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(54) FABRIC AND METHOD FOR MANUFACTURING THE SAME

(57) The present disclosure provides a fabric (1, 1a, 1b) including at least one interlaced thermoplastic yarn (2). The fabric (1, 1a, 1b) includes a first region (11) and a second region /12). At least a portion of the thermoplastic yarn (2) in the first region (11) is fused together, and the thermoplastic yarn (2) in the second region (12) is not fused.

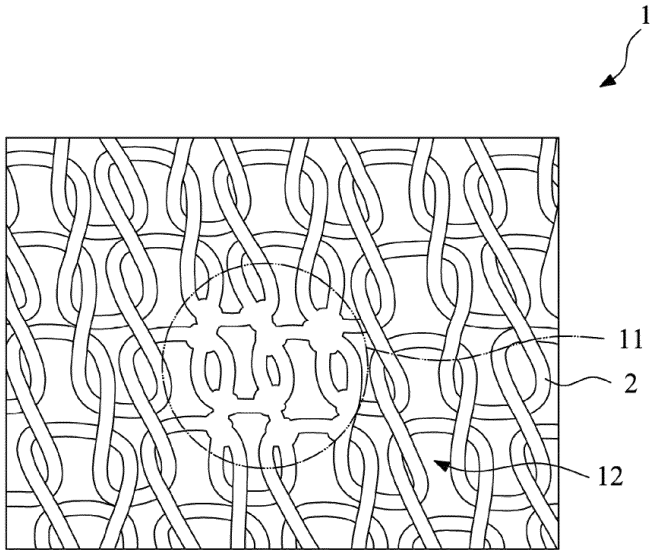

FIG. 2

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Description

BACKGROUND

1. Field of the Disclosure

[0001] The present disclosure relates to a fabric and a method for manufacturing the same, and more particularly to a fabric which includes both a fused region and a non-fused region, and a method for manufacturing such fabric.

2. Description of the Related Art

[0002] Generally, a functional stretch fabric refers to a fabric which has several regions with respectively different stretchabilities. The functional stretch fabric thus provides specific functions, and can be used in products such as shapewears or compression stockings. Since the functions of the functional stretch fabric are achieved by stretchability difference, it is necessary to provide at least a stretchable region and a non-stretchable region in the same fabric, and these regions must be located precisely.

[0003] The stretchability difference in a conventional functional stretch fabric may be achieved by applying several different weaving methods or yarns made of different materials in a single fabric. For example, the stretchable region may be formed by a weaving method which provides a better stretchability, while the non-stretchable region may be formed by a weaving method which provides no stretchability. Alternatively, the stretchable region may be formed by elastic yarns, while the non-stretchable region may be formed by non-elastic yarns.

[0004] However, during weaving of the conventional functional stretch fabric, the weaving methods or yarns must be changed frequently corresponding to the stretchable and non-stretchable regions. Hence, weaving process thereof is complicated, and production cost thereof is thus raised. Besides, the stretchability difference must be formed during the weaving process. After the conventional functional stretch fabric is formed, the stretchability cannot be modified. Accordingly, the production process thereof is less convenient, and cannot be used in different applications.

SUMMARY

[0005] The present invention provides a fabric and a method for manufacturing the same, which is able to form both a stretchable region and a non-stretchable region in the same fabric without applying different weaving methods or yarns made of different materials.

[0006] Hence, the present disclosure provides for a fabric including at least one interlaced thermoplastic yarn. The fabric includes a first region and a second region. At least a portion of the thermoplastic yarn in the first region is fused together, and the thermoplastic yarn in the second region is not fused.

[0007] The present disclosure further provides for a thermoplastic yarn including a thermoplastic fiber. The thermoplastic yarn includes a first section and a second section. The thermoplastic fiber in the first section is fused with a fiber section, and the thermoplastic fiber in the second section is not fused.

[0008] The present disclosure further provides for a method for manufacturing a fabric, including: (a) providing at least a thermoplastic yarn; (b) interlacing the thermoplastic yarn into an intermediate fabric, wherein the intermediate fabric comprises a first region and a second region; and (c) fusing at least a portion of the thermoplastic yarn in the first region together.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

FIG. 1 illustrates a top view of a fabric according to an embodiment of the present disclosure.

