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TEXTILE PRINTING

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This invention relates to the art of textile printing and more particularly to the preparation of improved printing pastes and vat dyestuff pastes. Specifically, it contemplates a novel type of printing assistant for use in pastes containing thio-indigoid dyes.

Textile printing differs from dyeing in that the color or colors applied are confined to certain parts of the material thus producing different designs or patterns. At the present time the most extensive textile printing is done with cylinder or roll printing machines. The fundamental principles in this art are simple and comprise passing the cloth to be printed under some tension and pressure over an intaglio metal roll, the engraving of which is filled with a printing paste. After leaving the printing machine the printed cloth is passed into a drier. This dries the printing paste on the cloth in its proper place and prevents the dye from spreading to other portions of the fabric. In order to complete the printing, the cloth, after leaving the drier, is passed into a steam ager for a period of a few minutes, during which time the vat color undergoes reduction and passes to the fibre. The fabric is then subjected to oxidizing conditions which may include passing it into a steeping bath, usually of water or water containing an oxidizing agent. Any excess color is washed off in a soap solution with which the textile material is treated following the steeping.

The paste applied by the printing roll, hereinafter called "printing paste", varies with different materials and manufacturers, but usually consists of the mixture of unreduced vat dyestuff, a strong reducing agent such as sodium hydrosulfite or Rongalite, an alkali and a thickening agent. The thickening agent is usually a gum (for instance British gum), starch or both. The printing paste is usually prepared by mixing dyestuff paste or pastes with the other ingredients enumerated, said other ingredients being in the form of a gummy mixture hereinafter called "printing gum". The dyestuff pastes are essentially finely divided suspensions of dye with or without a dispersing agent. These dyestuff pastes (hereinafter referred to as "dye pastes", "dyestuff pastes" or "color pastes") usually have the dye suspended in water, but in certain instances part of the water necessary for the suspension may be replaced by other fluids. These fluids are generally (and hereinafter) called "printing assistants".

In general any material which is responsible for results in textile printing which show any im-

provement over a water suspension dyestuff paste may be called a printing assistant.

It is an object of this invention to produce improved results in textile printing. Other objects are to produce improved printing pastes, improved printing gums, improved dyestuff pastes, and improved printing assistants and in general to improve the art of textile printing. Other objects will appear hereinafter.

These objects are accomplished by the present invention whereby certain anthraquinone-alkali metal-sulfonates or mixtures thereof are used as printing assistants in textile printing. These new printing assistants may be used alone or in conjunction with other printing assistants. The invention will be further understood by reference to the following examples. The parts are given by weight.

Example I

Twenty (20) parts of a 12.5% dyestuff paste of 4:4'-di-methyl-6:6'-dichloro-thioindigo and 2% of anthraquinone-2-sodium sulfonate were mixed with 80 parts of printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on a textile material which was then aged and developed in the usual way. The prints obtained were from 10 to 25% stronger than those obtained from a similar composition which differed only in the omission of the anthraquinone sodium sulfonate.

Example II

Twenty (20) parts of a 12.5% dyestuff paste of 6:6'-diethoxy-thioindigo and 2% anthraquinone-2-sodium sulfonate were mixed with 80 parts of printing gum similar to that mentioned in Example I. The resultant mixture was printed on a textile material which was then aged and developed in the usual way. The prints obtained were from 10 to 25% stronger than those obtained without the assistant mentioned.

Example III

Twenty (20) parts of a dyestuff paste of bis-beta-naphthionaphthene indigo, containing 2% of anthraquinone-2-sodium sulfonate, were mixed with 80 parts of the printing gum. The resultant mixture was printed on the fibre and developed in the usual way. The prints obtained were from 10 to 25% stronger than those obtained from a similar composition without the anthraquinone sulfonate present.

Example IV

Twenty (20) parts of dyestuff paste containing 20% of 5:5'-dichlor-7:7'-dimethyl-thioindigo and 2% of anthraquinone-2-sodium sulfonate, were mixed with 80 parts of a printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed and developed in the usual manner. The prints obtained were stronger than those obtained from a similar composition in the absence of the organic catalyst mentioned.

Example V

Twenty (20) parts of a dyestuff paste containing 12.5% of 6:6'-dichloro-thioindigo and 2% of anthraquinone-2-sodium sulfonate were mixed with 80 parts of a printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on a textile material which was then developed in the usual manner. The prints were stronger than those obtained from a similar composition without the assistants.

