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(54) **Procedure for the continuous uneven dyeing or discoloring of fabrics**

(57) A discontinuous dyeing or discoloring process for fabrics during which the fabric is moved forward in a preset direction, placed in a water bath and wrung in order to remove a specific amount of water, which varies

according to the desired aesthetic effect. The wrung fabric is then coated with a dyeing or discoloring agent in powder and sprayed with water according to a preset distribution pattern. The fabric is then exposed to a heat source to allow the remaining water to evaporate.

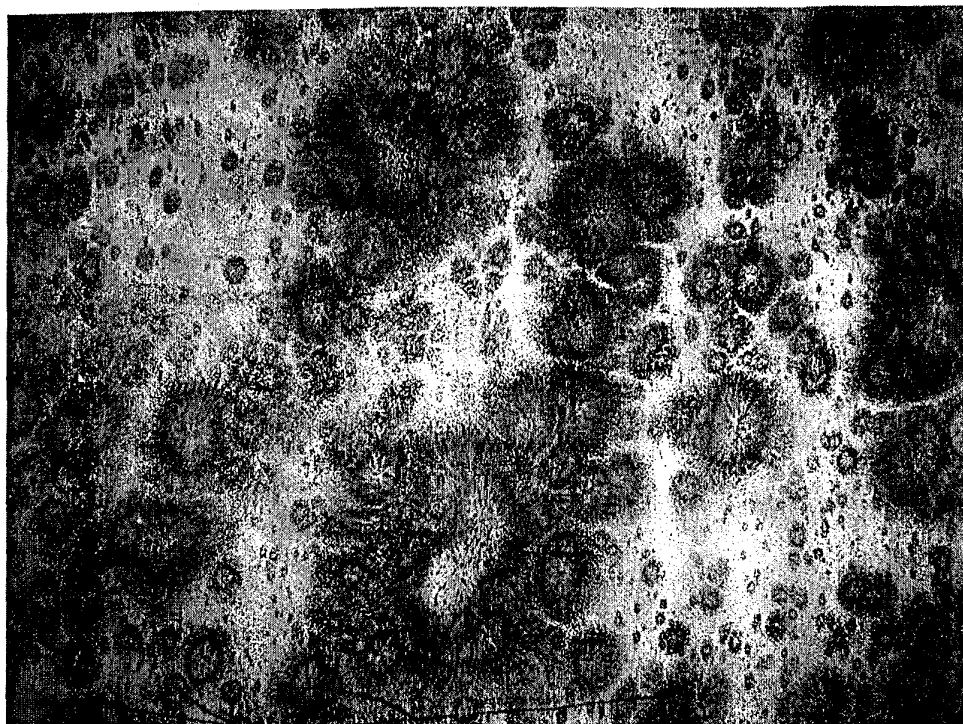


Fig. 1

Description

[0001] This invention applies to the textile finishing sector and specifically describes a new procedure for the continuous uneven dyeing or discoloring of fabrics.

[0002] The current procedure available to unevenly dye or discolor garments, in order to attain one of the effects most in demand by current fashion trends and employed in particular for youth garments, consists in preliminarily ironing, softening and drying the garments, in performing a final neutralizing phase and in dyeing/discoloring the garments. The latter process consists in impregnating granules of rough permeable but highly absorbent material (usually pumice) with a liquid dyeing or discoloring substance, depending on requirements. These granules are inserted, together with the dry garments that have to be treated, into a machine with revolving drum, which is allowed to run dry for a preset time. At the end of the cycle, the granules are disposed of or recycled so that they can be used for subsequent treatments.

[0003] In order to solve the numerous inconveniences of this procedure, the applicants suggested, with Italian patent application no. FI2003A000188, the implementation of a procedure for the uneven dyeing or discoloring of garments, fabrics and yarns that foresees a wet treatment phase in a machine with revolving drum or similar characteristics. During this phase, dyeing or discoloring agents are inserted into the machine using containers specifically designed to withstand the chemical conditions and temperature of the treatment. These containers also have several holes to allow the controlled and progressive release of the dyeing or discoloring agent, which occurs when the containers are shaken with the material inside the machine.