FIG. 2 illustrates a top view of a fabric according to an embodiment of the present disclosure.

FIG. 3 illustrates a top view of a fabric according to an embodiment of the present disclosure.

FIG. 4 illustrates a two-ply yarn according to an embodiment of the present disclosure.

FIG. 5 illustrates a two-ply yarn according to an embodiment of the present disclosure.

FIG. 6 illustrates a two-ply yarn according to an embodiment of the present disclosure.

FIG. 7 illustrates a three-ply yarn according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0010] The present disclosure provides a fabric including at least one interlaced thermoplastic yarn. The fabric includes a first region and a second region. At least a portion of the thermoplastic yarn in the first region is fused together, and the thermoplastic yarn in the second region is not fused.

[0011] In an embodiment of the present disclosure, the term "fabric" may refer to a fabric formed of one or more yarns, and preferably formed by interlacing the one or more yarns in an organized manner. For example, the fabric may be formed by weaving, knitting, crocheting, braiding, etc., and may be hand-made or machine-made, which is not limited in the present disclosure. In an embodiment of the present disclosure, the fabric excludes non-woven fabrics.

[0012] In an embodiment of the present disclosure, the term "interlacing/interlaced" may refer to interlacing one or more yarns and/or interlooping one or more yarns together. Accordingly, said "interlaced thermoplastic yarn" may be a thermoplastic yarn which is looped together (e.g., knitting, crocheting, braiding), or the thermoplastic yarn may be interlaced with other yarns (e.g., weaving). Besides, the term "an interlacing method" includes any known method in the field, such as weaving, knitting, crocheting, braiding, etc. The term "an interlacing pattern" refers to the pattern/texture formed by these interlacing methods.

[0013] In an embodiment of the present disclosure, the term "yarn" may refer to a structure formed of fiber(s), and may be a single-ply yarn formed of only one fiber, or a plied yarn formed of a plurality of fibers. The yarn may be formed of a single type of fiber, or may be formed of several types of fibers. The term "thermoplastic yarn" may refer to a yarn which is thermoplastic, i.e., which may be softened at a higher temperature and thus can be reshaped. Fibers which compose the thermoplastic yarn may all be thermoplastic, or only a portion of the fibers may be thermoplastic.

[0014] Shapes and relative positions of the first region and the second region are not limited in the present disclosure. Besides, locations of the first region and the second region in the fabric are not limited in the present disclosure. For example, the first region and the second region may be located at a center and a periphery of the fabric. Referring to FIGs. 1 to 3, the first region 11 is located at a center, and the second region 12 is located at a periphery and surrounds the first region 11. In other embodiments, the fabric may include a plurality of first regions and a plurality of second regions, and the first regions and the second regions may be arranged in an alternative manner.

[0015] In an embodiment of the present disclosure, the term "fuse or fused" may refer to a material/fiber/yarn which is melted by heat and/or pressure, and is partially attached to and/or covers an object, thus is joined with the object after cooling. It is noteworthy that the term "fuse or fused" does not require that the object also be melted by heat and/or pressure. For example, said "thermoplastic yarn fused together" may refer to two section of the thermoplastic yarn which are both melted and thus are joined together; or may refer to only one of the two sections which is melted for attaching to and/or covering the other one of the two sections which is not melted, thus the two sections are joined together.

[0016] FIG. 1 illustrates a fabric 1 according to an embodiment of the present disclosure. The fabric 1 includes at least an interlaced thermoplastic yarn 2. For example, as shown in FIG. 1, the fabric 1 is substantially formed of a thermoplastic yarn 2 by knitting. However, it is not to be taken in a limiting sense. The fabric 1 includes a first region 11 and a second region 12. As shown in FIG. 1, the first region 11 is substantially in a round shape. However, in other embodiments, the first region 11 may be in another shape, and may be regular or arbitrary. The fabric 1 may further include a plurality of first region 11. FIG. 1 illustrates the first region located at a center of the fabric 1, and the second region 12 located at a periphery of the fabric 1 and surrounding the first region 1. However, such arrangement is not to be taken in a limiting sense.

