

(19)



(11)

EP 1 811 079 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

25.07.2007 Bulletin 2007/30

(51) Int Cl.:

D06M 23/00 (2006.01)

D06B 21/00 (2006.01)

(21) Application number: **06100798.5**

(22) Date of filing: **24.01.2006**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

Designated Extension States:

AL BA HR MK YU

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(54) **Method of Producing a Windproof and Air-Permeable Knit Fabric**

(57) The present invention provides a method for producing a windproof and air-permeable single-layer knit fabric through several simple steps of designing, desizing, and brushing.

EP 1 811 079 A1

Description

Field of the invention

[0001] The present invention relates to producing a knit fabric; more particularly, it relates to obtaining a windproof and rainproof single-layer knit fabric through a specific engineering.

Description of the Related Art(s)

[0002] A prior art, "a fast-dry and windproof functional fabric with high air permeability and high moisture permeability", is proclaimed in Taiwan, comprising an anion-base polyester fabric, a surface fabric and a Teflon (Polytetrafluoroethylene) film. The Teflon film is deposited between the polyester fabric and the surface fabric. The polyester fabric is a hydrophile fabric. And, the Teflon film is waterproof, windproof and vapor permeable.

[0003] Another prior art, "Waterproof and Moisture-permeable Elastic Fabric with Layers", is proclaimed in Taiwan, where, the elastic fabric comprises a layer of stretchable material having elastic essence; a polymer film with air permeability, water resist, and elasticity as that of the stretchable material; and an adhesive to adhere the layer of stretchable material to the polymer film with discontinuous segments.

[0004] A third prior art, "Moisture-Permeable Fabric with Environmental-Protection Water-base Resin and a Producing Method Thereof", is proclaimed in Taiwan, where a method for producing the fabric includes the following steps: (a) The fabric is gone through a general pre-process to obtain a pick-up rate of 5~25%. (b) A water-base resin is coated at the bottom in an amount of 70~200g/m², a foaming rate of 1:3~1:7, and a drying temperature of 60~150°C for 45 seconds to 1 minute; and is squeezed. (c) A water-base PU resin is coated in an amount of 100~150g/m², a drying temperature of 60~150°C per 0.5~1.5 minutes, and a heat-treatment temperature of 120~200°C per 0.5~2.5 minutes. Consequently, an environmental protection fabric is obtained having a water-resistance more than 5000mm.H₂O and a moisture permeability more than 5000g/m²/Day.

[0005] Although the above prior arts are waterproof, they comprise multi-layers so that the fabrics are thick and the producing methods are complex. Hence, the prior art does not fulfill users' requests on actual use.

Summary of the invention

[0006] The main purpose of the present invention is to produce a windproof and rainproof single-layer knit fabric.

[0007] To achieve the above purpose, the present invention is a method for producing a windproof and air-permeable knit fabric, where the producing steps comprises designing the knit fabric with three parameters of characteristics; making a gray fabric; desizing the gray

fabric together with impurities and greasiness on a surface of the knit fabric removed as well as a process of shrinking tremendously; going through a brushing engineering comprising a high density process, a brushing process and a napping process; and, after obtaining nano-scale naps on the surface of the knit fabric through the above brushing engineering, going through a finish process with a special agent to obtain a finished product which is rainproof, winproof and air-permeable and follows the regulations of AATCC35 and ASTM D737. Accordingly, a novel method for producing a windproof and air-permeable knit fabric is obtained.

Brief descriptions of the drawings

[0008] The present invention will be better understood from the following detailed descriptions of the preferred embodiments according to the present invention, taken in conjunction with the accompanying drawings, in which

- FIG.1 is a view showing a flow chart according to a preferred embodiment of the present invention;
- FIG.2 is a view showing a flow chart of a brushing engineering according to the preferred embodiment of the present invention;
- FIG.3 is a view showing an examination result of a finished product according to the preferred embodiment of the present invention;
- FIG.4 is a view showing a knit fabric according to the preferred embodiment of the present invention;
- FIG.5 is a view showing a rain test according to the preferred embodiment of the present invention;
- FIG.6 is a view showing another knit fabric according to the preferred embodiment of the present invention;
- FIG.7 is a view showing another rain test according to the preferred embodiment of the present invention;

Description of the preferred embodiment

[0009] The following description of the preferred embodiment is provided to understand the features and the structures of the present invention.