[0004] This procedure is particularly suitable for the uneven dyeing or discoloring of textiles, but cannot be effectively used with fabrics of large sizes or that exceed specific lengths.

[0005] The aim of this invention is to provide a procedure for the continuous uneven dyeing or discoloring of fabrics.

[0006] Another aim of this invention is to provide a procedure for the continuous uneven dyeing or discoloring of fabrics, with the characteristics specified above, that enhances the range of aesthetic effects as compared to those that can be attained with traditional discoloring procedures.

[0007] These aims are attained by means of the uneven dyeing and discoloring procedure for fabrics described in this invention, the main characteristics of which are detailed in claim 1. Other relevant characteristics of the invention are detailed in the related claims.

[0008] As specified in the above-mentioned patent application, dyeing or discoloring is carried out using dyes or bleaches in powder, instead of the liquid solutions that are generally employed in traditional dyeing or discoloring treatments. The procedure described in

the aforementioned patent application differs from traditional methods because of the fact that the powder dye or bleach is distributed on the fabric while it is fed through a machine designed for this purpose. Before being dyed or discolored, the fabric is immersed into a water bath and pressed in order to attain the percentage of humidity required for the selected aesthetic effect.

[0009] The applicants have noticed that the distribution of powder dye or bleach does not cause any significant changes to the fabric because of the lack of consistent distribution. Even if the substances are distributed on wet fabric, which generally aids solubilization, the effect is very localized and the result achieved generally consists in a dyeing/discoloring distributed in specific areas, which does not allow the diversification of the aesthetic effect. In addition to this, it is necessary to consider that the impossibility of consistently wetting the surface of fabrics with a high absorption prevents the full solubilization of the dyeing agent.

[0010] One of the innovative characteristics of this invention derives from the fact that the procedure foresees the initial distribution of the powder dye/bleach on the fabric and the subsequent application of water (wetting). Water can be nebulized, sprayed, sprayed continuously (rain) or applied in the form of large or small drops. This creates a series of continuous streams that form uneven lines of different sizes, depending on the amount of water applied and on the applications systems used. Technicians must select the distribution system according to the final desired effect.

[0011] After this treatment, fabric is heated in order to remove all the traces of water.

[0012] Thus, the resulting dyeing or discoloring effects vary according to the system used to distribute water. Water causes the dissolution of the dye or discoloring agent, its distribution on the fabric and the consequent formation of patterns and fancy shapes. Figures 1 and 2 show two possible examples of the effects that can be attained using the procedure described in this invention.

[0013] After the application of the dye/discoloring agent and the water, the fabric can be wound up and left in this condition for a few hours to allow it to fully absorb the dye/bleach.

[0014] The composition of the bath used to impregnate the fabric and process conditions vary according to the fibers of the material, as the experts of the field know. With cellulose fibers like cotton, flax, viscose, modal and similar materials, it is necessary to increase the temperature of the bath to 50°C. In this case, the bath should also include a chloride or sodium sulfate saline solution with an absorber to aid the impregnation of the fabric. With reactive dyes it is instead preferable to use baths with a high alkaline pH in order to create the background required to cause the reaction of the dye on the fiber. In this case, it is generally necessary to dampen the fabric with water before heating it, and leave it to rest for 8-10 hours to allow the dye to react with the fiber

according to the dye fixing specifications applicable to this type of dye (see the Pad-Batch procedure by way of example).

[0015] If the fabric is made of protein or polyamide fibers, the bath must be heated at 60°C and acidified with sulfuric or formic acid. For synthetic and acetate fibers, it is necessary to use a slightly acid pH and a temperature of approximately 50°C and include a dispersing agent to allow the fixation of dispersed dye.

[0016] After immersion, fabric must always be pressed. This is done by means of one or two pairs of rollers that remove approximately 80-100% of the amount of liquid as compared to the weight of the fabric.

[0017] To discolor a fabric, it is necessary to immerse it twice in a bath containing water at 50°C or at a lower temperature and subsequently press it in order to attain the percentage of water required for the desired treatment.