Example VI

Twenty (20) parts of a dyestuff paste containing 17% of a dyestuff known as Sulfanthrene Scarlet G and 2% of anthraquinone-2-sodium sulfonate, were mixed with 80 parts of printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on a textile material, aged and developed as usual. The resultant prints were from 10 to 25% stronger than those obtained from a similar mixture in the absence of the assistant.

Example VII

Twenty (20) parts of a dyestuff paste, identical with the one mentioned in Example VI, but containing 2% of anthraquinone-2:6-disodium sulfonate as an assistant, were mixed with the printing gum containing potash, Rongalite and glycerine. The resulting mixture was printed on the textile fibre, aged and developed in the usual way. The prints were stronger than those obtained from a similar mixture in the absence of the assistant.

Example VIII

Twenty (20) parts of the dyestuff paste mentioned in Example VI but containing 2% of anthraquinone-2:7-disodium sulfonate as an assistant, were mixed with the printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on a textile material, aged and developed as usual. The resulting prints were stronger than those obtained from a similar mixture without the addition of the assistant.

Example IX

Twenty (20) parts of the dyestuff paste mentioned in Example VI, but containing a mixture of anthraquinone-disodium sulfonates as assistants, were mixed with 80 parts of a printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on the textile material, aged and developed as usual. The resultant prints were from 10 to 20% stronger than those obtained from a similar mixture without the addition of the assistants.

Example X

Twenty (20) parts of a dyestuff paste prepared from the thio-indigo dye obtained by well known methods from 2-thioglycolnaphthalene, containing 2% of anthraquinone-2-sodium sul-

fonate, were mixed with 80 parts of the printing gum. The resultant mixture was printed on the fibre and developed in the usual way. The prints obtained were stronger than those obtained from a similar composition without the anthraquinone sulfonate present.

Example XI

Twenty (20) parts of a 12.5% dyestuff paste of 4:4'-di-methyl-6:6'-dichloro-thioindigo and 2% of 1-nitro-anthraquinone-6-potassium sulfonate were mixed with 80 parts of printing gum containing potash, Rongalite and glycerine. The resulting mixture was printed on a textile material which was then aged and developed in the usual way. The prints obtained were stronger than those obtained from a similar composition which differed only in the omission of the anthraquinone sulfonate.

Example XII

Twenty (20) parts of a 12.5% dyestuff paste of 4:4'-di-methyl-6:6'-dichloro-thioindigo and 2% of 1-chloro-anthraquinone-5-sodium sulfonate were mixed with 80 parts of printing gum containing potash, Rongalite and glycerine. The resultant mixture was printed on a textile material which was then aged and developed in the usual way. The prints obtained were stronger than those obtained from a similar composition which differed only in the omission of the anthraquinone sodium sulfonate.

As will be clear from the above examples and description the printing assistants of this invention are salts of anthraquinone sulphonic acids. The particular assistant used may be the salt of an anthraquinone mono-sulphonic acid as indicated in Examples I, II, III, IV, V, VI, X, XI and XII, or the salt of an anthraquinone di-sulphonic acid as indicated in Examples VII and VIII or it may be the salts of a mixture of the anthraquinone sulphonic acids as indicated in Example IX.

One mixture of such compounds whose use is of especial importance is that remaining after the removal of anthraquinone-2-sulphonic acid from a residue resulting from the sulphonation of anthraquinone which is referred to in Example IX.

The relative efficiency of the various particular anthraquinone sulphonic acid salts listed above is of minor importance in comparison with the total improvement or effect produced in the printing. Ordinarily the choice of a particular assistant of this class depends upon convenience and price.

While the salts used in the above examples were the sodium and potassium derivatives it is to be understood that other alkali metal derivatives are suitable, for example, ammonium. Throughout the specification and claims the word "alkali metal" is used to cover the ammonium radical.

As will be obvious to those skilled in the art the anthraquinone derivative can be added to the dye paste as the free acid. Under the conditions of reduction the corresponding alkali metal salts would be formed.

As will be apparent from the examples the anthraquinone nucleus may be substituted or unsubstituted.

The amount of the assistant is ordinarily varied directly with the amount of solid dyestuff and the paste used. Based on a 12.5% solids dye paste the preferred amounts of the printing as-

assistant lies between 1 and 5%. Greater or lesser amounts than this may be used when desired for example the use of .5 to 10% of the printing assistant gives good results. Less than .5% may be used if desired although the result is not as noticeable as that produced by using an amount falling within the preferred range. Generally more than 10% may be used without detriment to the process.

