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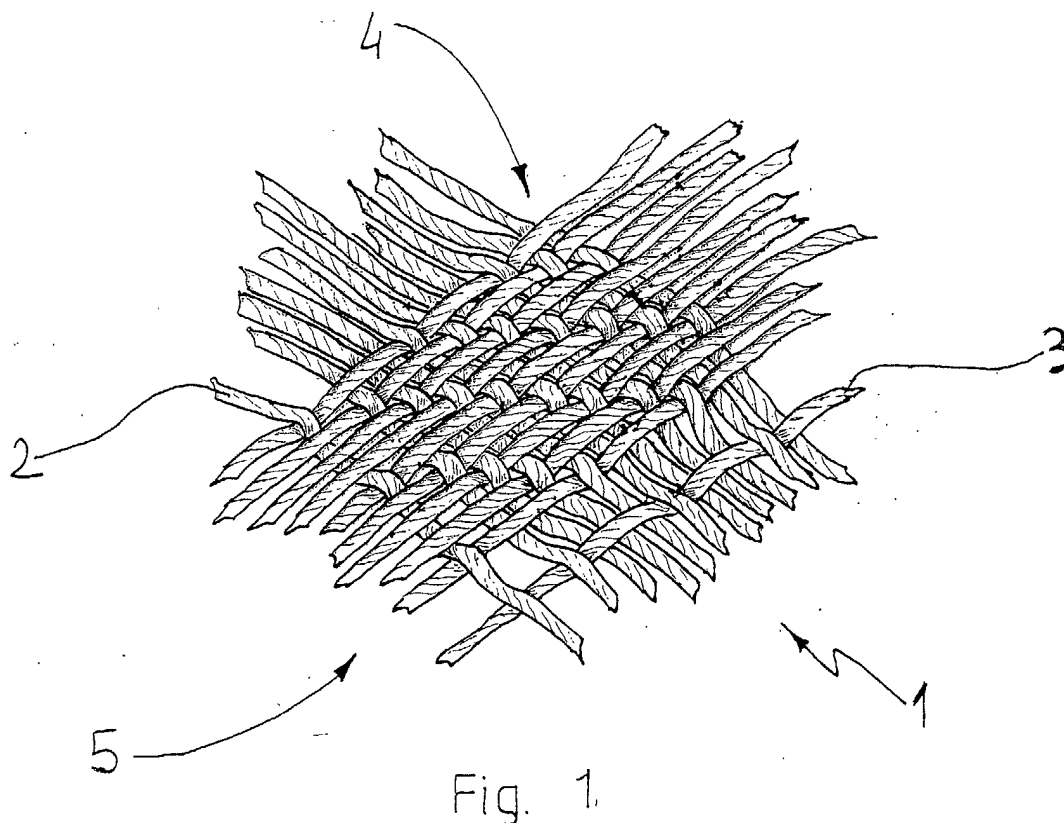
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(54) **Process for printing blended fabrics**

(57) Process for printing fabrics (1) comprising at least a synthetic fiber and a natural fiber, made of a weft (2) with one-fiber yarn, synthetic or natural, and of a warp (3) or one-fiber yarn, synthetic or natural, said process comprises the following steps: weaving said

weft (2) and said warp (3) so that the resulting fabric (1) has a weave where synthetic fiber prevails, appearing on a side (4); carrying out a thermosetting of said fabric (1); carrying out a sublimation printing on said side (4) where synthetic fiber prevails, after said thermosetting.



EP 1 375 733 A1

Description

[0001] The present invention relates to a process for printing fabrics comprising at least a synthetic fiber and a natural fiber.

[0002] More particularly, the present invention relates to a printing process carried out on mixed fabrics comprising both a synthetic fiber, in particular polyester, and a natural fiber, in particular cotton.

[0003] The invention finds its main - though not exclusive - application in the preparation of fabrics to be used for making up clothes, such as for instance overalls for personnel working in the field of industry, transport and the like.

[0004] It is known about some printing techniques for dyeing fabrics, such as for instance direct printing or printing by application, discharge printing, reserve printing, both physical and chemical.

[0005] When used on fabrics made of mixed fibers - polyester and cotton for instance - these traditional printing techniques create some problems, such as for instance an imperfect resistance of colors to washings carried out on the printed fabric and a lack of brightness.

