(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 695 979 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
29.10.2014 Bulletin 2014/44

(51) Int Cl.:
D04B 1/16 *(2006.01)*

(21) Application number: **12178364.1**

(22) Date of filing: **06.08.2012**

(54) **Method for knitting a windproof fabric**

Verfahren zum Stricken winddichten Stoffs

Procédé de tricotage d'un tissu résistant au vent

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
12.02.2014 Bulletin 2014/07

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Printed by Jouve, 75001 PARIS (FR)

Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a method for knitting a windproof fabric, according to the preamble of claim 1 and as known from US 2007/125130.

Description of the Prior Art

[0002] The major methods for fabric manufacture are weaving and knitting. Woven fabric has the characteristics of high density, inelastic, starchy, and water resistant, while knitted fabric is low density, elastic, and soft and breathable. Different fabric manufacturing methods are used for different products. If clothes are made of woven fabric in order to be water resistant, the characteristics of high density and inelasticity of the woven fabric make the cloth relatively stiff and uncomfortable to wear. The knitted fabric 10, as shown in Figs. 1 and 2, has a relatively low density due to the loops 11 are relatively long, which makes the knitted fabric 10 soft and comfortable to wear. However, the low density knitted fabric 10 is not resistant to water. Also because the loops 11 are relatively long, the knitted fabric is relatively loose and more likely to be damaged.

[0003] US 2007/125130 A1 discloses a method for producing a windproof and air-permeable knit fabric through several steps of feeding a yarn at a predetermined feeding speed, and subjecting a surface of the knitted windproof fabric to a quality medication process.

[0004] WO 98/26118 A1 discloses a cloth consisting at least partially of fibers or yarns which are composed of at least two or more components with different melting points but manufactured from the same raw material.

[0005] EP 1 803 844 A1 discloses an air permeable woven or knitted fabric and clothes containing crimped composite filaments formed from a polyester resin component and a polyamide resin component different from each other in thermal shrinkage and bonded together in a side by side manner.

[0006] EP 1 403 410 A1 discloses insulated knitted fabric comprising a single layer or two or more layers, and at least an outer layer is composed of fibers having a single filament.

[0007] EP 0 908 544 A1 discloses a crimp-forming conjugate multifilament yarn comprising at least two polyester components with different heat-shrinkage properties, the components are combined in parallel with each other to form knitted products with unique surface texture and stretch ability.

[0008] However, there is still need to provide improved windproof and water resistant knitted fabric.

[0009] Moreover, the present invention has arisen to mitigate and/or obviate the afore-described disadvantages.

SUMMARY OF THE INVENTION

[0010] These objects are solved by a method for knitting a windproof fabric according to claim 1. Preferred embodiments are subject matter of the dependent claims. Accordingly, a method for knitting a windproof fabric is provided, wherein the fabric is knitted by a yarn which is made of two types of fibers which have different BWS (boiling water shrinkage) values, so that the knitted fabric is not only comfortable to wear, but also water resistant.

[0011] Further, a method for knitting a windproof fabric is provided, wherein the yarn is knitted at a predetermined knitting speed which is faster than the feeding speed, so as to increase the density of the knitted windproof fabric, and consequently achieving the function of windproof and water resistance.

[0012] A method for knitting a windproof fabric comprises the following steps:

feeding a yarn at a predetermined feeding speed, the yarn being made of two types of fibers which have different boiling water shrinkage values, a first type of the fibers being a 15D - 100D (Denier) polyester fiber with a BWS (boiling water shrinkage) value of 15 - 85 %, and a second type of the fibers being 15D ~ 100D polyester fiber with a BWS value of 0 ~ +15%, or a 20D - 160D Nylon fiber with a BWS value of 0 ~ +15%;
knitting the yarn into a knitted windproof fabric at a predetermined knitting speed which is 5 ~ 35% faster than the feeding speed; and
subjecting a surface of the knitted windproof fabric to a quality modification process.