[0017] As shown in FIG. 1, at least a portion of the thermoplastic yarn 2 in the first region 11 is fused together. That is, in the first region 11, the thermoplastic yarn 2 is fused at intersections to form point-like fusion regions. In this situation, a texture or shape of the thermoplastic yarn 2 is not greatly changed. The thermoplastic 2 in the second region 12 is not fused, and remains in a knitted shape.

[0018] As shown in FIG. 1, the fabric 1 may initially be stretchable. For example, the fabric 1 may be stretchable due to characteristics of material thereof or interlacing pattern thereof. However, since the thermoplastic yarn 2 in the first region 11 is fused, i.e., two sections of the thermoplastic yarn 2 are fused and joined together at each fusion region, the first region 11 of the fabric 1 is non-stretchable, or is slightly stretchable merely due to characteristics of the material thereof. Meanwhile, since the thermoplastic yarn 2 in the second region 12 is not fused, the second region 12 of the fabric 1 remains stretchable due to characteristics of the material thereof and interlacing pattern thereof. In other words, stretchability of the second region 12 (e.g., elongation at break, elastic recovery) of the second region 12 is better than that of the first region 11.

[0019] FIG. 2 illustrates a fabric la according to an embodiment of the present disclosure. The fabric 1a is similar to the fabric 1 shown in FIG. 1, except that the fusion of the thermoplastic yarn 2 in FIG. 2 not only occurs at the intersections, but also extends to the surroundings, thus the fusion regions are enlarged.

[0020] FIG. 3 illustrates a fabric lb according to an embodiment of the present disclosure. The fabric 1b is similar to the fabric la shown in FIG. 2, except that the fusion regions are further enlarged, such that all sections of the thermoplastic yarn 2 in the first region 11 are fused together into a sheet-like structure.

[0021] It is noteworthy that the terms "stretch/stretchable" and "non-stretch/non-stretchable" are relative descriptions. That is, stretchability (stretch percentage) of a stretchable fabric is greater than that of a non-stretchable fabric in at least one direction. For example, in a predetermined direction, a stretch percentage of a non-stretchable fabric is preferably less than 2%; while a stretch percentage of a stretchable fabric is preferably greater than 20%.

[0022] In the fabric of the present disclosure, since the sections of the thermoplastic yarn in the first region are fused together while the thermoplastic yarn in the second region is not fused, the first section and the second section are provided with different stretchabilities. Hence, a material of the first region may be the same as a material of the second region. Besides, an interlacing pattern of

the first region and an interlacing pattern of the section region may be substantially the same. That is, the fabric is provided with both a stretchable region and a non-stretchable region at the same time without the need of different interlacing pattern or yarns made of different materials.

[0023] In an embodiment of the present disclosure, the "thermoplastic yarn" may include a thermoplastic fiber and a functional fiber, and may be a two-ply yarn. When the thermoplastic yarn includes the thermoplastic fiber, at least a portion of the thermoplastic fiber in the first region is fused together, and the thermoplastic fiber in the second region is not fused. That is, the thermoplastic yarn in the first region is fused together by utilizing the thermoplastic fiber.

[0024] The "thermoplastic fiber" may refer to a fiber including a thermoplastic material or made of the thermoplastic material. The thermoplastic material is exposed on a surface of the thermoplastic fiber, such that the thermoplastic fiber can be fused by heat and/or pressure. For example, the thermoplastic fiber may be a single-component fiber. That is, the thermoplastic fiber is made of only the thermoplastic material. Alternatively, the thermoplastic fiber may be a multicomponent fiber, which includes the thermoplastic material and another fiber material. However, it is required that the thermoplastic material is exposed on the surface of the thermoplastic fiber. For example, the thermoplastic fiber may be in a shape of core/sheath, side by side, segmented pie, islands-sea, etc., which is not limited in the present disclosure.

[0025] In an embodiment of the present disclosure, the thermoplastic material includes, but is not limited to, thermoplastic polyurethane (TPU), thermoplastic polyester elastomer (TPEE) or thermoplastic polyolefin (TPO). The TPU, for example, includes polyester-based TPUs, which are mainly derived from adipic acid esters; and polyether-based TPUs, which are mainly based on tetrahydrofuran ethers. The TPEE, for example, includes polyethylene terephthalate (PET) and polybutylene terephthalate (PBT). The TPO, for example, includes polyethylene (PE) and polypropylene (PP).

