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(54) **Non-woven fabric**

(57) A non-woven fabric is described and is constituted by a textile substrate of bound fibres characterized in that it comprises at least 50% by weight of lyocell cellulose fibres. The non-woven fabric has good resistance

to pressure and to dyeing in a bath at a temperature above 80°C, and has an affinity for dyes similar to that of fabrics made of natural fibres. It can advantageously be used for lining garments which are dyed after the textile components have been assembled.

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Description

[0001] In general, the present invention relates to a non-woven fabric suitable for use as a textile component in clothing manufacture.

[0002] In particular, the present invention relates to a non-woven fabric of the above-mentioned type which has good resistance to pressure and to dyeing in a bath at temperatures greater than 80°C, and an ability to fix dyes (an affinity for dyes) similar to that of fabrics made of natural fibres, particularly cotton fabrics.

[0003] The term "non-woven fabric" (corresponding to the Italian term "tessuto non tessuto") means a flat textile structure having adequate cohesion and produced by a system other than those which provide for the interlacing of threads by weaving or the formation of a mesh.

[0004] Various known non-woven fabrics based on the cellulose fibre known as viscose, as well as non-woven fabrics made of one or more synthetic fibres such as, for example, polyethylene, polypropylene, polyester and polyamide fibres, are known.

[0005] These non-woven fabrics are generally constituted by a carded web of fibres or a plurality of superimposed layers of fibres in which the fibres of the web and of the layers are bound by mechanical or chemical processes.

[0006] Of the various uses of non-woven fabrics, that in which they are used as textile components in clothing manufacture, particularly as linings, are becoming ever more important because non-woven fabrics are relatively easy and inexpensive to produce in comparison with conventional fabrics.

[0007] In this field, as is known, there is an ever increasing tendency to perform dyeing on the already almost finished garment, that is, after its fabric components, constituted by fabrics made of natural fibres and off-white non-woven fabrics, have been fully or partially assembled to produce the finished or semifinished garment.

[0008] This dyeing is generally performed in a bath containing the preselected dye at temperatures above 80°C for a period of about 1 hour.

[0009] However, although the non-woven fabrics of the prior art have satisfactory mechanical properties, for example, of cohesion and flexibility, and a reasonably soft feel, up to now there is still no non-woven fabric which can claim good resistance to dyeing temperatures and, at the same time, an affinity for dyes similar to that of fabrics made of natural fibres, particularly cotton fabrics.

[0010] In fact, although viscose non-woven fabrics have affinities for dyes similar to those of cotton, they have the serious disadvantage that they tend to be deformed to a large extent during dyeing and to shrink, losing the desired mechanical properties.

[0011] Moreover, they also show a certain tendency to delamination, that is, to detachment of the layers of

fibres of which they are composed, which do not adhere to one another adequately.

[0012] On the other hand, non-woven fabrics made of synthetic fibres have the disadvantage of having an affinity for dyes which is very different from that of natural fibres, particularly cotton although, in the case of polyester or polyamide non-woven fabrics, they show a better resistance to the dyeing process.

[0013] To prevent this problem, a garment containing a non-woven fabric made of synthetic fibres has to be subjected to a double dyeing process but this leads to a considerable increase in production costs.

[0014] As mentioned above, non-woven fabrics are often used in clothing manufacture as linings or padding for finished garments.

[0015] In this application, the non-woven fabric is treated with a thermo-adhesive resin and is applied to the already substantially made-up garment, which has not yet been subjected to dyeing, at a temperature and a pressure which are adequate to bring about fusion of the resin and adhesion of the non-woven fabric to the garment (for example, a temperature above 135°C and a pressure of 0.35 kg/cm²).

[0016] However, the above-mentioned non-woven fabrics, particularly viscose fabrics, do not adequately stand up to the aforementioned application conditions and their mechanical properties often deteriorate.

[0017] Moreover, when the lined garment is immersed in the dye bath, linings made of the above-mentioned non-woven fabrics sometimes tend to be detached from the textile substrate to which they have been made to adhere.

[0018] The technical problem upon which the present invention is based is that of providing a non-woven fabric which has good resistance to pressure and to dyeing in a bath at temperatures greater than 80°C and, at the same time, an affinity for dyes similar to that of fabrics made of natural fibres, particularly cotton fabrics, so as to be usable in the manufacture of clothing without having the disadvantages mentioned above with reference to the prior art.

[0019] This problem is solved by a non-woven fabric constituted by a textile substrate made of bound fibres and characterized in that it comprises at least 50% by weight of lyocell cellulose fibres.