[0013] The knitted windproof fabric comprises a plurality of loops which are tightly interlaced with one another, and has a wale (or warp) density of 50 ~ 150g/in, a course (or weft) density of 80 - 140g/in and a weight of 60 - 210g/SQM.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is an illustrative view of a conventional knitted fabric;
Fig. 2 shows a loop of the conventional knitted fabric;
Fig. 3 is a flow chart showing the steps of a method for knitting a windproof fabric in accordance with the present invention;
Fig. 4 is an illustrative view a knitted fabric knitted by the method of the present invention;
Fig. 5 shows a loop of the knitted fabric knitted by the method of the present invention; and
Fig. 6 is an illustrative view another knitted fabric knitted by the method of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The present invention will be clearer from the following description when viewed together with the accompanying drawings, which show, for purpose of illustrations only, the preferred embodiment in accordance with the present invention.

[0016] Referring to Fig. 3, a method for knitting a windproof fabric in accordance with the present invention comprises the following steps:

Feeding yarn 20: wherein yarn is fed from a yarn storage device at a predetermined feeding speed;
Knitting 30: using a fine gauge knitting machine to knit the yarn into a windproof fine gauge knitted fabric which is tightly knitted and includes a plurality of loops, wherein the yarn is knitted at a predetermined knitting speed which is 5 - 35% (optimally 20%) faster than the feeding speed, so that the length of the loops of the knitted windproof fabric is reduced, and the density of the knitted windproof fabric is also improved.

[0017] The yarn is made of two types of fibers which have different BWS values (boiling water shrinkage), a first fiber is 15 D - 100D (Denier) polyester fiber with a boiling water shrinkage of BWS value of 15 - 85 %, and a second fiber is 15D ~ 100D polyester fiber with a BWS value of 0 ~ +15%, or a 20D ~ 160D Nylon fiber with a BWS value of 0 ~ +15%.

[0018] The first and second fibers are mixed at a predetermined weight (or volume) ratio, for example, at the ratio of 1:1.5 ~ 1:10.5. The first and second fibers are a long fiber and a short fiber, respectively, and mixed in such a manner that the long fiber is a core, and the short fiber wraps the long fiber up, or, the short fiber is a core and wrapped up by the long fiber, so as to make the physical property of the yarn fall in between the physical properties of the two types of fibers which form the yarn (the yarn formed by the two different fibers is endowed with the physical properties of both fibers. Adjusting the ratio between the two fibers can make the property of the yarn close to the physical property of the long fiber or the short fiber.

[0019] The windproof fine gauge knitted fabric is a single layer or double layer flannel or brushed fabric and treated with quality modification process to meet the quality requirements of ISO 9237, and the wind pressure resistance performance and the breathability of the fine gauge knitted fabric are 100PA, and 50~100 $cm^3/cm^2/s$, respectively.

[0020] The windproof fine gauge knitted fabric 40, as shown in Figs. 4 and 5, comprises a plurality of loops 41 which are tightly interlaced with one another, so that the intervals among the loops 41 are reduced to a certain extent to make the knitted windproof fabric 40 water resistant and windproof.

[0021] In according to the method of the present invention, since the yarn is fed at relatively low feeding speed, the length of every loop 41 of the knitted windproof fabric 40 will be reduced, and so will be the density of the loops 41 of the knitted windproof fabric 40. Since the knitted windproof fabric 40 is a knitted structure, it is soft, elastic and comfortable to wear. Furthermore, the present invention changes the proportion of the yarning feeding speed and the knitting speed, so as to increase the density of the loops 41 of the knitted windproof fabric 40, and consequently makes the knitted windproof fabric 40 windproof and even water resistant.

[0022] Since the length of the loops 41 of the knitted windproof fabric 40 is reduced, the surface of the knitted windproof fabric 40 will become more tight and smooth, so as to prevent fabric pilling, and consequently extending the service life of the knitted windproof fabric 40.

[0023] The abovementioned knitted windproof fabric 40 is a single jersey fabric, and it can also be a double jersey fabric, as shown in Fig. 6.