[0026] Generally, the functional fiber is not thermoplastic, but provides the thermoplastic yarn with other functions and properties, such as favorable elasticity and handle (hand feeling). Hence, the functional fiber is preferably not fused in the fabric. That is, the functional fiber is not melted for attaching to and/or covering an object, while the thermoplastic fiber may be melted for attaching to and/or covering the functional fiber.

[0027] For example, the functional fiber may be made of luminous, reflective or antibacterial materials, or may be cool-feeling, heat-retaining or elastic fibers. A material of the elastic fiber may be polyester-polyurethane copolymer (e.g., Spandex, Lycra and Elastane), and an elongation at break thereof may be equal to or greater than 500%. Preferably, the elastic fiber also has a favorable elastic recovery, such as an elastic recovery of 100% after an elongation of 100%, or an elastic recovery of 95% after an elongation of 500%.

[0028] On the other hand, in a microscopic aspect, i.e., referring to the thermoplastic yarn in the fabric, the thermoplastic yarn has a first section and a second section. The thermoplastic yarn includes the aforementioned thermoplastic fiber, and the thermoplastic fiber in the first section is fused with another fiber section, while the thermoplastic fiber in the second section is not fused.

[0029] Similarly, since the first section of the thermoplastic fiber is fused with the other fiber section, thus the shape and relative position of these sections are fixed. Accordingly, the first section is not stretchable. In Contrast, since the second section of the thermoplastic fiber is not fused, the thermoplastic yarn remains in the original shape with the original properties, thus the second section is still stretchable.

[0030] The aforementioned fiber section may be another section of the thermoplastic fiber, or a section of another fiber. For example, the thermoplastic yarn may include a third section, and the thermoplastic fiber in the first section may be fused with the thermoplastic fiber in the third section. Alternatively, when the thermoplastic yarn includes the aforementioned functional fiber, the thermoplastic fiber in the first section may be fused with a fiber section of the functional fiber.

[0031] The present disclosure further provides a method for manufacturing a fabric, including: (a) providing at least a thermoplastic yarn; (b) interlacing the thermoplastic yarn into an intermediate fabric, wherein the intermediate fabric comprises a first region and a second region; and (c) fusing at least a portion of the thermoplastic yarn in the first region together.

[0032] Definition and properties of the thermoplastic yarn are described above, thus are not repeated redundantly. The thermoplastic yarn may be formed into the fabric by any means, which is not limited in the present disclosure. For example, the fabric may be formed of a single thermoplastic yarn or a plurality of thermoplastic yarns, or may be formed of the thermoplastic yarn with other yarns. Preferably, the fabric is formed by an interlacing method, such as weaving, knitting, crocheting or braiding, and may be hand-made or machine-made.

[0033] It is noteworthy that the first region and the second region of the intermediate fabric may be interlaced by a same interlacing method, e.g., the whole fabric may be interlaced by a single interlacing method. Besides, a material of the first region may be the same as a material of the second region. For example, the first region and the second region may be formed by using one or more yarns made of a same material. That is, each yarn extends through the first region and the second region. Further, the first region and the second region may be formed by a same yarn, such as formed by knitting.

[0034] After the intermediate fabric is formed, at least a portion of the thermoplastic yarn in the first region is fused together. For example, the first region of the fabric is heated, such that the portion of the thermoplastic yarn

in the first region is fused together. The heating temperature may be in a range between the softening point and the melting point of the material of the thermoplastic fiber, such that the thermoplastic fiber can be softened and thus fused together. Preferably, the thermoplastic fiber is softened, while the functional fiber is not softened. If the portion of the thermoplastic yarn in the first region is only heated to be fused (e.g., without being pressed), the shape of the thermoplastic yarn in the first region does not greatly change. That is, the thermoplastic yarn forms point-like fusion regions at the intersections, such as the structure shown in FIG. 1.