[0020] The non-woven fabric of the present invention preferably comprises at least 70% by weight of lyocell cellulose fibres.

[0021] A non-woven fabric in which the fibres of the textile substrate are exclusively lyocell cellulose fibres is particularly preferred.

[0022] The term "lyocell" is intended to define a class of cellulose fibres produced by a substantially physical method of processing cellulose which comprises extrusion, in a coagulation bath, of solutions of wood pulp dissolved in a solvent constituted basically by a tertiary-amine N-oxide.

[0023] It should be noted that lyocell cellulose fibres

have a greater purity than cellulose fibres produced by other known methods such as, for example, the viscose method in which the cellulose is first converted chemically into an alkali-soluble derivative thereof (xanthogenate) and is then regenerated by treatment with acids.

[0024] It has surprisingly been found that a non-woven fabric according to the invention comprising at least 50% of lyocell cellulose fibres retains substantially unchanged mechanical properties and undergoes no significant changes when it is subjected to dyeing in a bath at temperatures above 80°C.

[0025] It can thus advantageously be used as a textile component in the manufacture of clothes which are to be dyed after the assembly of the textile components.

[0026] Moreover, the non-woven fabric according to the invention has affinities for dyes similar to those of fabrics made of natural fibres, so that a garment which contains the non-woven fabric of the invention does not require a double dyeing process.

[0027] In particular, when the non-woven fabric according to the invention has been treated with a thermo-adhesive resin, it can advantageously be used as a lining or padding for garments, since it can withstand the application pressures and temperatures.

[0028] According to one embodiment of the invention, in addition to lyocell cellulose fibres, the non-woven fabric also comprises fibres of other materials such as viscose, polyester and polyamide, in percentages by weight which vary from 1% to 50%, preferably from 1% to 30%.

[0029] The non-woven fabric of the invention may possibly comprise from 1% to 10% by weight of a chemical binder for the fibres.

[0030] The binder may be a thermoplastic polymer having a melting point below 160°C, selected from the group comprising polyester, polypropylene and mixtures thereof, or a conventional thermoplastic resin with an acrylic, vinyl, styrene, or butadiene base, or a mixture thereof, in aqueous solution.

[0031] According to one embodiment of the invention, the thermoplastic polymer is present in the textile substrate of the non-woven fabric of the invention in the form of partially fused fibres.

[0032] The textile substrate of the non-woven fabric according to the invention may be constituted by a single carded web of fibres or by superimposed layers of fibres.

[0033] The textile substrate is formed in accordance with conventional methods which comprise dry or wet processes.

[0034] According to one embodiment of the invention, the non-woven fabric has a total weight of less than 70g/m², preferably from 30g/m² to 60g/m².

[0035] According to a preferred embodiment of the invention, the fibres of the non-woven fabric are bound by a conventional method of interlacing with water (also known by the English term hydroentanglement).

[0036] In this process, the textile substrate in the form of a carded web or layers of fibres is generally transport-

ed on a perforated support, for example, an endless belt, possibly rolled by suitable rollers, and then passed, still on the support, under a ramp of nozzles with circular orifices of predetermined diameter and relative spacing.

[0037] Water is passed through the nozzles under pressure so as to entangle the fibres of the textile substrate, giving rise to a non-woven fabric which is compact and at the same time soft and strong and which, finally, is dried.

[0038] Alternatively, the fibres of the textile substrate may be bound by a chemical binder such as those mentioned above, with the use of conventional dry binding processes known in the field by the English term "dry laid".

[0039] For example, the binder (thermoplastic polymer or resin) in powder or diluted form, is sprayed onto the textile substrate or is applied thereto in a manner similar to that used for printing fabrics.

[0040] In any case, after application, the binder is melted and any solvent is at the same time removed.

[0041] Alternatively, the textile substrate of the non-woven fabric may comprise fibres of a thermoplastic polymer having a melting point below 160°C and the fibres may be bound by a conventional method known by the English term "spun laid" in which the thermoplastic polymer is partially melted by passing the textile substrate between rollers heated to a predetermined temperature.

[0042] According to another embodiment of the invention, a thermoplastic resin having a melting point above 115°C is applied by a resin-dot coating method to a surface of the textile substrate of the non-woven fabric, so as to have a total weight within the range of 10-20 g/m².

[0043] The resin-dot coating may be performed with resin in powder form by a method known in the art as powder-dot coating, or may be performed with resin in the form of paste with emulsifiers, plasticizers and possibly other conventional additives, by one of the methods known in the art as paste-dot coating and double-dot coating.