[0010] FIG.1 is a view showing a flow chart according to a preferred embodiment of the present invention. As shown in the figure, the present invention is a method for producing a windproof and air-permeable knit fabric, comprising the following steps:

- (a) Designing a knit fabric 1: Characteristics of the knit fabric are decided by using three parameters of a yarn count, a weaving and a yarn character. The yarn count is a value between 1 and 0.1 denier; the weaving comprises a parameter for obtaining a fabric with a high density between 40 and 45 courses per inch; and, the yarn character is a shrinkage rate between 30% and 50% in a boiling water.

(b) Obtaining a gray fabric 2: The gray fabric is made by a machine according to the above three parameters.

(c) Desizing 3: Two processes are done: a cleaning process of removing impurities and greasiness on a surface of the knit fabric to obtain a clearer surface with fewer blemishes; and a process of shrinking tremendously to obtain thickness and elasticity.

(d) Pre-setting 4: The knit fabric is processed through a pre-setting 4 under a temperature between 170°C and 190°C after the desizing to avoid influence on the original structure while going through the following steps for making the knit fabric.

(e) Dyeing 5: The knit fabric after pre-setting is dipped into a dyestuff. The dyestuff is heated with water mixed. The knit fabric is stirred in the dyestuff to be dyed evenly. The dyed fabric is washed with a color fixing agent added to fix color.

(f) Going through a brushing engineering 6: The knit fabric after dyeing is gone through a brushing engineering to obtain a feel of hand. The brushing engineering comprises a plurality of processes to obtain a structure of the knit fabric to be windproof and waterproof with nano-scale naps of high density. Please refer to FIG.2, which is a view showing a flow chart of the brushing engineering according to the preferred embodiment of the present invention. As shown in the figure, the brushing engineering comprises a plurality of processes, including a high density process 61, a brushing process 62 and a nano-scale napping process 63.

(g) Going through a finish process 7: The knit fabric after brushing engineering, which has nano-scale naps, is dipped in a special agent, which is a nano-scale fluoride, to obtain a windproof and rainproof surface.

[0011] FIG.3 is a view showing an examination result of a finished product according to the preferred embodiment of the present invention. As shown in the figure, the finished product is gone through a windproof and air-permeability test. The windproof and air-permeability test follows the regulations of ASTM D737. The rain test follows the regulations of AATCC 35. The finished product is certificated by passing these tests. The finished product made with the above steps obtains characteristics of light-weight, comfortable feeling, rainproof and windproof surface, and elasticity. The knit fabric is rainproof for resisting a rain pressure below 600mmhg and is windproof for resisting a wind pressure around 20~50ft³/ft³xmin.

[0012] FIG.4 through FIG.7 are views showing a knit fabric, a rain test, another knit fabric and another rain test, according to the preferred embodiment of the present invention. As shown in FIG.5 and FIG.7, the finished products are gone through a rain test; the water drops 9 do not permeate through the finished fabric products 8; and, so, the finished fabric products 8 comprises a rainproof characteristic.

[0013] To sum up, the present invention is a method for producing a windproof and air-permeable knit fabric, where, through several simple steps of designing, desizing, and brushing, a windproof, rainproof and elastic knit fabric is produced.

[0014] The preferred embodiment herein disclosed is not intended to unnecessarily limit the scope of the invention. Therefore, simple modifications or variations belonging to the equivalent of the scope of the claims and the instructions disclosed herein for a patent are all within the scope of the present invention.

Claims

1. Method of producing a windproof and air-permeable knit fabric, comprising the steps of:

- obtaining a gray fabric with a yarn count between 1 and 0.1 denier, a weaving of 40 to 45 courses per inch, and a yarn character of shrinkage between 30% and 50% in boiling water;
- desizing the gray fabric by shrinking it and removing impurities and greasiness from the surface of said fabric;
- pre-setting the fabric under a temperature between 170°C and 190°C after desizing;
- performing a brushing treatment including a brushing process and a napping process; and
- finishing the knit fabric after performing the brushing treatment by adding a nano-scale fluoride.

