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(54) METHOD FOR MANUFACTURING A NONWOVEN FABRIC AND NONWOVEN FABRIC MANUFACTURED BY SAID METHOD

(57) The method for manufacturing a nonwoven fabric comprises a fiber carding step and a fiber hydroentangling step for forming a web, wherein it also comprises a calendering step of said web.

The nonwoven fabric manufactured by said method comprises fibers forming substantially parallel stripes.

This nonwoven fabric resulting from the method according to the present invention is adaptable to irregular surfaces. Moreover, and opposite to the calender bonded nonwoven fabrics, the cost of the method according to the present invention is low, since the fibers are water jet bonded.

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Description

[0001] The present invention refers to a method for manufacturing a nonwoven fabric and to a nonwoven fabric manufactured by said method.

Background of the invention

[0002] Several technologies to manufacture nonwoven fabrics are known. Basically, these techniques differ in the web formation method (raw material feeding and preparation) and/or the web bonding method.

[0003] Therefore, the raw material to produce nonwovens can be continuous yarn, staple fibers or pulp.

[0004] In the case of staple fibers, the web formation method consists of carding the fibers and a web bonding step that can be carried out mechanically by hydroentangling (the fibers are sewed by high pressure water jet spray) or needle-punching (the fibers are sewed by needles); chemically (by adding a polymeric bonding agent in order to bind the fibers); or thermally (the fibers are bonded under heating with air or calendering).

[0005] The main applications of the nonwoven fabrics are in the hygiene, medical, industrial and geotextiles markets.

[0006] The nonwoven fabric spunlace manufacturing method combines the staple fibers carding and hydroentangling steps.

[0007] It is known that the spunlace nonwoven method and the resulting fabrics present the following advantages with regards to the other nonwoven technologies mentioned above:

- Free of Chemical Additives: the spunlace is the most suitable method to produce materials with final use in contact with the skin, since no chemical substance is added on the fabric.
- Low Cost: higher production output than the needle-punching method and there is no need to subject the web to long drying times to bond the fibers
- No Change of the Fiber Structure during web bonding. As a result, the intrinsic properties of the fibers are preserved in the spunlace fabric.
- Textile Hand Feel: opposite to the thermally and chemically point-bonded nonwovens, the spunlace fabric show a uniform bonding, which results in a textile hand feel, like a towel.
- High Conformability: due to staple fiber entanglement, the spunlace products present good adaptability to irregular surfaces.
- High Liquid Absorption: opposite to the continuous yarn containing nonwoven products (spunbonded or meltblown nonwoven fabrics), the spunlace products present high liquid absorption, due to the resulting capillarity when making the nonwovens with staple fibers.
- Softness and Bulkiness, as a result of the carding and hydroentangling method steps.

[0008] Anyway, there are certain applications that require very thin (not bulky) nonwovens, so a standard spunlace nonwoven fabric does not meet the demanded specifications.

[0009] The nonwoven fabrics thickness or caliper is measured according to the EDANA Test Method NWSP 120.6.R0 (15) and it is expressed in mm.

[0010] Even though the nonwoven fabrics caliper depends on the material basis weight (g/m^2), the thickness of a standard spunlace product is higher than 0,20 mm.

[0011] So, the current nonwoven manufacturing methods to achieve nonwoven fabrics thinner than 0,20mm are the spunbond, meltblown and calender bonded technologies.

[0012] However, these technologies present the following limitations:

The spundbonded and meltblown nonwoven fabrics are made of filaments (instead of staple fibers), which results in very rigid fabrics that are not adaptable to irregular surfaces.

[0013] In addition, the continuous yarn containing nonwoven products (spunbonded or meltblown nonwoven fabrics), present low capillarity, which results in a low liquid absorption and, consequently, poor compatibility with liquids, such as water, but also liquid resins or waxes.

[0014] On the other hand, the calender bonded products present good adaptability, since they are made of staple fibers, but the calender bonding production costs are high, due to the low speed needed to fix the fibers by heat transfer.

[0015] Therefore, the objective of the following invention is to provide a nonwoven fabric produced by carding and hydroentangling and, subsequently, calendering, so the resulting nonwoven fabric presents a low caliper.

[0016] In addition, and opposite to the spunbonded and meltblown nonwovens, this nonwoven fabric resulting from the method is adaptable to irregular surfaces.

[0017] Moreover, and opposite to the calender bonded nonwoven fabrics, the cost of the method according to the present invention is low, since the fibers are water jet bonded.