[0006] Other printing techniques have then been introduced into the market during the following years, and among these sublimation printing has given particularly satisfying results.

[0007] As is generally known, sublimation printing is a printing process carried out by sublimation of colored gas which is hot-imprinted on materials, in particular on some types of synthetic material.

[0008] Techniques exploiting sublimation printing have been largely used in the decoration of clothes or fabrics. Essential requirements for such techniques are the previous printing of the pattern, by conventional printing techniques or by digitalizing the image (scanner, camera, CD), on a support sheet impregnated with sublimation inks, and then the transfer of the pattern onto the clothes or fabrics to be printed using heat and pressure.

[0009] The decoration of fabrics and clothes, for instance T-shirts, which are 100% polyester, carried out using sublimation printing techniques, has been extraordinarily successful. Sublimation inks, though weak and quite faded when printed on the support sheet, result in patterns with brilliant and light colors when transferred with heat and pressure onto these 100% polyester fabrics or clothes.

[0010] However, when patterns with sublimation inks were transferred onto 100% cotton fabrics or onto fabrics made of cotton- polyester combinations, the patterns sublimated on the latter types of fabrics were distorted and colors faded.

[0011] Various techniques have been suggested in order to overcome the problems associated with the decoration of fabrics containing cotton using sublimation technique. Some techniques comprise a change in the composition of the inks used, others the application

of particular diluents on the fabrics, others the use of particular support sheet for the images to be then transferred onto the fabric. The methods known at the state of the art further include pre-treatments or coatings of the fabric or of a conventional transfer sheet by sublimation with various chemicals so as to allow the fabrics containing cotton or other natural fibers to accept sublimating colored substances.

[0012] Unfortunately, it has been found that most of the sublimation printing techniques previously disclosed are unsatisfying since the colors of the transferred pattern fade after a relatively short time.

[0013] For instance, printing involving the transfer of sublimation colors onto fabrics made of mixed fibers with a ratio cotton-polyester of 35:65, is wholly unsatisfying, with evident areas which are not covered by the color. If the cotton content in the fabric is lower, with a ratio of 20:80, the coloring of the fabric is still granulous. Even though the ratio is changed to 10:90, so that only a small portion of the fabric is made of cotton fibers, the color resistance to repeated washings of the printed fabric is not yet attained.

[0014] Therefore, all these methods suffer from various disadvantages and in particular by a low-quality reproduction of colors and by an unacceptably low resistance of colors to frequent washings.

[0015] The present invention aims at solving the aforesaid problems, which are typical of the processes known at the state of the art when applied to mixed fabrics, and therefore at providing a process for dyeing mixed fabrics, natural fiber/synthetic fiber, which can be easily applied, which does not require particular modifications to the tools used in sublimation printing, which is cheap and reliable.

[0016] This is obtained by means of a process for printing fabrics comprising at least a synthetic fiber and a natural fiber, having the characteristics contained in claim 1.

[0017] The dependent claims outline particularly advantageous embodiments of the process for printing fabrics according to the invention.

[0018] Other characteristics and advantages of the invention will be evident from reading the following description, provided by way of mere non-limiting example, together with the figures shown in the attached table, where:

- Figure 1 shows a perspective view of a detail of a woven fabric with a four-harness satin weave, on which a printing process according to the invention can be carried out;
- Figure 2 shows a perspective view of a detail of a woven fabric with a five-harness satin weave, on which a printing process according to the invention can be carried out.

[0019] With reference to the aforesaid figures, the numeral 1 generally indicates a mixed fabric, synthetic fib-

er/natural fiber, made of a weft with one-fiber yarn and of a warp with one-fiber yarn, on which a printing process according to the present invention can be carried out.

[0020] The printing process according to the present invention comprises the following steps:

- weaving weft 2 and warp 3 so that the resulting fabric 1 has a weave where synthetic fiber prevails, appearing on a side 4 ;
- carrying out a thermosetting of said fabric 1 ;
- carrying out a sublimation printing on said side (4) where synthetic fiber prevails, after said thermosetting.

