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(54) **Method of fabric dyeing with inorganic pigments.**

(57) The invention discloses a method of fabric dyeing, according to which organic pigments, whether synthetic or not, are substituted for inorganic pigments, generally called "earths", thereby drastically reducing water pollution caused by dyes in reflux water. Furthermore, dye costs are reduced, earths being less expensive since they are obtained from natural minerals.

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The invention concerns a method of fabric dyeing realized by means of inorganic pigments, generally called earths.

The known dyeing technique relative to the textile field exclusively utilizes organic dyes, whether natural or synthetic.

With the exception of specific and limited cases, the most substantial utilization of dyes in the textile industry regards synthetic dyes, i.e. organic dyes obtained from chemical reactions of organic products with various reagents. Acid or basic organic dyes, mordant dyes, substantive dyes, vat dyes, sulphur dyes are utilized, depending on the textile fiber to be dyed. Most of said dyes are utilized in the dyebath.

The dyebath dyeing of textile products implies serious ecological problems concerning the waste-water of the dyebath, said waste-water being very polluting, since it irremediably alters the water in which said industrial waste-water is discharged.

In some cases, the process of dyebath is substituted for a process of dye spreading, whereby the waste-water is almost completely avoided and water pollution is extremely limited.

But if one takes into account that all organic synthetic dyes are obtained from chemical processes which per se produce polluting residual products, it is easy to realize that the process of dye spreading by utilizing synthetic dyes does not solve the problem of pollution at the root.

Another limit to consider is that organic synthetic dyes are realized by means of chemical processes implying costs which significantly affect the dyed fabric too.

The proposed purpose of the invention is to overcome the above-mentioned inconveniences.

The main purpose is to realize a method of fabric dyeing implying a low or almost null rate of pollution, both during the proper dyeing phase and after the dyeing phase, when the dye residue is discharged.

Another purpose is that the dyestuff used in the dyeing process

is cheap and does not significantly weigh on the dye cost. All above mentioned purposes and others which will be better understood hereafter are fulfilled by a method of fabric dyeing comprising:

- one or more cleaning phases of the piece of fabric to be dyed;
- a drying phase;
- one or more dyeing phases, whether through dye spreading or dyebath;
- at least one final drying phase,

said method being characterized in that the dye spreading phase or the dyebath phase are realized by means of a compound or a bath composed of inorganic pigments (earths), water and binders.

According to the invention, the inorganic pig-

ments which are used for the dye spreading compound or the dyebath are mixtures of inorganic compounds and suitable binders and are obtained from natural minerals.

Said inorganic pigments, commonly called earths, are used to cover metallic and non-metallic surfaces for protective or decorative purposes. Said inorganic pigments or earths have never been used in the process of fabric dyeing.

The dyeing method according to the invention proposes to use inorganic pigments (earths) instead of organic pigments and/or dyes, said inorganic pigments (earths) essentially consisting of mineral powders, thereby not implying the pollution problems which the synthetic or natural organic pigments do, for which the use of further chemicals is necessary before their being discharged in order to reduce their polluting power.

Apart from the very low rate of pollution of inorganic pigments (earths) used in the dyeing method according to the invention, the other advantage of said method is that said inorganic pigments are not very expensive, thereby reducing the dyeing cost significantly.

A method of fabric dyeing according to the invention is described hereafter, which is given by way of example only, but is not meant to limit the scope of the invention.

Before being dyed, the piece of fabric must be made apt to be dyed. It is therefore subject to cleaning phases, one of which is the desizing, i.e. a process of degradation of glues and starches so as to make them soluble through the use of enzymes.

Afterwards, the fabric to be dyed is scoured by immersing it into basic Ph solutions, like soaps or hydrogen peroxide.

Subsequently, the fabric is bleached with hypochlorite, sodium chlorite or similar substances. The fabric is then dried and dyed.

In the fabric dyeing method according to the invention inorganic pigments are used, also called "earths". Said inorganic pigments are either in paste form or dyebath, depending on the dyeing method to be used, whether dye spreading or dyebath.

The earths are available on the market in the form of powder, and are added to water or binders, said binders being natural, artificial or synthetic resins, for example acrylic, poliuretan, vinyl resins, or the like. The function of said resins is to fix the colour and prevent the fabric colour from fading in consequence of washing, light or heat.

In the case of dye spreading, the mixture is prepared in paste form. Some experiments have shown that good results concerning the dye are reached when the compound is composed of elements according to the following weight percentages:

- earths (1% to 30%);
- binding resins (15%);
- suitable thickening agent (3%-4%);
- the rest of the weight is given by water.

Satisfactory results have also been obtained by using the following weight percentages: earths (1% to 35%), binders (10% to 20%), the same quantity of thickening agent and the rest water.

In the case of dyebath the percentage of the compound elements is more or less unchanged, apart from the elimination of the thickening agent and the addition of the soaking liquid, if necessary.

When the dyeing procedure is finished, the fabric is dried. Although the earths polluting rate is almost negligible - since it consists of powder of natural minerals - it is clear that the dye spreading operation with the earths is preferable to the dyebath operation because the spreading operation does not produce residual products. i.e. water which must be regenerated or discharged into the drainage.

With respect to the type of colour obtained by means of the dyeing method in which earths are used, it can be observed that all colours can be realized through the dosage of the fundamental colours with suited experimental proportions.

Claims

1. A method of fabric dyeing comprising:
 - one or more cleaning phases of the fabric to be dyed (desizing, scouring, bleaching);
 - a drying phase;
 - one or more dyeing phases, whether through dye spreading or dyebath;
 - at least one final drying phase,
 characterized in that the dye spreading phase or the dyebath phase are realized by means of a compound or a bath composed of inorganic pigments (earhs), water and dye fixing hinders.
2. A method according to claim 1), whereby the dye spreading compound is composed of:
 - 1% to 35%, preferably 15%, of inorganic pigments (earths);
 - 10% to 20%, preferably 15%, of binders;
 - 50% to 60%, preferably 55%, of water.

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EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	PETER & ROUETTE: "Grundlagen der Textilveredlung" no. 174500, 1989, Deutscher Fachverlag GmbH, Frankfurt am Main * page 407, left-hand column, last paragraph - page 415, left-hand column, paragraph 2 * * in particular page 408, fig 7.21b * * page 409, right-hand column, paragraph 3 * * page 414, fig 7.32 * * page 487, right-hand column; figure 7.97c * ---	1	D06P1/44
X	FR-A-2401264 (CHEMISCHE PFERSEE GMBH) * page 2, line 28 - page 3, line 14 * * page 4, line 33 - page 5, line 2 * * page 6, lines 4 - 12 * * page 7, lines 14 - 31 * ---	1, 2	
A	EP-A-377434 (KURTZ, WALTRAUD ET AL) * the whole document * -----	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D06P
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 AUGUST 1991	Examiner DELZANT J-F.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			