The assistant may be added to the dye paste, it may be added to the printing gum or it may be added to the printing paste as desired. Valuable results are obtainable in each case. It may be incorporated in the paste in conjunction with other printing assistants of other types with satisfactory results. The mode of the incorporation of the printing assistant has not been found to be particularly important.

It has been found that the presence of these assistants in the printing paste makes possible the production of prints of superior strength and brightness to those obtained from a similar printing paste from which the assistant has been omitted.

By "an unsubstituted anthraquinone sulfonic acid or sulfonate", we mean an anthraquinone sulfonic acid or sulfonate in which the anthraquinone nucleus contains no substituents other than sulfonic acid or sulfonate groups.

So much of this application as relates broadly to vat dye printing pastes containing anthraquinone sulfonic acid and salts thereof, and specifically substituted anthraquinone sulfonic acid and sulfonates, is claimed in our co-pending application U. S. Serial No. 703,155 filed December 19, 1933. The specific embodiment of the invention which relates to printing with anthraquinone-2-sulfonic acid and salts thereof is disclosed and claimed in our copending application Serial No. 703,156 filed December 19, 1933.

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 we do not limit ourselves to the specific embodiments thereof except as defined in the appended claims.

We claim:

1. A vat dye printing paste comprising an unsubstituted alkali-metal anthraquinone sulfonate.

2. An indigoid vat dye printing paste comprising an unsubstituted alkali-metal anthraquinone sulfonate.

3. A printing paste comprising a thioindigoid dye and an unsubstituted anthraquinone sulfonate of a metal of the group consisting of sodium, potassium and ammonium.

4. A printing paste comprising a thioindigoid dye and an unsubstituted anthraquinone sodium sulfonate.

5. A printing paste comprising 4:4'-di-methyl-6:6'-di-chlorothioindigo and an unsubstituted alkali metal anthraquinone sulfonate.

6. A printing paste comprising 6:6'-di-ethoxy-

thioindigo and an unsubstituted alkali metal anthraquinone sulfonate.

7. A printing paste comprising bis-beta naphthionaphthene indigo and an unsubstituted alkali metal anthraquinone sulfonate.

8. A printing paste comprising a thioindigoid dye and the alkali metal salt of an unsubstituted anthraquinone di-sulfonic acid.

9. A printing paste comprising a thioindigoid dye and the alkali metal salt of 2:6-anthraquinone di-sulfonic acid.

10. A printing paste comprising a thioindigoid dye and the alkali metal salt of 2:7-anthraquinone di-sulfonic acid.

11. A printing paste comprising a thioindigoid dye and the alkali metal salt of an unsubstituted anthraquinone mono-sulfonic acid.

12. A printing paste comprising a thioindigoid dye and the alkali metal salts of a mixture of unsubstituted anthraquinone sulfonic acids.

13. A vat dye printing paste comprising a thioindigoid dye and the alkali metal salts of the mixture of anthraquinone sulfonic acids remaining after the removal of the 2-anthraquinone-sulfonic acid from an anthraquinone sulfonation residue.

14. A thioindigo printing paste comprising an unsubstituted alkali-metal anthraquinone sulfonate.

15. A thioindigoid printing gum comprising an unsubstituted alkali-metal anthraquinone sulfonate.

16. In the process of printing indigoid vat dyes on textiles the step which comprises incorporating a substance selected from the class consisting of unsubstituted anthraquinone sulfonic acid and an alkali metal salt thereof in the printing paste.

17. The process of printing thioindigoid dye-stuffs which comprises applying to the fiber a printing paste comprising the thioindigoid dye, an alkali metal salt of an unsubstituted anthraquinone-2-sulphonic acid, printing gum, potash and Rongalite and thereafter drying, ageing and developing the print.

18. In a process of printing indigoid dyes on textiles, the step which comprises printing on a textile material with a printing paste containing a water-insoluble thioindigoid color and a substance from the group consisting of unsubstituted anthraquinone sulfonic acids and ammonium and alkali metal salts thereof.

19. The process of preparing printed materials which comprises printing on a textile material with 4:4'-dimethyl-6:6'-dichloro thioindigo in the presence of an unsubstituted alkali metal anthraquinone sulfonate.

20. The process of preparing printed materials which comprises printing on a textile material with 6:6'-diethoxy thioindigo in the presence of an unsubstituted alkali metal anthraquinone sulfonate.

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