2. Method according to claim 1, comprising the steps of:

- (a) designing said knit fabric: with parameters of a yarn count between 1 and 0.1 denier, a weaving of 40 to 45 courses per inch, and a yarn character of shrinkage between 30% and 50% in boiling water;
- (b) obtaining a gray fabric: made by a machine with said parameters;
- (c) desizing: with a high shrinkage together with a removal of impurities and greasiness on a surface of said knit fabric;
- (d) pre-setting: under a temperature between 170°C and 190°C for said knit fabric after said desizing;
- (e) dyeing: by dipping said knit fabric into a dyestuff after said pre-setting;
- (f) going through a brushing engineering: comprising a high-density process, a brushing process and a napping process; and
- (g) going through a finish process: by adding a nano-scale fluoride to said knit fabric after said brushing engineering.

3. Method according to claim 1 or 2, wherein said knit

fabric is a filament fabric having shrinkage capability.

4. Method according to one of claims 1 to 3, wherein a surface of said knit fabric after said brushing engineering is a surface having nano-scale naps. 5
5. Method according to one of claims 1 to 4, wherein said weaving comprises a process of high density.
6. Method according to one of claims 1 to 5, wherein said yarn character comprises a high shrinkage. 10
7. Method according to one of claims 1 to 6, wherein said knit fabric obtains thickness and elasticity after said desizing. 15

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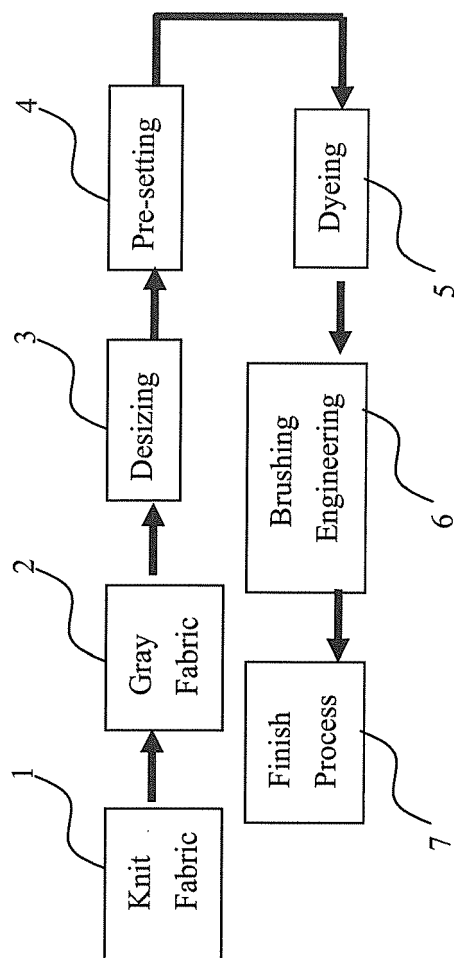