[0021] With the sole purpose to simplify the disclosure of the present invention the following description will refer in a non-limiting way to polyester and cotton, thus intending to make reference to any synthetic and natural fiber, respectively.

[0022] Moreover, yarn with one natural fiber refers to any yarn without synthetic fibers, thus comprising also a composition of natural fibers. The same applies to yarn with one synthetic fiber.

[0023] In particular, synthetic fiber refers to an organic resin containing one or more of the following materials: epoxypolyester resins, polyester resins, polyamide resins, polyurethane resins, acrylic resins, methacrylates, etc.

[0024] In the embodiment shown in the figures the fabric 1 to be printed has a cotton weft 2 and a polyester warp 3. The warp 3 is made of 68 yarns by centimeter of 100% polyester, with count 167, made of 48 glossy or semi-opaque or opaque filaments, and there are 18 weft yarns by centimeter with count NE 10 of 100% cotton.

[0025] As shown in Fig. 1, the fabric 1 has a four-harness satin weave, of the type known as "Turkish". This means that the warp 3 makes with respect to the weft 2 three turns above and one below, meaning by "above" the side to be printed. Therefore, the cotton is mainly on the reverse 5 of the fabric 1. As an alternative and as shown in Fig. 2, the fabric 1 can be made using the traditional five-harness satin, i.e. four turns above and one below.

[0026] Nevertheless, other weaves of the fabric can be used, as already known to the person skilled in the art, such as for instance twill or herringbone, canvas, etc., though without changing the description referring to the only weave shown.

[0027] It is further possible to modify counts, yarns by centimeter and number of shots without changing the results of the printing process according to the invention.

[0028] This step in which the fabric 1 is provided with a weave mainly of polyester on the side 4 to be printed is followed by a finishing operation, a sort of preliminary thermosetting, aiming at improving the stability of the fabric before sublimation printing.

[0029] This thermosetting step is carried out by winding the fabric 1 on calendering rollers heated at a temperature of 150 to 220°C for 30 to 50 seconds, according to the compositions of the fabric 1, thus allowing the fibers to obtain a variation in weft 2 and warp 3 of 3-8%.

[0030] Such thermosetting step allows causing an excellent dimensional stability to the synthetic fibers, which can thus receive and fix homogeneously the color of the following printing process.

[0031] Once the thermosetting on the fabric 1 has been carried out, the printing process according to the present invention provides for a final step of sublimation printing.

[0032] This final step of sublimating printing first comprises the printing, split up on different color levels, on a film support, not shown, of the image to be then transferred onto the fabric 1.

[0033] The printing of the film support is carried out with methods which are usual for the skilled person, i.e. with such systems as for instance offset, rotogravure, screen printing, digital plotter.

[0034] This film support for the transfer of sublimation colors can be made of any sheet comprising for instance paper, glass fiber cloth, plastic film, thin metal layer, or woven or non-woven fabric.

[0035] The colors used are made of sublimation pigments dispersed and mixed with vehiculating substances which can transfer the pigment into the fibers of the fabric.

[0036] After obtaining the colored image on the film support, the latter is then applied on the surface of the fabric 1 to be printed so as to allow the sublimation pigments to migrate into said fabric 1, on which the image previously obtained on the film support will thus form.

[0037] This step of sublimation printing is carried out by heating at a temperature ranging from 180 to 220°C and by pressing the film support on the fabric 1 by means of calenders for continuously printed fabrics, or by means of presses for set fabrics, for about 40-60 seconds.

[0038] The printing process described above is particularly suitable for mixed cotton-polyester fabrics with a greater amount of polyester fiber with respect to cotton fiber on the side to be printed. In particular, the printing according to the present invention carried out on the fabric 1 having a weave as shown in the figures, i.e. carried out mainly on the warp 3 of 100% polyester, allows to obtain a precise, clear and defined image.

[0039] It has thus been ascertained that the process for printing fabrics according to the present invention wholly solves the problems known at the state of the art, with evident advantages with respect to prior art.

[0040] As a matter of fact, the process for printing fabrics according to the present invention allows to obtain on the fabric with a weave, for instance the satin weave as shown in the figures, where the synthetic fiber prevails on the side to be printed, images whose colors have a high resistance to frequent washings even at

high temperatures and which are highly bright.