[0018] The dye or discoloring agent is applied to the fabric by means of a special machine that moves the fabric forward at controlled speed. The dye or discoloring agent in powder is distributed onto the fabric by means of a hopper that is placed above the fabric. The powder falls on the damp fabric where it partly dissolves or adheres to it. The degree of consistency of the distribution of the dye or discoloring agent influences the consistency of the final effect.

[0019] The configuration of the powder distribution system is known, though the system has so far been used for other applications and more specifically for the application of adhesive powder on fabrics designed to be joined at a later stage. The system recommended for this application should comprise a powder distribution system - hopper or equivalent device - and a downstream water distribution system. A feeder is required to continuously feed the fabric to these devices.

[0020] After the dye or discoloring agent has dissolved and adhered to the fabric as a result of the application of water, and the fabric has been wound and allowed to rest for a few hours, it is possible to start drying the fabric and evaporate the residuals of water. This can be done using an evaporator running in continuous mode or a tentering machine for fabrics with four fields and steam supply.

[0021] Once the dye has completely adhered, the fabric can be washed, fixed, softened, dried and thermally fixed using traditional methods.

[0022] The dyeing and discoloring effects that can be attained vary considerably, depending on the temperature of the water, the degree of compression of the fabric, the amount of powder applied to the fabric and, for discoloring, also on the type of dyes used for the background dye applied to the fabric that has to be discolored (it is possible for example to dye the fabric with a dye resistant to bleaching agents and apply a second layer with a less resistant dye; in this case the discoloring agent attacks the less solid color revealing the more resistant dye). It is also possible to equip the dye distribu-

tion machine with special mobile transversal nozzles in order to control the spray of water and apply the exact amount required to dissolve the dye or discoloring agent and form several kinds of patterns by appropriately adjusting the water distribution method and the movement of the nozzles.

[0023] One of the advantages of the procedure described in this invention lies in the possibility of consistently creating discoloring effects that are highly repeatable and solid. Thus, the procedure described can be used for garment fabrics, indoor or outdoor decor fabrics, sports apparel fabrics, household fabrics. It is also useful to notice that the procedure described in this invention offers high outputs along with very low production costs.

[0024] The procedure described in this invention can also be slightly changed in order to allow the use of pre-dyed polyamide adhesive powder instead of dyeing powder. In this case, the dyed powder is introduced into the hopper of the distribution system; it is possible to simultaneously use one or more colors to apply multi-color effects to the fabric. This process differs from the one described above due to the fact that it does not use a dye and does not therefore require the application of water. However, it is necessary to increase the temperature of the fabric to that of the gluing agent, which can range from 90 to 150°C, depending on the type of glue used. During the subsequent phase, the fabric is conveyed through a pressurized cylinder. Fabric can be protected with a glossy film in order to add glossiness to the polyamide or with a flat film to add flatness to the fabric. In both cases, the film must be removed at the end of the process.

[0025] The range of aesthetic effects that can be attained with the procedure described in this invention can be further extended by including specific treatments downstream from the water distribution system or during the application of water.

[0026] One of the initial possible treatment may include the brushing of the fabric in the direction in which it is fed and after the application of water. This can be done with a cylindrical brush that revolves in the same or in the opposite direction as compared to the fabric or with the aid of a fixed brush that moves along the fabric being fed into the machine. This produces an accentuated striping on the fabric. The intensity of the stripes naturally varies according to the conformation and rigidity of the bristles of the brush and to the brushing pressure.

[0027] It is also possible to have a variant in which water is distributed by means of the brushes.

[0028] A second additional treatment could be sponging. This is done using a spongy surface, which can also be uneven, and rotating it in contact with the moving surface. The cylinder, downstream from the water distribution system, can also be wet independently and be rotated on the fabric with an adjustable pressure.

[0029] A third potential treatment may involve the use

of a preventively dampened fabric in polyester or other material that cannot be dyed with the dyes in use. This fabric is pressed by a pressure roller coated with a dyeing substance. This enables to create the pattern on the polyester fabric while it is still moving. The polyester fabric must then be washed to allow the removal of the residuals of dye before it can be reused.