[0024] To make the structure of the fabric more stable, the knitted windproof fabric 40 formed after the step of knitting 30 can be subjected to a quality modification process, which is a heating process used to heat the knitted windproof fabric 40, so that the surface of the knitted windproof fabric 40 will be firstly melted and then cured after the heating process, and will accordingly become less elastic and more stable, while the density of the knitted windproof fabric 40 doesn't change. Hence, one surface of the knitted windproof fabric 40 can be subjected to the quality modification process

to provide a better windproof and water resistance performance, and this surface of the knitted windproof fabric 40 subjected to the quality modification process can be used as an external surface, while the other surface of the knitted windproof fabric 40 which is not subjected to the quality modification process can be used as an inner surface which is to be in contact with the wear's skin to provide better wearing comfort.

[0025] The quality modification process is to heat the knitted windproof fabric 40 at 190 - 205°C for 1~5 seconds, so as to make the knitted windproof fabric 40 meet the quality requirements of ISO 9237, and the wind pressure resistance performance and the breathability of the fine gauge knitted fabric are 100PA and 3-50 $cm^3/cm^2/s$, respectively. Furthermore, the knitted windproof fabric 40 is water passes the AATCC35 rain test.

[0026] The present invention is aimed at providing a method for knitting a windproof fabric, and the test data of the fabrics knitted by the method of the present invention are as shown in table 1, wherein the breathability of the respective fabrics ranges 3-50 $cm^3/cm^2/s$, which means that all the fabrics are windproof. The fabrics with the reference numbers: R6033, R6267, R0091, R1268 and R2156 all have a water permeability less than 1g, which means that these fabric are water resistant.

[0027] The fabric knitted by the method of the present invention has the following advantages over the existing windproof fabric available on the market:

1, lightweight, the test data as shown in table 2 shows that the fabrics (which weigh: 126 - 190g/SQM) knitted by the method of the present invention is 30 - 40% lighter than the existing windproof fabrics which mostly weigh 190 -347 g/SQM.

2, simplified manufacturing process: through the improved fabric density and the quality modification process, the knitted fabric of the present invention achieves the function of windproof and water resistance. Hence, the manufacturing process of the present invention is obviously simplified, low cost and environmentally friendly, as compared to the conventional method of using chemical coating to improve windproof performance.

3. the existing commercially available windproof clothing made of coated fabric will produce friction noise when it is worn and the different parts of the clothing rub against each other. However, there is no coating on the surface of the knitted fabric of the present invention, so the clothing made of the knitted fabric of the present invention doesn't have the problem of friction noise when being worn.

[0028] While we have shown and described various embodiments in accordance with the present invention, it is clear to those skilled in the art that further embodiments may be made without departing from the scope of the present invention.

Table 1 :

Test data of the windproof fabric of the present application							
test No.	color	fabric processing	SQM	breathability test Cm/sq.cm/sec	rain test (deemed as "PASS" when water permeability is less than 1g)	initial water spray test	water spray test washed 20 times
R6033	black	single jersey	181	3	0.1	100	80
R6267	black	single jersey	126	3.9	0.1	100	80
R0091	Leopard	three-layer lamination	159	0	0.1	100	90
R1268	coffee	interlock	174	10.4	0.2	100	80
R2156	coffee	interlock	190	6	0.1	100	70
R6034	black	single jersey	129	40.3	8.1	100	80
R6128	black	single jersey	169	28.9	8.7	100	80
R6128	Rose	single jersey		21.1	8.3	100	80

(continued)

Test data of the windproof fabric of the present application							
test No.	color	fabric processing	SQM	breathability test Cm/sq.cm/sec	rain test (deemed as "PASS" when water permeability is less than 1g)	initial water spray test	water spray test washed 20 times
R6129	Apple green	single jersey	169	19.9	7.8	100	70
R6129	black	single jersey		16.1	15.4	100	70
R6199	Apple green	single jersey	177	14.5	4.9	100	80
R9061	bright yellowish brown	single jersey	174	14.6	4.9	100	70
R1039	carbon black	interlock	150	16.1	1.6	100	70
R1267	Dark brown	interlock	150	16.2	1.1	100	90

Table 2 :