[0035] Furthermore, the intermediate fabric may be pressed when it is softened. Hence, the softened thermoplastic yarn may extend to be fused with nearby fiber sections. For example, the first region of the fabric may be heated and pressed at the same time, such that the portion of the thermoplastic yarn in the first region is fused together. For example, the first region maybe pressed with a pressure of about 2 kg/cm^2 to about 30 kg/cm^2. Hence, the fusion of the thermoplastic yarn not only occurs at the intersections, but also extends to the surroundings, thus forming the structure shown in FIG. 2. Alternatively, the fusion regions are further enlarged, such that all sections of the thermoplastic yarn in the first region are fused together into a sheet-like structure, such as the structure shown in FIG. 3.

[0036] The following examples are given for illustrating the method for manufacturing the composite fabric of the present disclosure, but are not intended to limit the scope of the present invention

[0037] An elastic TPU fiber manufactured by SAN FANG CHEMICAL INDUSTRY CO., LTD. is provided as fiber A, and a melting point thereof is about 90°C to about 180°C. A sheath/core fiber manufactured by SAN FANG CHEMICAL INDUSTRY CO., LTD. is provided as fiber B, with the core made of PET and the sheath made of elastic TPU. A spinning-grade elastic fiber (e.g., Spandex or Lycra) is provided as fiber C. In the present example, the fiber A and the fiber B are thermoplastic fibers, and the fiber L is a functional fiber (elastic fiber).

[0038] Then, the fiber B and the fiber L are combined (yarn-covering) to form a two-ply yarn, such as shown in FIGs. 4, 5 or 6. The fiber A, fiber B and fiber L are combined (yarn-covering) to form a three-ply yarn as shown in FIG. 7. Each of the two-ply yarns and the three-ply yarn is interlaced by a knitting machine to form an intermediate fabric which is elastic and is stretchable.

[0039] Then, the first region of the intermediate fabric is heated and pressed by a mold, such as under a temperature of 90°C to 180°C and a pressure of 2 kg/cm^3 to 30 kg/cm^3, such that at least a portion of the thermoplastic fiber (fiber A and/or fiber B) is fused together. Hence, the first region forms a non-stretchable region, while the second region remains stretchable, thus forming the fabric of the present disclosure.

[0040] While the present disclosure has been described and illustrated with reference to specific embodiments thereof, these descriptions and illustrations are not limiting. It should be understood by those skilled in the art that various changes may be made and equivalents may be substituted without departing from the true spirit and scope of the present disclosure as defined by the appended claims. The illustrations may not be necessarily drawn to scale. There may be distinctions between the artistic renditions in the present disclosure and the actual apparatus due to manufacturing processes and tolerances. There may be other embodiments of the present disclosure which are not specifically illustrated. The specification and drawings are to be regarded as illustrative rather than restrictive. Modifications may be made to adapt a particular situation, material, composition of matter, method, or process to the objective, spirit and scope of the present disclosure. All such modifications are intended to be within the scope of the claims appended hereto. While the methods disclosed herein have been described with reference to particular operations performed in a particular order, it will be understood that these operations may be combined, sub-divided, or re-ordered to form an equivalent method without departing from the teachings of the present disclosure. Accordingly, unless specifically indicated herein, the order and grouping of the operations are not limitations of the present disclosure.

Claims

1. A fabric comprising at least one interlaced thermoplastic yarn, wherein the fabric comprises a first region and a second region, at least a portion of the thermoplastic yarn in the first region is fused together, and the thermoplastic yarn in the second region is not fused.

2. The fabric of claim 1, wherein the first region of the fabric is non-stretchable, and the second region of the fabric is stretchable.

3. The fabric of claim 1, wherein a material of the first region of the fabric is the same as a material of the second region of the fabric.

4. The fabric of claim 1, wherein an interlacing pattern of the first region and an interlacing pattern of the second region are substantially the same.

5. The fabric of claim 1, wherein the thermoplastic yarn comprises a thermoplastic fiber, at least a portion of the thermoplastic fiber in the first region is fused together, and the thermoplastic fiber in the second region is not fused.

6. The fabric of claim 5, wherein the thermoplastic yarn comprises a functional fiber, and the functional fiber in the fabric is not fused.

