting the fabric with a non-dischargeable dye selected from the group consisting of blue and green dyes of the naphthophenazine series, dyeing with a dischargeable dye and thereafter discharging areas of the dischargeable dye.

6. In the production of white discharge effects of great purity and clearness on silk the steps of dyeing with a dischargeable color, tinting with a non-dischargeable color selected from the group consisting of blue and green dyes of the naphthophenazine series, and thereafter discharging portions of the dischargeable color.

7. In the production of white discharge effects of great purity and clearness on silk the steps of dyeing with a dischargeable dye and tinting with a non-dischargeable dye selected from the group consisting of blue

and green dyes of the naphthophenazine series simultaneously and thereafter discharging portions of the dischargeable dye.

8. A dyestuff paste comprising pontamine blue RW and a dye selected from the group consisting of indocyanine BD and wool fast blue BL.

9. A dischargeable dye in admixture with a non-dischargeable dye, selected from the group consisting of blue and green dyes of the naphthophenazine series, said non-dischargeable dye being in an amount sufficient to mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

10. A dischargeable dye in admixture with a non-dischargeable blue dye of the naphthophenazine series, said non-dischargeable dye being in an amount sufficient to whiten and mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

11. A dischargeable dye in admixture with a non-dischargeable green dye of the naphthophenazine series, said non-dischargeable dye being in an amount sufficient to whiten and mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

12. A dischargeable azo dye in admixture with a non-dischargeable dye selected from the group consisting of blue and green dyes of the naphthophenazine series, said non-dischargeable dye being in an amount sufficient to whiten and mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

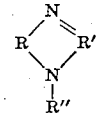
13. In the production of white discharge effects of great purity and clearness on silk, the steps of dyeing with pontamine black E, and tinting with a non-dischargeable dye selected from the group consisting of blue and green dyes of the naphthophenazine series simultaneously, and thereafter discharging portions of the dischargeable dye.

14. In the production of white discharge effects of great purity and clearness on silk, the steps of dyeing with pontamine black E and tinting with a wool-fast blue BL simultaneously and thereafter discharging portions of the dischargeable dye.

15. Pontamine black E in admixture with a non-dischargeable dye selected from the group consisting of blue and green dyes of the naphthophenazine series, said non-dischargeable dye being in an amount sufficient to mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

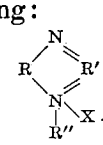
16. Pontamine black E in admixture with a wool-fast blue BL, said wool-fast blue BL being in an amount sufficient to mask the discoloration produced by discharging the dischargeable dye from material dyed with the admixture.

17. A dischargeable dye in admixture with a small quantity of a substantially non-dischargeable blue or green dye containing the following grouping:



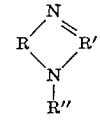
in which R, R′ and R″ represent radicals of the benzene or naphthalene series.

18. A dischargeable dye in admixture with a small quantity of a substantially non-dischargeable blue or green dye containing the following grouping:



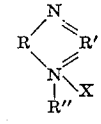
in which R, R′ and R″ represent radicals of the benzene or naphthalene series, and X represents an acid radical.

19. In the process of producing on pure or weighted silk white discharge effects of exceptional purity and clearness the step of tinting prior to discharging, the areas of the fabric which appear white in the finished product with a substantially non-dischargeable blue or green dye containing the following grouping:



in which R, R′ and R″ represent radicals of the benzene or naphthalene series.

20. In the process of producing on pure or weighted silk white discharge effects of exceptional purity and clearness the step of tinting prior to discharging, the areas of the fabric which appear white in the finished product with a substantially non-dischargeable blue or green dye containing the following grouping:



in which R, R′ and R″ represent radicals of the benzene or naphthalene series, and X represents an acid radical.

In testimony whereof, I affix my signature.

FRANCIS H. SMITH.