Test data of other commercially available brands							
test No.	color	fabric processing	SQM	breathability test Cm/sq.cm/sec	rain test (deemed as "PASS" when water permeability is less than 1g)	initial water spray test	water spray test washed 20 times
A01	black	three-layer lamination	190	1.47	0	-	-
B02	khaki / black	two-layer lamination	285	97.2	>5	-	-
C03	gray/blue	two-layer lamination	203	51.59	>5	-	-
D04	blue/gray	two-layer lamination	347	58.09	0.1	-	-
E05	black	three-layer lamination	250	57.8	>5	0	0

Claims

1. A method for knitting a windproof fabric (40) comprising the following steps:

feeding a yarn at a predetermined feeding speed;
knitting the yarn into a knitted windproof fabric (40); and
subjecting a surface of the knitted windproof fabric (40) to a quality modification process;
the method being **characterized in that**:

the yarn is made of two types of fibers which have different boiling water shrinkage values, a first type of the fibers being a 15 Denier -100 Denier polyester fiber with a boiling water shrinkage of boiling water

shrinkage value of 15-85 %, and a second type of the fibers being 15 Denier -100 Denier polyester fiber with a boiling water shrinkage value of 0-+15%, or a 20 Denier -160 Denier Nylon fiber with a boiling water shrinkage value of 0-+15%;
the yarn is knitted at a predetermined knitting speed which is 5-35% faster than the feeding speed.

2. The method for knitting a windproof fabric (40) as claimed in claim 1, wherein the first and second fibers are a long fiber and a short fiber, respectively, and mixed in such a manner that the long fiber is a core, and the short fiber wraps the long fiber up, or, the short fiber is a core and wrapped up by the long fiber.

3. The method for knitting a windproof fabric (40) as claimed in claim 2, wherein the first and second fibers are mixed at a predetermined weight or volume ratio of 1:1.5-1:10.5.

4. The method for knitting a windproof fabric (40) as claimed in claim 1, wherein the yarn is knitted at a predetermined knitting speed which is 20% faster than the feeding speed.

5. The method for knitting a windproof fabric (40) as claimed in claim 1, wherein the quality modification process is a heating process.

6. The method for knitting a windproof fabric (40) as claimed in claim 5, wherein the quality modification process is to heat the knitted windproof fabric (40) at a temperature of 190-205°C for 1~5 seconds, so as to make the knitted windproof fabric (40) meet the quality requirements of ISO 9237, and a wind pressure resistance performance and a breathability of the fine gauge knitted fabric are 100PA and 3~50 $cm^3/cm^2/s$, respectively.

Patentansprüche

1. Verfahren zum Fügen eines winddichten Textils (40), das die folgenden Schritte umfasst:

Zuführung eines Fadens mit einer vorgegebenen Zuführgeschwindigkeit,
Fügen des Fadens zu einem gefügten winddichten Textil (40), und
Behandlung der Oberfläche des gefügten winddichten Textils (40) mit einem Qualitätsänderungsprozess,
wobei das Verfahren **dadurch gekennzeichnet ist, dass**:

der Faden aus zwei Arten von Fasern hergestellt ist, welche verschiedene Schrumpfwerte in kochendem Wasser aufweisen, wobei eine erste Faserart eine 15 Denier - 100 Denier Polyesterfaser mit einer Schrumpfung in kochenden Wasser entsprechend eines Schrumpfwerts in kochendem Wasser von 15 - 85 % aufweist, und wobei eine zweite Faserart eine 15 Denier - 100 Denier Polyesterfaser mit einem Schrumpfwert in kochendem Wasser von 0 $\pm$ 15%, oder eine 20 Denier - 160 Denier Nylonfaser mit einem Schrumpfwert in kochendem Wasser von 0 $\pm$ 15% ist, wobei
der Faden mit einer vorgegebenen Fügegeschwindigkeit gefügt wird, die 5 - 35% oberhalb der Zuführgeschwindigkeit liegt.