[0044] The resin applied to the textile substrate of the non-woven fabric according to the invention may be a polyamide, polyester or polyurethane thermoplastic resin.

[0045] It is important that the resin should have a melting point above 115°C, preferably from 125°C to 140°C, in order adequately to withstand the dyeing of the garment in a bath at temperatures above 80°C.

[0046] The characteristics and advantages of the invention will become clearer from the following description of examples of the use of non-woven fabrics according to the invention and from the description of comparison examples relating to some known non-woven fabrics, these descriptions being given by way of non-limiting example.

EXAMPLE 1

[0047] A textile substrate composed of a web of lyo-

cell cellulose fibres was prepared by a wholly conventional carding and folding method.

[0048] The fibres of the web were then bound together by a hydroentanglement method, in conventional manner.

[0049] A non-woven fabric which had good mechanical properties was thus produced and, in particular, had the following characteristics:

Weight: 50 g/m² according to EDANA method 40.3-90

Density: 118g/dm³

[0050] Breaking load according to EDANA method 20.2-89:

MD dry = 120 N/5cm longitudinal dry
MD moist = 120 N/5cm longitudinal dry
CD dry = 60 N/5cm transverse dry
CD moist = 70 N/5cm transverse wet

[0051] A polyamide thermoplastic resin was then applied to a surface of the non-woven fabric by a conventional powder-dot resin-coating method so as to have a weight of 15g/m².

[0052] The resin had a melting point of 123°C and the characteristic of good resistance to washing in water above 80°C.

[0053] A part of a cotton jacket, in the specific case, the shoulder portion, which had not yet been dyed, was lined with a sample of the non-woven fabric in conventional manner, at a temperature of 150°C and with an application pressure of 0.500kg/cm² so that the resin was melted and the non-woven fabric was made to adhere to the shoulder portion.

[0054] Upon completion of the lining, the sample of non-woven fabric had no significant deformation or shrinkage.

[0055] The shoulder portion thus lined was then immersed in a dye bath containing Direct Red 81 (Colour Index number) dye and having a temperature of 90-95°C and was subjected to washing for 1 hour in accordance with normal methods for dyeing cotton.

[0056] Upon completion of the washing, the non-woven fabric according to the invention remained perfectly adhering to the shoulder portion, retained substantially unchanged mechanical properties, and was dyed in the same manner as the shoulder portion.

EXAMPLE 2 (Comparison)

[0057] A non-woven fabric made of conventional viscose fibres was prepared by the method described in Example 1.

[0058] The viscose non-woven fabric had the following characteristics:

Weight: 50 g/m² according to EDANA method

40.3-90

Density: 98g/dm³

[0059] Breaking load according to EDANA method 20.2-89:

MD dry = 55 N/5cm longitudinal dry
MD moist = 30 N/5cm longitudinal dry
CD dry = 25 N/5cm transverse dry
CD moist = 12 N/5cm transverse wet

[0060] The viscose non-woven fabric was coated with resin and was used to line the shoulder portion of a cotton jacket in the manner described in Example 1 and the lined shoulder portion was dyed as indicated in the aforesaid example (washing at 90-95°C for 1 hour).

[0061] Upon completion of the washing, although the viscose non-woven fabric was dyed completely in the same manner as the cotton shoulder portion to which it had been made to adhere, it was completely deformed and delaminated.

EXAMPLE 3 (Comparison)

[0062] A non-woven fabric made of 100% polyester fibres was prepared by the method described in Example 1 and had the following characteristics:

Weight: 50 g/m² according to EDANA method 40.3-90
Density: 119g/dm³

[0063] Breaking load according to EDANA method 20.2-89:

MD dry = 140 N/5cm longitudinal dry
MD moist = 160 N/5cm longitudinal dry
CD dry = 70 N/5cm transverse dry
CD moist = 70 N/5cm transverse wet.

[0064] The non-woven polyester fabric was coated with resin and used to line the shoulder portion of a cotton jacket in the manner described in Example 1 and the lined shoulder portion was then dyed as indicated in the aforesaid example (washing at 90-95°C for 1 hour).

[0065] Upon completion of the washing, the polyester non-woven fabric showed moderate characteristics of stability and adhesion to the cotton shoulder portion to which it had been made to adhere, although the final product was slightly deformed because of the different shrinkage characteristics of the coupled fibres.