Description of the invention

[0018] With the nonwoven fabric and the method according to the present invention it is possible to solve said drawbacks, providing other advantages that are described below.

[0019] According to a first aspect, the present invention refers to a method for manufacturing a nonwoven fabric, comprising a fiber carding step and a fiber hydroentangling step for forming a web, wherein the method also comprises a calendering step of said web.

[0020] Preferably, said calendering step is carried out at a temperature from 60 °C and 280 °C and applying a pressure from 40 N/mm and 300 N/mm.

[0021] According to a preferred embodiment, said fibers are staple fibers, being natural fibers, synthetic fibers or a mixture of natural and synthetic fibers.

[0022] According to second aspect, the present invention refers to a nonwoven fabric manufactured by the method described previously, the nonwoven fabric comprising fibers forming substantially parallel stripes.

[0023] According to a preferred embodiment, said stripes have a width from 0.05 mm and 1.0 mm.

[0024] Said fibers are natural fibers, synthetic fibers, or a mixture of natural and synthetic fibers.

[0025] As stated previously, the resulting nonwoven fabric according to the present invention, manufactured by the method according to the present invention presents a low caliper, e.g. lower than 0.20 mm.

[0026] In addition, this nonwoven fabric resulting from the method according to the present invention is adaptable to irregular surfaces.

[0027] Moreover, and opposite to the calender bonded nonwoven fabrics, the cost of the method according to the present invention is low, since the fibers are water jet bonded.

Brief description of the drawings

[0028] For a better understanding the above explanation and for the sole purpose of providing an example, some non-limiting drawings are included that schematically depict a practical embodiment.

[0029] Figure 1 is a diagrammatical plan view of the nonwoven fabric according to the present invention, showing the substantially parallel stripes.

Description of preferred embodiments

[0030] Firstly, the present invention refers to a nonwoven fabric resulting of spunlacing (carding and hydroentangling) a plurality of staple fibers forming a web and, subsequently, calendering said web.

[0031] In this case, the calendering step is not carried out to bond the fibers, but to reduce the fabric thickness.

[0032] So, the spunlace nonwoven fabric obtained presents a significantly thinner caliper than the standard spunlace materials.

[0033] Anyway, the spunlace nonwoven obtained with the method according to the present invention preserves the good adaptability of the fabric to irregular surfaces.

[0034] In addition, as a result of the water jet fiber bonding, the nonwoven fabric of the invention shows a uniform bonding, which can be appreciated by visual analysis under an optical microscope.

[0035] In fact, the water jet uniform boding results in 0.05 - 1.0 mm wide parallel stripes in machine direction separated between 0.5 - 1.5 mm, which differentiate a hydroentangled nonwoven fabric from other technologies, such as calender bonded, thermal bonded or chemical bonded.

[0036] These wide parallel stripes are shown in Fig. 1.

[0037] Regarding the feedstock, the fibers source can be natural (such as Viscose, Lyocell or PLA), synthetic (like PET, PP, PE or bi-component fibers) or a blend of natural source fibers and synthetic fibers.

[0038] Moreover, the spunlace nonwoven fabric of the invention presents a basis weight between 25 and 90 g/m^2.

[0039] The nonwoven manufacturing method according to the present invention comprises the following steps:

- Web forming by staple fibers carding;
- Web bonding by staple carded fibers hydroentanglement;
- Calendering of the hydroentangled web.

[0040] So, according to the present invention, the spunlace nonwoven manufacturing method comprises an additional calendering final treatment of the hydroentangled web, which differentiates it from the standard spunlace production method.

[0041] In addition, and opposite to the calender bonding technology, the method of the invention is a low-cost method, since the fibers are water jet bonded.

[0042] This additional calendering step of the spunlaced web is carried out preferably at a temperature between 60 and 280 °C and a nip pressure between 40 N/mm and 300 N/mm.