[0041] Furthermore, the transferred pattern does not fade and its colors are resistant even after repeated washings of the printed fabric.

[0042] An important feature is also the possibility to carry out the described process on fabrics for overalls which often carry the firm logo or other patterns and which require continuous washings at high temperature.

[0043] More to the point, the present invention provides on the one hand for a high-quality printed fabric and on the other hand a fabric where natural fiber, cotton for instance, prevails on the reverse of the fabric, therefore in direct contact with the body of the person wearing it, giving a high comfort similar to fabrics which are 100% natural fiber.

[0044] The invention has been previously described making reference to a preferred embodiment.

[0045] However, the invention is not limited to the only embodiment previously described, but indeed comprises several embodiments, all falling within the spirit and scope of the invention as claimed hereafter.

4, wherein said natural fiber comprises cotton fiber.

7. Printing process according to any of the claims 4 to 6, wherein said weave is a four-harness satin.
8. Printing process according to any of the claims 4 to 6, wherein said weave is a five-harness satin.
9. Printed fabric (1) obtained with the process according to one or more of the preceding claims.

Claims

1. Process for printing fabrics (1) comprising at least a synthetic fiber and a natural fiber, made of a weft (2) with one-fiber yarn, synthetic or natural, and of a warp (3) or one-fiber yarn, synthetic or natural, **characterized in that** it comprises the following steps:
 - weaving said weft (2) and said warp (3) so that the resulting fabric (1) has a weave where synthetic fiber prevails, appearing on a side (4);
 - carrying out a thermosetting of said fabric (1);
 - carrying out a sublimation printing on said side (4) where synthetic fiber prevails, after said thermosetting.
2. Printing process according to claim 1, wherein said sublimation printing is carried out at a temperature of 180 to 220°C for 40-60 seconds.
3. Printing process according to claim 1 or 2, wherein said thermosetting is carried out at a temperature within a range of 150 to 220°C for 30-50 seconds.
4. Printing process according to any of the claims 1 to 3, wherein said synthetic fiber on the side (4) to be printed is present on at least 2/3 of the whole surface to be printed.
5. Printing process according to any of the claims 1 to 4, wherein said synthetic fiber comprises polyester fiber.
6. Printing process according to any of the claims 1 to

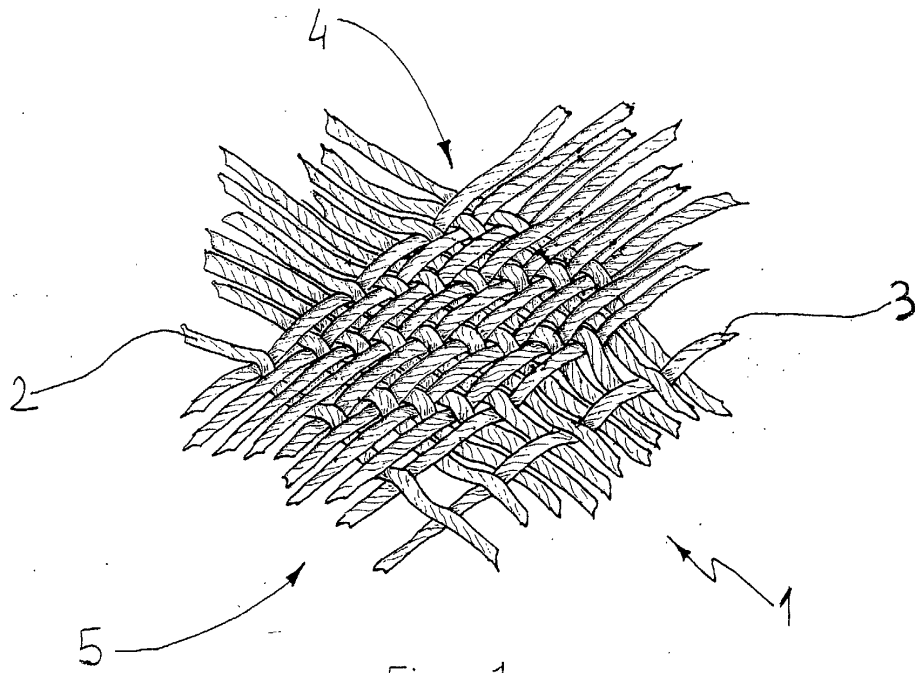


Fig. 1.