7. The fabric of claim 6, wherein the functional fiber is an elastic fiber, and an elongation at break of the elastic fiber is equal to or greater than about 500%.

8. A method for manufacturing a fabric, comprising:

(a) providing at least a thermoplastic yarn;
(b) interlacing the thermoplastic yarn into an intermediate fabric, wherein the intermediate fabric comprises a first region and a second region; and
(c) fusing at least a portion of the thermoplastic yarn in the first region together.

9. The method of claim 8, wherein step (b) comprises interlacing the first region and the second region by a same interlacing method.

10. The method of claim 9, wherein the interlacing method includes weaving, knitting, crocheting or braiding.

11. The method of claim 8, wherein step (c) comprises heating the first region of the fabric, such that the portion of the thermoplastic yarn in the first region is fused together.

12. The method of claim 8, wherein the first region of the fabric is non-stretchable, and the second region of the fabric is stretchable.

13. The method of claim 8, wherein a material of the first region of the fabric is the same as a material of the second region of the fabric.

14. The method of claim 8, wherein the thermoplastic yarn comprises a thermoplastic fiber, and step (c) comprises fusing the thermoplastic fiber in the first region.

15. The method of claim 14, wherein the thermoplastic yarn comprises a functional fiber, and the functional fiber in the fabric is not fused.