2. Verfahren zum Fügen eines winddichten Textils (40) nach Anspruch 1, wobei die ersten und zweiten Fasern eine lange Faser beziehungsweise eine kurze Faser sind und in einer Weise vermischt werden, dass die lange Faser ein Mittelstück bildet und die kurze Faser die lange Faser umhüllt oder die kurze Faser ein Mittelstück bildet, das von der langen Faser umhüllt wird.

3. Verfahren zum Fügen eines winddichten Textils (40) nach Anspruch 2, wobei die ersten und zweiten Fasern miteinander in einem vorgegebenen Gewichts- oder Volumenverhältnis von 1:1.5 - 1:10.5 gemischt werden.

4. Verfahren zum Fügen eines winddichten Textils (40) nach Anspruch 1, wobei der Faden mit einer vorgegebenen Fügegeschwindigkeit gefügt wird, die 20% oberhalb der Zuführgeschwindigkeit liegt.

5. Verfahren zum Fügen eines winddichten Textils (40) nach Anspruch 1, wobei der Qualitätsänderungsprozess ein Heizprozess ist.

6. Verfahren zum Fügen eines winddichten Textils (40) nach Anspruch 5, wobei der Qualitätsänderungsprozess darin besteht, das gefügte winddichte Textil (40) für 1 -5 Sekunden auf eine Temperatur von 190~205°C zu erhitzen,

sodass das gefügte winddichte Textil die Qualitätsanforderungen nach ISO 9237 erfüllt und die Winddruckfestigkeitsleistung und die Atmungsaktivität des gefügten Textils mit kleiner Maschenweite 100PA beziehungsweise 3~50 $cm^3/cm^2/s$ beträgt.

Revendications

1. Procédé pour tricoter un tissu coupe-vent (40) comprenant les étapes suivantes :

   alimenter un fil à une vitesse d'alimentation prédéterminée ;
   tricoter le fil dans un tissu coupe-vent tricoté (40) et
   soumettre une surface du tissu coupe-vent tricoté (40) à un processus de modification de qualité,
   le procédé étant **caractérisé en ce que**
   le fil est fait de deux types de fibres qui ont différentes valeurs de retrait à l'eau bouillante, un premier type de fibres étant une fibre de polyester de 15 à 100 deniers avec une valeur de retrait à l'eau bouillante de 15 à 85% et un second type de fibres étant une fibre de polyester de 15 à 100 deniers avec une valeur de retrait à l'eau bouillante de à 0 $\pm$ 15% ou une fibre de nylon de 20 à 160 deniers avec une valeur de retrait à l'eau bouillante de à 0 $\pm$ 15%,
   le fil est tricoté à une vitesse de tricotage prédéterminée qui est de 5 à 35% plus rapide que la vitesse d'alimentation.

2. Procédé pour tricoter un tissu coupe-vent (40) selon la revendication 1, la première et la seconde fibre étant respectivement une fibre longue et une fibre courte et étant mélangées de telle manière que la fibre longue est un noyau et la fibre courte enveloppe la fibre longue ou la fibre courte est un noyau et est enveloppée par la fibre longue.

3. Procédé pour tricoter un tissu coupe-vent (40) selon la revendication 2, la première et la seconde fibre étant mélangées à un rapport de poids ou de volume prédéterminé de 1:1,5 à 1:10,5.

4. Procédé pour tricoter un tissu coupe-vent (40) selon la revendication 1, le fil étant tricoté à une vitesse de tricotage prédéterminée qui est de 20% plus rapide que la vitesse d'alimentation.

5. Procédé pour tricoter un tissu coupe-vent (40) selon la revendication 1, le processus de modification de qualité étant un processus de chauffage.

6. Procédé pour tricoter un tissu coupe-vent (40) selon la revendication 1, le processus de modification de qualité étant de chauffer le tissu coupe-vent tricoté (40) à une température de 190 à 205 °C pendant 1 à 5 secondes de manière à faire en sorte que le tissu coupe-vent tricoté (40) satisfasse aux exigences de qualité d'ISO 9327 et à une performance de résistance à la pression du vent et à une respirabilité du tissu tricoté de jaune fine, respectivement de 100 PA et de 3-50 $cm^3/cm^2/s$.