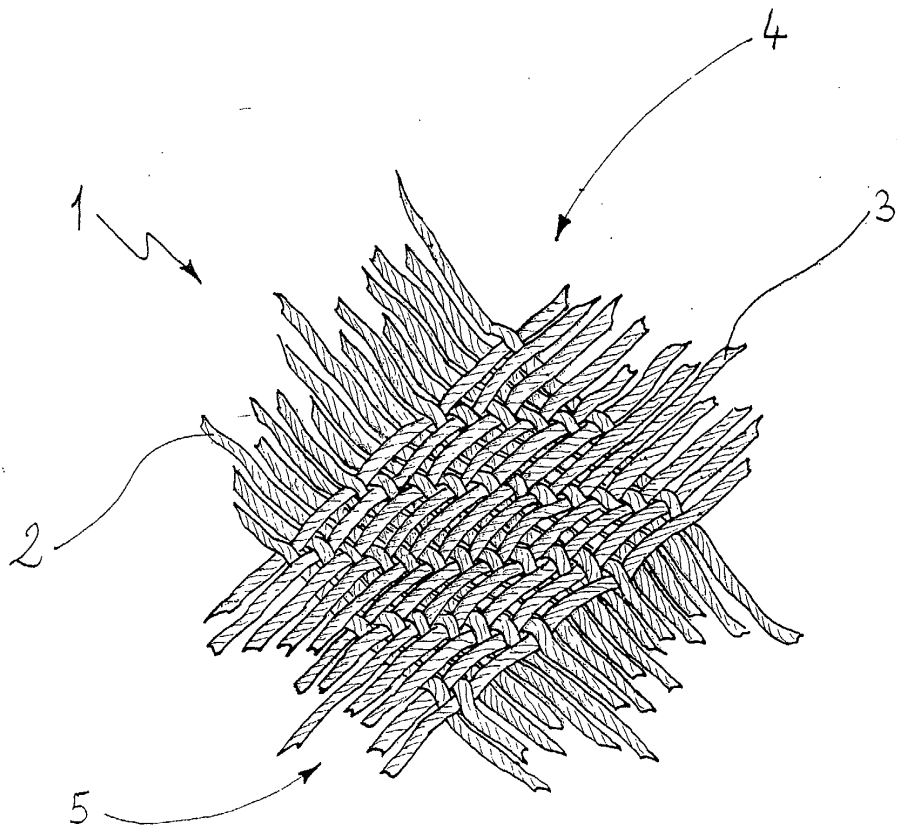


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5400

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.7)
A	EP 0 563 757 A (YOSHIDA KOGYO KK) 6 October 1993 (1993-10-06) * column 1, line 37 - line 45 * * column 2, line 32 - line 38 * * column 3, line 6 - line 18 * ---	1-9	D06P3/82 D06P5/00 D06P5/20
A	FR 2 556 750 A (ARIEL) 21 June 1985 (1985-06-21) * page 1, line 3 - line 5 * * page 2, line 29 - line 32 * * example 1 * ---	1-9	
A	US 5 487 936 A (COLLIER SUSAN J) 30 January 1996 (1996-01-30) * column 2, line 31 - line 54 * * examples * -----	1-9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			D06P D03D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		3 December 2002	Fiocco, M
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 42 5400

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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03-12-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0563757	A	06-10-1993	JP	5277006 A	26-10-1993
			CA	2092655 A1	02-10-1993
			DE	69307754 D1	13-03-1997
			DE	69307754 T2	21-08-1997
			EP	0563757 A1	06-10-1993
			ES	2096791 T3	16-03-1997
			HK	128597 A	19-09-1997
			KR	9410797 B1	16-11-1994
			SG	71671 A1	18-04-2000
			US	5401555 A	28-03-1995
FR 2556750	A	21-06-1985	FR	2556750 A1	21-06-1985
US 5487936	A	30-01-1996	GB	2287966 A , B	04-10-1995
			IT	RM940848 A1	21-09-1995
			JP	8060563 A	05-03-1996