[0066] However, the polyester non-woven fabric did not show the same coloration as the cotton shoulder portion since it did not have the same affinity for dyes as natural fibres.

[0067] This problem can be solved only by performing a double dyeing of the garment which, however, considerably increases production costs.

EXAMPLE 4

[0068] A non-woven fabric according to the invention, constituted by a textile substrate containing 70% of lyocell cellulose fibres and 30% polyester fibres was prepared by the method described in Example 1.

[0069] The non-woven fabric had the following characteristics:

Weight: 50 g/m² according to EDANA method 40.3-90

Density: 118g/dm³

[0070] Breaking load according to EDANA method 20.2-89:

MD dry = 130 N/5cm longitudinal dry

MD moist = 150 N/5cm longitudinal dry

CD dry = 70 N/5cm transverse dry

CD moist = 70 N/5cm transverse wet.

[0071] The non-woven fabric of the invention was coated with resin and used to line the shoulder portion of a cotton jacket in the manner described in Example 1 and the lined shoulder portion was then dyed as indicated in the aforesaid example (washing at 90-95°C for 1 hour).

[0072] Upon completion of the washing, the non-woven fabric according to the invention remained perfectly adhering to the shoulder portion, retained substantially unchanged mechanical properties, and had a colour slightly lighter than that of the shoulder portion.

[0073] This colour difference was, however, considered acceptable in the clothing manufacturing field.

Claims

1. A non-woven fabric constituted by a textile substrate of bound fibres and characterized in that it comprises at least 50% by weight of lyocell cellulose fibres.
2. A non-woven fabric according to Claim 1, characterized in that it comprises at least 70% of lyocell cellulose fibres.
3. A non-woven fabric according to Claim 1, in which the fibres are lyocell cellulose fibres.
4. A non-woven fabric according to Claim 1, characterized in that it comprises, as a percentage by weight, from 1 to 50% of fibres of a material selected from the group comprising viscose, polyester and polyamide.
5. A non-woven fabric according to Claim 2, characterized in that it comprises, as a percentage by

weight, from 1 to 30% of fibres of a material selected from the group comprising viscose, polyester and polyamide.

6. A non-woven fabric according to any one of the preceding claims, in which the textile substrate is constituted by a carded web of fibres or by superimposed layers of fibres.
7. A non-woven fabric according to any one of the preceding claims, in which the fibres are bound by hydroentanglement.
8. A non-woven fabric according to any one of the preceding claims, in which the textile substrate comprises from 1% to 10% by weight of a binder for the fibres.
9. A non-woven fabric according to Claim 8, in which the binder is a thermoplastic polymer having a melting point below 160°C, selected from the group comprising polyester, polypropylene, and mixtures thereof.
10. A non-woven fabric according to Claim 8, in which the binder is a thermoplastic resin with an acrylic, vinyl, styrene or butadiene base or a mixture thereof, in aqueous solution.
11. A non-woven fabric according to claim 9, in which the thermoplastic polymer is present in the textile substrate in the form of partially fused fibres.
12. A non-woven fabric according to any one of the preceding claims, in which a surface of the textile substrate is provided with a thermoplastic resin having a melting point above 115°C, the resin being applied to the surface by a resin-dot coating method and in a manner such as to have a weight of 10-20 g/dm².
13. A non-woven fabric according to Claim 12, in which the resin-dot coating is performed by a powder-dot, paste-dot or double-dot coating method.
14. A non-woven fabric according to claim 12 or Claim 13, in which the thermoplastic resin has a melting point within the range of 125-140°C.
15. A non-woven fabric according to any one of Claims 12 to 14, in which the thermoplastic resin is a polyamide or polyester resin.
16. A non-woven fabric according to any one of the preceding claims, characterized in that it has a total weight of less than 70g/m², preferably from 30 g/m² to 60 g/m².
17. Use of a non-woven fabric according to any one of

the preceding claims in the production of clothing.

- 18.** Use of a non-woven fabric according to any one of Claims 12 to 16 for lining garments.

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- 19.** Use according to Claim 18, in which the garments are dyed after the textile components have been assembled.

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EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0025

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION
X	WO 97 19213 A (INT PAPER CO) 29 May 1997 (1997-05-29) * page 8, line 21 - page 9, line 27 * ---	1-3,7	D04H1/42 D04H1/46 D04H1/54
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			TECHNICAL FIELDS SEARCHED
			D04H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		25 August 1999	V Beurden-Hopkins, S
CATEGORY OF CITED DOCUMENTS		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	
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			

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

EP 99 83 0025

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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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82