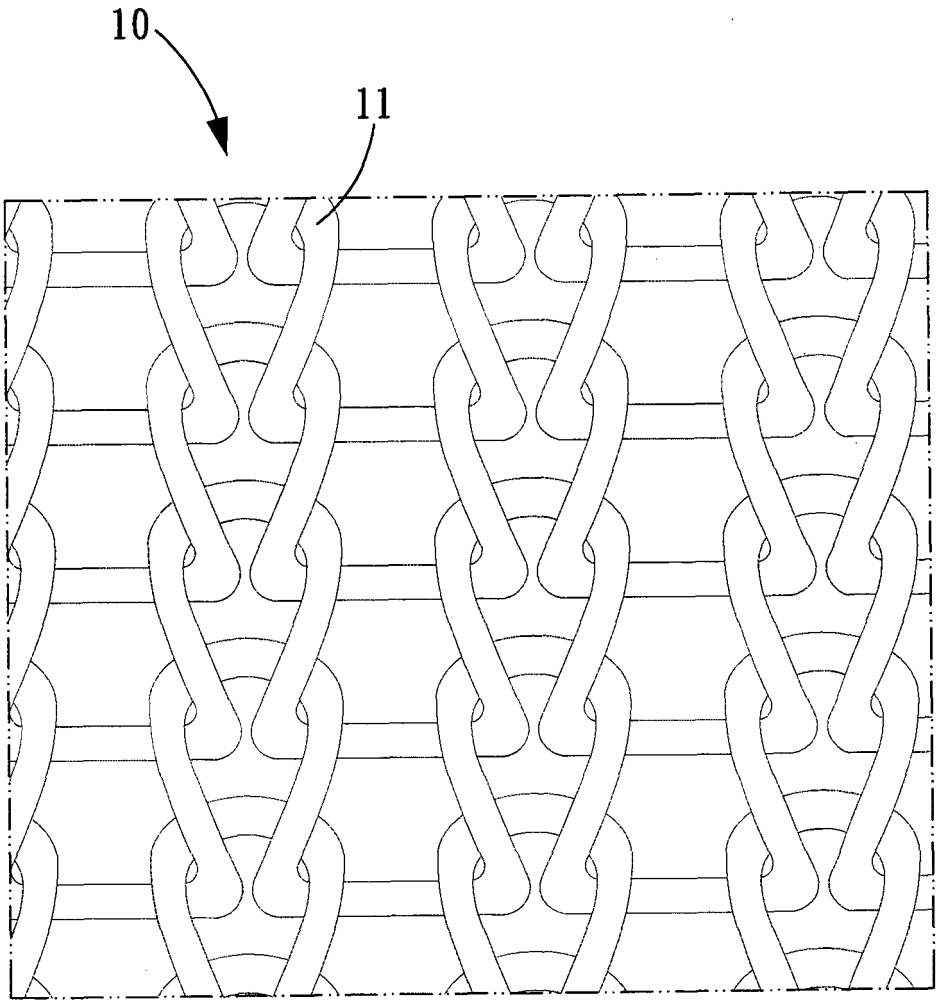

FIG. 1
PRIOR ART

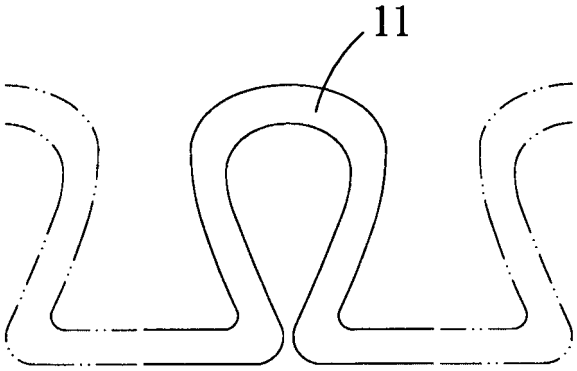

FIG. 2
PRIOR ART