- Examples

[0043] In the following table, two examples of nonwoven fabrics of the present invention are shown and the resulting caliper is compared to similar composition and basis weight standard spunlace materials (references):

EXAMPLE	NONWOVEN FABRIC COMPOSITION			PRODUCTION PROCESS STEPS				Caliper (mm)
						Calendering		
	Basis Weight (g/m^2)	Type and % Natural source Fibers	Type and % Synthetic Fibers	Carding	Hydro-entanglement	Pressure (N/mm)	Temperature (°C)	
Example 1	35	-	100% Polyester	YES	YES	110	230	0.08
Reference (Standard spunlace fabric)	35	-	100% Polyester	YES	YES	NO		0.58

EXAMPLE	NONWOVEN FABRIC COMPOSITION			NONWOVEN FABRIC COMPOSITION				Caliper (mm)
	Basis Weight (g/m^2)	Type and % Natural source Fibers	Type and % Synthetic Fibers	Carding	Hydroen tanglement	Calendering		
						Pressure (N/mm)	Temperature (°C)	
Example 2	50	70% Viscose	30% Polyester	YES	YES	200	80	0,17
Reference (Standard spunlace fabric)	50	70% Viscose	30% Polyester	YES	YES	NO		0,66

[0044] Even though reference has been made to a specific embodiment of the invention, it is obvious for a person skilled in the art that the method and the nonwoven fabric described herein are susceptible to numerous variations and modifications, and that all of the details mentioned can be substituted for other technically equivalent ones without departing from the scope of protection defined by the attached claims.

Claims

1. Method for manufacturing a nonwoven fabric, comprising a fiber carding step and a fiber hydroentangling step for forming a web, **characterized in that** it also comprises a calendering step of said web.

2. Method for manufacturing a nonwoven fabric according to claim 1, wherein said calendering step is carried out at a temperature from 60 °C and 280 °C.

3. Method for manufacturing a nonwoven fabric according to claim 1 or, wherein said calendering step is carried out applying a pressure from 40 N/mm and 300 N/mm.

4. Method for manufacturing a nonwoven fabric according to claim 1, wherein said fibers are staple fibers.

5. Method for manufacturing a nonwoven fabric according to claim 1 or 4, wherein said fibers are natural fibers.

6. Method for manufacturing a nonwoven fabric according to claim 1 or 4, wherein said fibers are synthetic fibers.

7. Method for manufacturing a nonwoven fabric according to claim 1 or 4, wherein said fibers are a mixture of natural and synthetic fibers.

8. Nonwoven fabric manufactured by the method according to anyone of the previous claims, **characterized in that** the nonwoven fabric comprising fibers forming substantially parallel stripes.

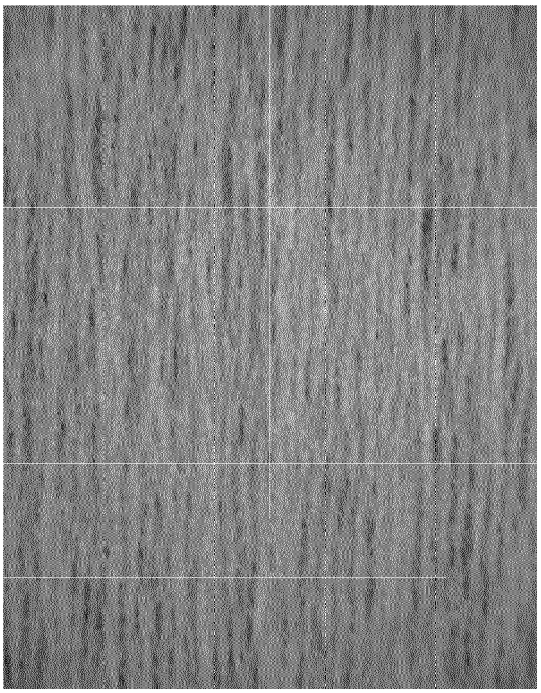
9. Nonwoven fabric according to claim 8, wherein said stripes have a width from 0.05 mm and 1.0 mm.

10. Nonwoven fabric according to claim 8, wherein said fibers are natural fibers.

11. Nonwoven fabric according to claim 8, wherein said fibers are synthetic fibers.

12. Nonwoven fabric according to claim 8, wherein said fibers are a mixture of natural and synthetic fibers.

FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 19 38 2116

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2018/105965 A1 (POURDEYHIMI BEHNAM [US] ET AL) 19 April 2018 (2018-04-19) * paragraph [0065]; figure 1 * -----	1-12	INV. D04H1/49 D04H1/558
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A	EP 2 692 924 A1 (SUOMINEN CORP [FI]) 5 February 2014 (2014-02-05) * abstract * -----	1-12	
A	WO 2006/044295 A1 (PROCTER & GAMBLE [US]; GORLEY RONALD THOMAS [US] ET AL.) 27 April 2006 (2006-04-27) * claim 8; example 2 * -----	1-12	TECHNICAL FIELDS SEARCHED (IPC) D04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	26 June 2019	Saunders, Thomas

CATEGORY OF CITED DOCUMENTS

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