

UNITED STATES PATENT OFFICE

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DYEING AND PRINTING OF TEXTILE FIBERS

No Drawing. Application filed April 8, 1929, Serial No. 353,670, and in Germany April 30, 1928.

The present invention relates to a process of dyeing textile fibers by slop-padding and printing.

The printing and slop-padding of textile fibers with the esters of the leuco-compounds of vat dyestuffs, such as indigo, indigoid dyestuffs, anthraquinone dyestuffs and others (compare British Patent 186,057) is performed by printing or slop-padding the fibers in the usual manner with a printing paste or in a bath respectively, containing a leuco-ester of said vat dyestuffs, an agent for saponifying the ester, an oxidizing agent, such as sodium chlorate, an oxidizing catalyst, such as the ammonium salt of the vanadic or tungstic-acid and, in the case of printing, thickening agent, for example starch, gum or tragacanth. The fiber which has been printed or slop-padded in the usual manner is dried, then the dyestuffs is developed by saponification of the ester and oxidation of the leuco-compound, finally the fiber is rinsed and dried.

Heretofore the developing of the dyestuff, that means the saponification of the ester and oxidation of the leuco-compound, has been performed by the catalytical action of hydrogen ions which were produced in the developing process from the saponifying agent present in the printing paste or slop-padding bath respectively by the interaction of steam during a short time say for about 5-10 minutes. It is self-evident that only such saponifying substances can be used as do not unfavorably influence the fiber and the dyestuff. Heretofore water-soluble rhodanides have been used generally as saponifying agents, especially ammonium rhodanide; but these rhodanides are liable to change the tints of sensitive dyestuffs. In order to overcome this disadvantage, diethyl-tartrate has been used instead of the rhodanides, but the tartaric acid being a very weak acid, a great quantity of this compound, 6% and more calculated on the amount of the printing paste or the slop-padding bath, is necessary.

According to the present invention, there are added to the printing paste or slop-padding bath as saponifying agents, that means as agents yielding hydrogen ions by the action of steam, chlorides, esters and anhy-

drides of aliphatic and aromatic sulfonic acids and of aromatic carboxylic acids, the sulfo-chlorides of the aromatic series being the most valuable saponifying agents. The quantity of the new saponifying agents used may be varied within the widest limits; generally we add to the printing paste or bath about 1 to about 8% or more calculated on the amount of the printing paste or bath; but, when applying a high percentage of the saponifying agents, care must be taken that the fiber is not damaged. As the saponifying agents used in our invention are insoluble in water, they are added to the paste or bath dissolved in a suitable organic solvent, such as diethylenedioxide, acetone, alcohol, di-(β -hydroxyethyl)-thioether, generally in a concentration of about 25 to about 50%. Among the compounds coming into consideration for the purpose of our invention there may be enumerated by way of example the following ones: the sulfochlorides of the methionic acid and the sulfopropionic acid, benzene-1.3-disulfochloride, the anhydride of benzene-sulfonic acid, the phenylester of benzene-sulfonic acid, naphthalene-1-sulfochloride, the ethylester of naphthalene-1-sulfonic acid, naphthalene-2-sulfochloride, the methylester of naphthalene-2-sulfonic acid naphthalene-1.6-disulfochloride and the esters of the naphthalene-1.6-disulfonic acid, naphthalene-2.7-disulfochloride, and the esters of the naphthalene-2.7-disulfonic acid, naphthalene-1.3.6-trisulfochloride. The latter compound does react somewhat more slowly than the other ones and therefore the developing process takes more time than usual; the 4-methylbenzene-1-sulfochloride and the esters of the corresponding sulfonic acids react still more slowly. Suitable compounds are further terephthaloylchloride reacting more rapidly than the above mentioned compounds, benzene-1-carboxylic acid chloride-3-sulfochloride, 2-naphthoic acid chloride and β -chloro-ethane-sulfochloride.

The saponifying agents used in our invention are very stable, even in admixture with the printing paste, and therefore a premature developing of the dyestuff does not occur. On the other hand, when treating the printed

or dyed fiber with steam, the dyestuff will, without failure, be developed.

The invention is illustrated by the following example, but is not restricted thereto:

Example.—A cotton tissue is printed in the usual manner with a printing paste consisting of 8 parts by weight of the sulfuric acid ester of the leuco-compound of 4,4'-dimethyl-6,6'-dichloro-thioindigo, 30 parts by weight of water, 45 parts by weight of a neutral starch tragacanth thickening agent (consisting of 10% of wheat starch, 10% of water and 80% of a 6% tragacanth slime), 1 part by weight of sodium chlorate dissolved in 2 parts by weight of water, 1.25 parts by weight of naphthalene-1.6-disulfochloride dissolved in di-(β -hydroxyethyl)-thioether and 10 parts by weight of an aqueous solution of the ammonium salt of vanadic acid (dissolved 1:1000). The print is dried, treated for about 5 minutes with saturated steam, soaped on the boil and dried.

For the purpose of our invention the sloppadding process is an equivalent of the printing process.

We claim:

1. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and a saponifying agent of the group consisting of the chlorides, esters and anhydrides of aliphatic sulfonic acids and of sulfonic and carboxylic acids of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

2. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and an aromatic sulfochloride of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

3. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and naphthalene-1.6-disulfochloride, drying the fibers, steaming, washing and drying the same.

4. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and about 1 to 8% (calculated on the weight of the printing paste) of a saponifying agent of the group consisting of the chlorides, esters and anhydrides of aliphatic sulfonic acids and of sulfonic and carboxylic acids of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

5. The process which comprises printing

fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and 1 to 8% (calculated on the weight of the printing paste) of an aromatic sulfochloride of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

6. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and 1 to 8% (calculated on the weight of the printing paste) of naphthalene-1.6-disulfochloride, drying the fibers, steaming, washing and drying the same.

7. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and about 1.25% (calculated on the weight of the printing paste) of a saponifying agent of the group consisting of the chlorides, esters and anhydrides of aliphatic sulfonic acids and of sulfonic and carboxylic acids of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

8. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and about 1.25% (calculated on the weight of the printing paste) of an aromatic sulfochloride of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

9. The process which comprises printing fibers with a printing paste containing an ester of a leuco-compound of a vat dyestuff, an oxidizing agent, an oxidizing catalyst, a thickening agent and about 1.25% (calculated on the weight of the printing paste) of naphthalene-1.6-disulfochloride, drying the fibers, steaming, washing and drying the same.

10. The process which comprises printing fibers with a printing paste containing a sulfuric acid ester of a leuco-compound of an indigoid dyestuff, sodium chlorate, ammonium salt of vanadic acid, a thickening agent and about 1.25% (calculated on the weight of the printing paste) of a saponifying agent of the group consisting of the chlorides, esters and anhydrides of aliphatic sulfonic acids and of sulfonic and carboxylic acids of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

11. The process which comprises printing fibers with a printing paste containing a sulfuric acid ester of a leuco-compound of an indigoid dyestuff, sodium chlorate, ammonium salt of vanadic acid, a thickening

agent and about 1.25% (calculated on the weight of the printing paste) of an aromatic sulfochloride of the benzene and naphthalene series, drying the fibers, steaming, washing and drying the same.

5 12. The process which comprises printing fibers with a printing paste containing a sulfuric acid ester of a leuco-compound of an indigoid dyestuff, sodium chlorate, ammonium salt of vanadic acid, a thickening agent and about 1.25% (calculated on the weight of the printing paste) of naphthalene-1.6-disulfochloride, drying the fibers, steaming, washing and drying the same.

10 15 In testimony whereof we have hereunto set our hands.

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