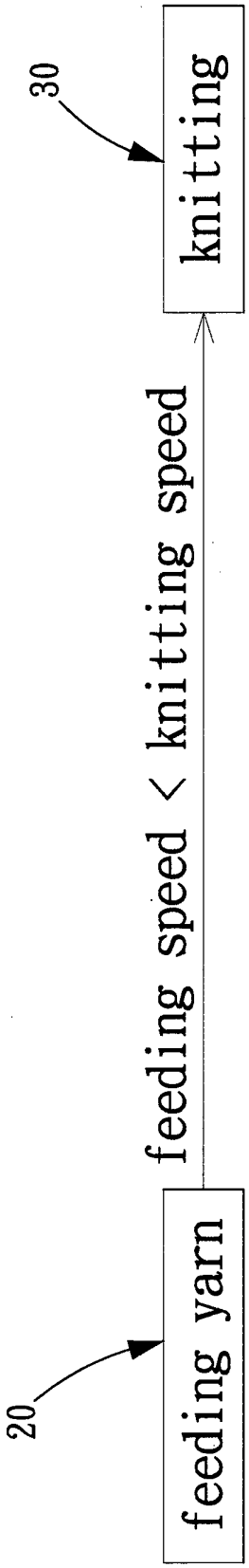

FIG. 3

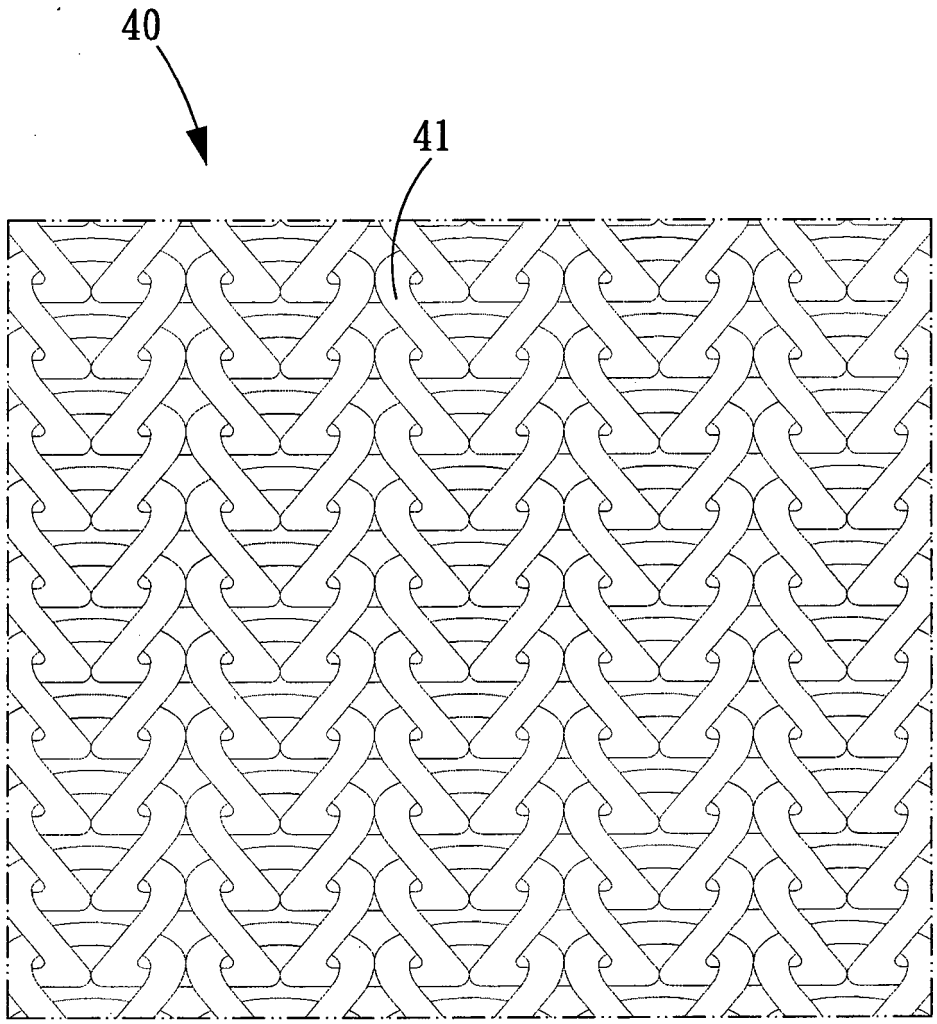

FIG. 4

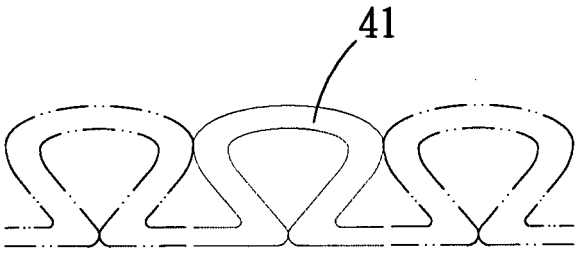

FIG. 5