FIG.1

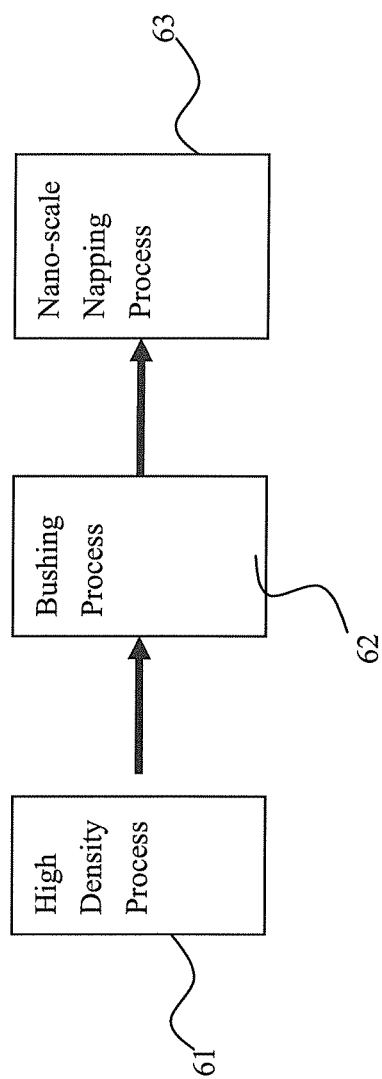


FIG.2

Test No.	Color	Air permeability (ft ³ /ft ² xmin)	Initial water repellency	Water repellency after 15 times of water-wash	Rain test (pass below 1g)
T7293	Black	32.1	80	80	11.50
	Cerise	33.6	90	90	12.00
	Khaki	31.6	80	80	10.80
	Navy	26.9	100	90	0.69
T7316	Orange	27.2	100	90	0.29
	Light purple	25.6	100	90	0.34
	Yellow	26.1	100	90	0.20
	Khaki	27.3	100	90	0.09
T7491	Orange	30.9	70	-	13.25
	Orange	28.1	100	-	0.09
T7499	Black	33.7	-	-	18.13
	Aquamarine	28.6	-	-	0.31
	Silver	29.3	-	-	0.12
T7601	Yellow	25.6	100	90	0.10
	Black	27.8	100	90	0.47
	Dark brown	26.9	100	90	0.15
	Dark brown	27.8	-	-	0.24
	Aquamarine	28.3	-	-	0.10
	Aquamarine	28	100	90	0.09
	Aquamarine	27.9	-	-	0.13
	Aquamarine	29.4	-	-	0.34
	Cerise	30.1	100	90	0.46
	Cerise	29.8	-	-	0.09
	Cerise	27.6	-	-	0.08
	Orange	31.9	100	90	0.08
T7635	Light khaki	25.7	100	90	0.81
T7704	Black	27.3	90	80	0.15
	Red	26.9	90	70	0.13
	Yellow	26.7	90	70	0.08
	Sapphire blue	29.1	90	80	0.38