[0030] Although the dyeing or discoloring procedure described in this invention has been specifically developed for fabrics, it can also be effectively applied to garments and yarns.

[0031] The variants and/or changes that can be applied to the procedure for the uneven dyeing or discoloring of fabrics described in this invention do not affect the purpose of the invention itself.

Claims

1. Procedure for the continuous uneven dyeing or discoloring of fabrics **characterized by** the following phases:
 - Immersion of a fabric sample, fed in a specific direction, in a water bath
 - Compression of the impregnated fabric to attain the percentage of water required for the desired aesthetic effect
 - Distribution of a powder dye or discoloring agent on the pressed fabric
 - Distribution of water on the fabric with the selected distribution system
 - Heating of the fabric to produce the evaporation of water in excess
2. Procedure as per claim 1, **characterized by** the fact that water is nebulized, sprayed or sprayed continuously (rain) with irregular and large drops, in order to form continuous streams suitable to create discontinuous stripes of dimensions that vary according to the amount of water applied and other factors.
3. Procedure as per claims 1 and 2, **characterized by** the fact that the temperature of the water bath ranges between ambient temperature and 90°C.
4. Procedure as per claim 3, **characterized by** the fact that the temperature of the water bath ranges from 50 to 90°C.
5. Procedure as per any of the claims above, **characterized by** the fact that the water bath includes a sulfate or sodium chloride saline solution.
6. Procedure as per any of the claims from 1 to 4, **characterized by** the fact that water bath has a very high alkaline pH.
7. Procedure as per any of the claims from 1 to 4, **characterized by** the fact that water bath has a slightly acid pH.
8. Procedure as per any of the claims above, **characterized by** the fact that the water bath contains sulfuric or formic acid.
9. Procedure as per any of the claims above, **characterized by** the fact that water is evaporated by means of a dry or wet process.
10. Procedure as per claim 9, **characterized by** the fact that water is evaporated by means of a tentering machine.
11. Procedure as per claim 9, **characterized by** the fact that water is evaporated by means of a continuous evaporation system.
12. Procedure as per claim 1, **characterized by** the fact that the fabric is coated with a dye or discoloring agent in powder and allowed to rest for a few hours to enable the substance to adhere to the fabric.
13. Procedure as per any of the claims above **characterized by** the fact that the fabric is first wet with water and then brushed in the direction of feeding or in the opposite direction.
14. Procedure as per claim 13, **characterized by** the fact that the brushing operation is carried out by means of a cylindrical brush that rotates in the same direction of the fabric or in the opposite direction.
15. Procedure as per claim 13, **characterized by** the fact that the brushing operation is carried out by means of a fixed brush that moves along the fabric while it is moving.
16. Procedure as per claims 14 or 15, **characterized by** the fact that the brush is linked to an independent water distribution system.
17. Procedure as per any of the claims from 1 to 12, **characterized by** the fact that the wet fabric is first subjected to wetting, then to sponging.
18. Procedure as per claim 17, **characterized by** the fact that the sponging treatment is carried out by means of a roller with spongy surface, which can also be uneven, that rolls along the fabric being unwound.
19. Procedure as per any of the claims from 1 to 12, **characterized by** the fact that during the water distribution phase, the fabric comes into contact by pressure with a wet fabric in material that cannot be

dyed with the dyes in use.

20. Procedure for the continuous uneven dyeing or discoloring of fabrics **characterized by** the fact that the fabric is coated with a colored adhesive powder, which is applied to a protective film and melted in order to cause the adherence of the color to the fabric, at temperatures between 90° and 150°C. 5
21. Procedure as per claim 20, **characterized by** the fact the adhesive powder is made of polyamide and that the film can be glossy or flat. 10
22. Fabric unevenly dyed or discolored using the procedure described in any of the claims above. 15
23. Procedure for the continuous uneven dyeing or discoloring of fabrics substantially compliant with the characteristics described above and illustrated in the enclosed drawing. 20