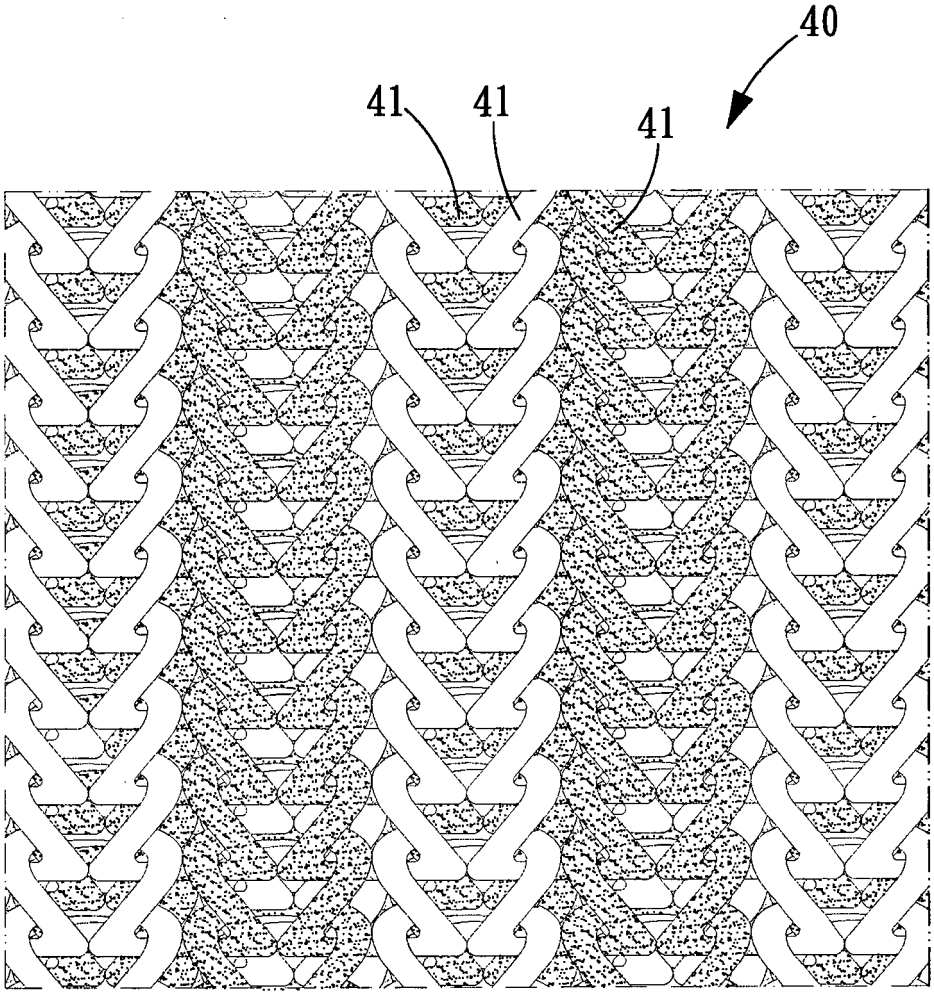

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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