FIG.3

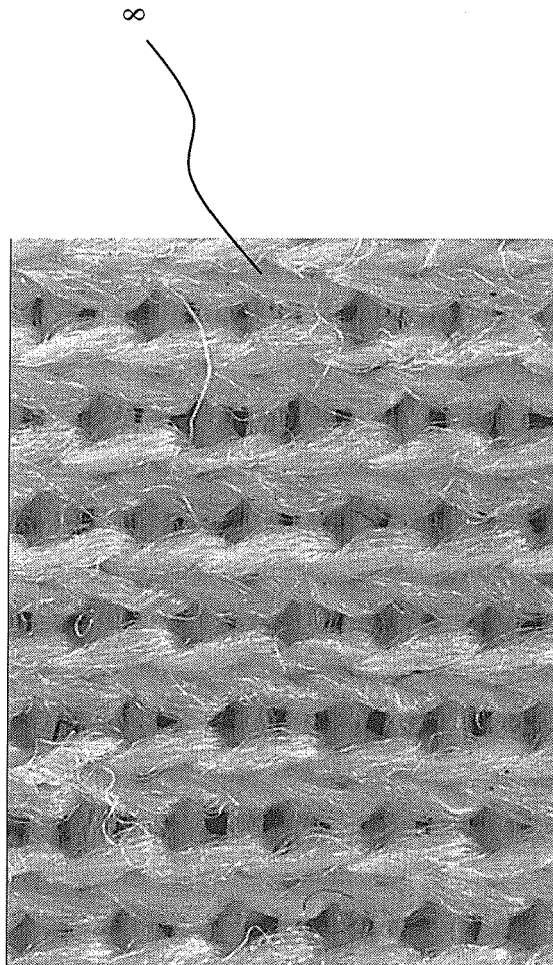


FIG.4

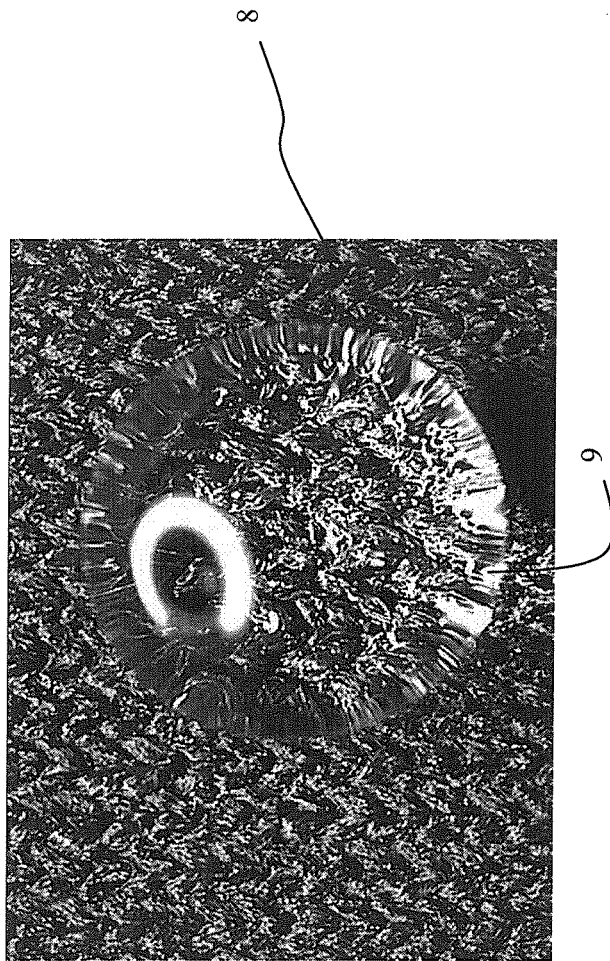


FIG.5

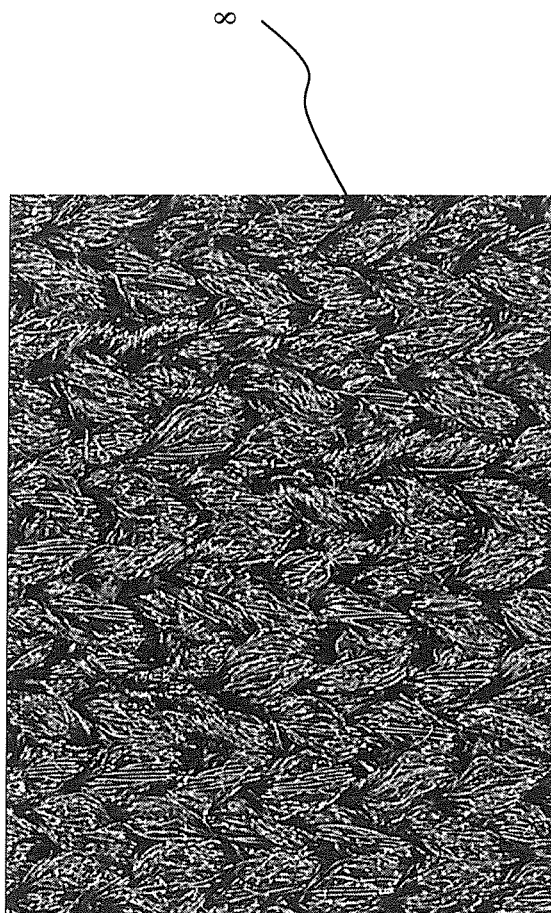


FIG.6

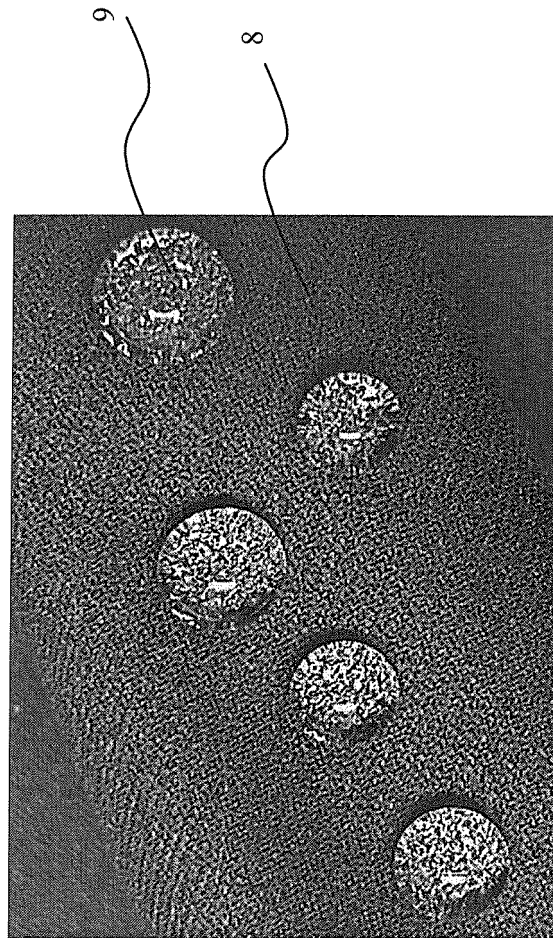


FIG.7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 10 0798

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Place of search The Hague		Date of completion of the search 18 December 2006	Examiner Blas, Valérie
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
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EP 06 10 0798

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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