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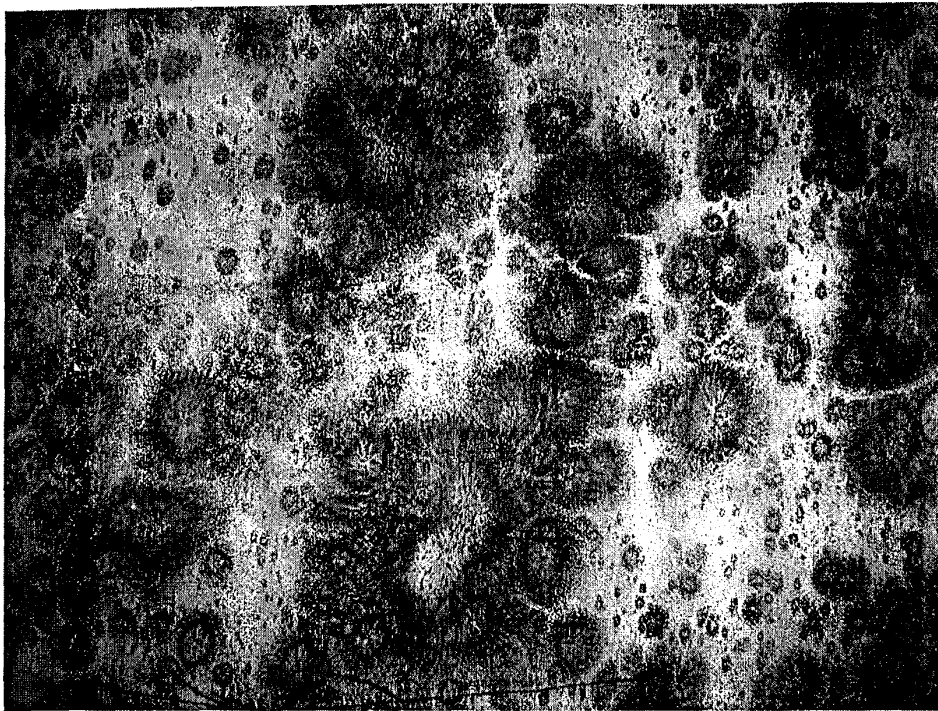


Fig. 1

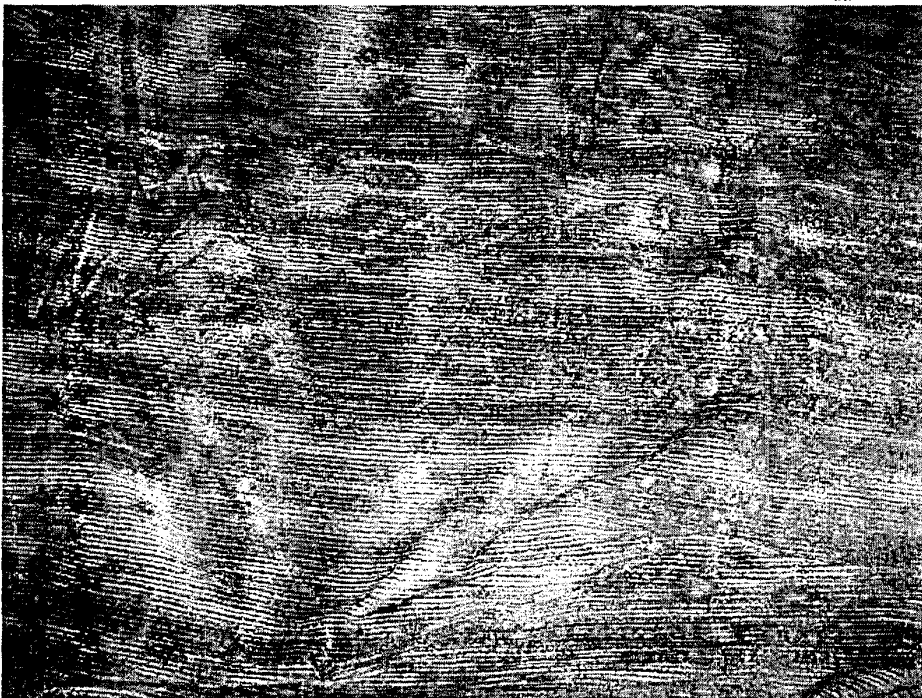


Fig. 2