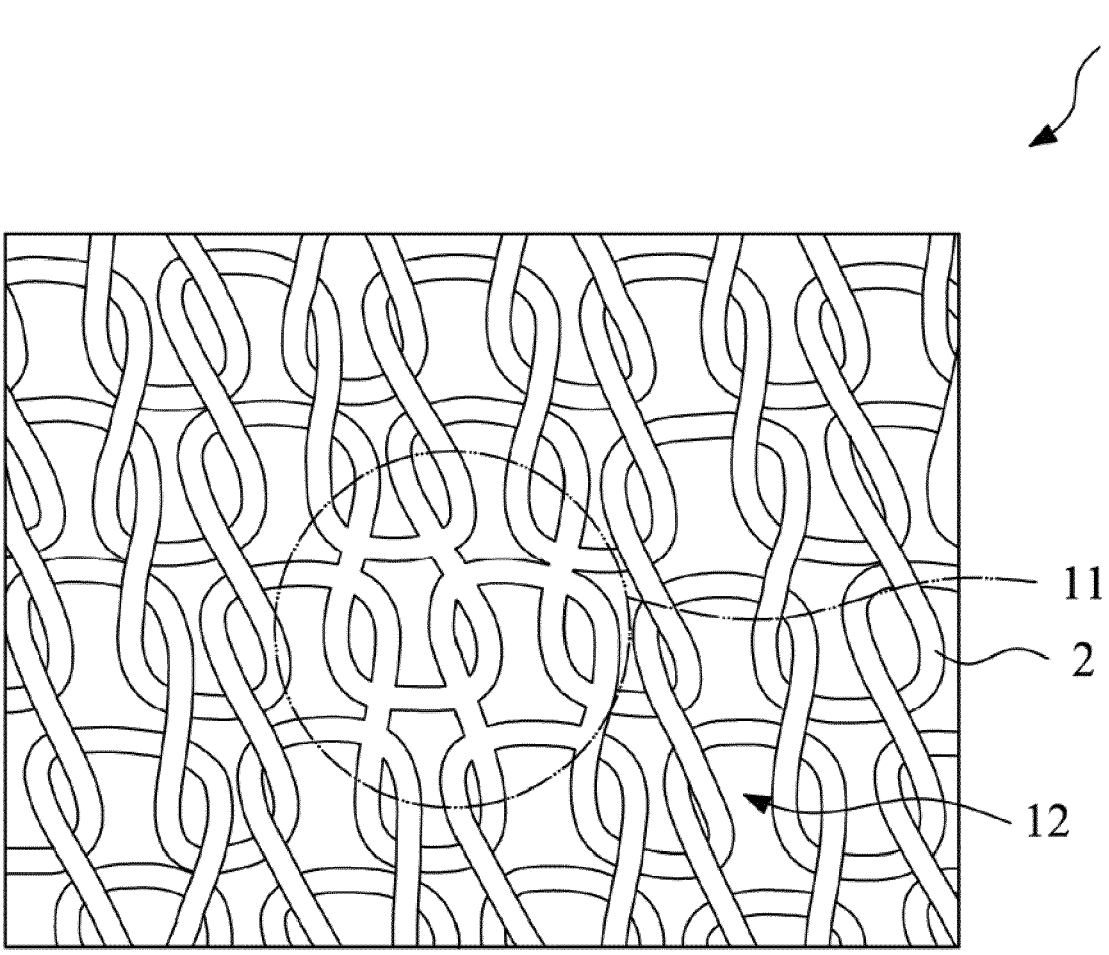

FIG. 1

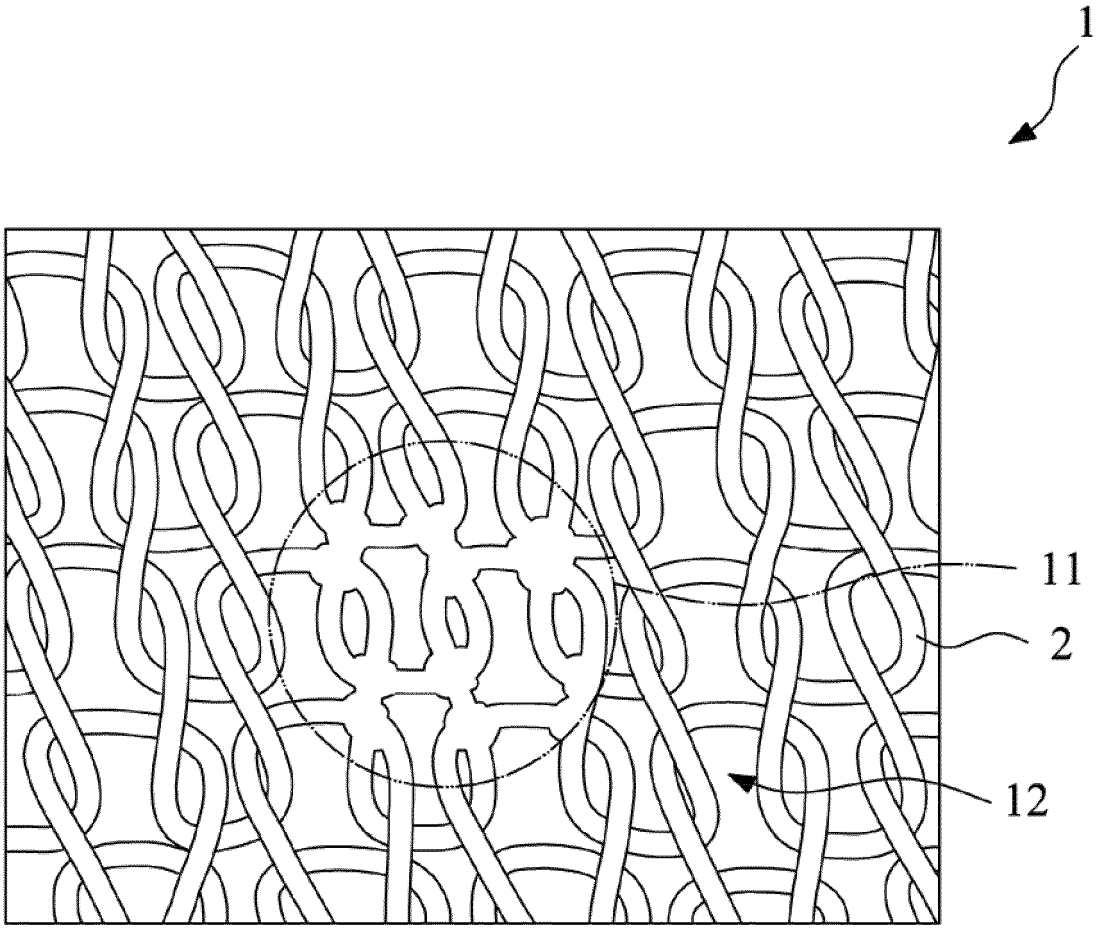

FIG. 2

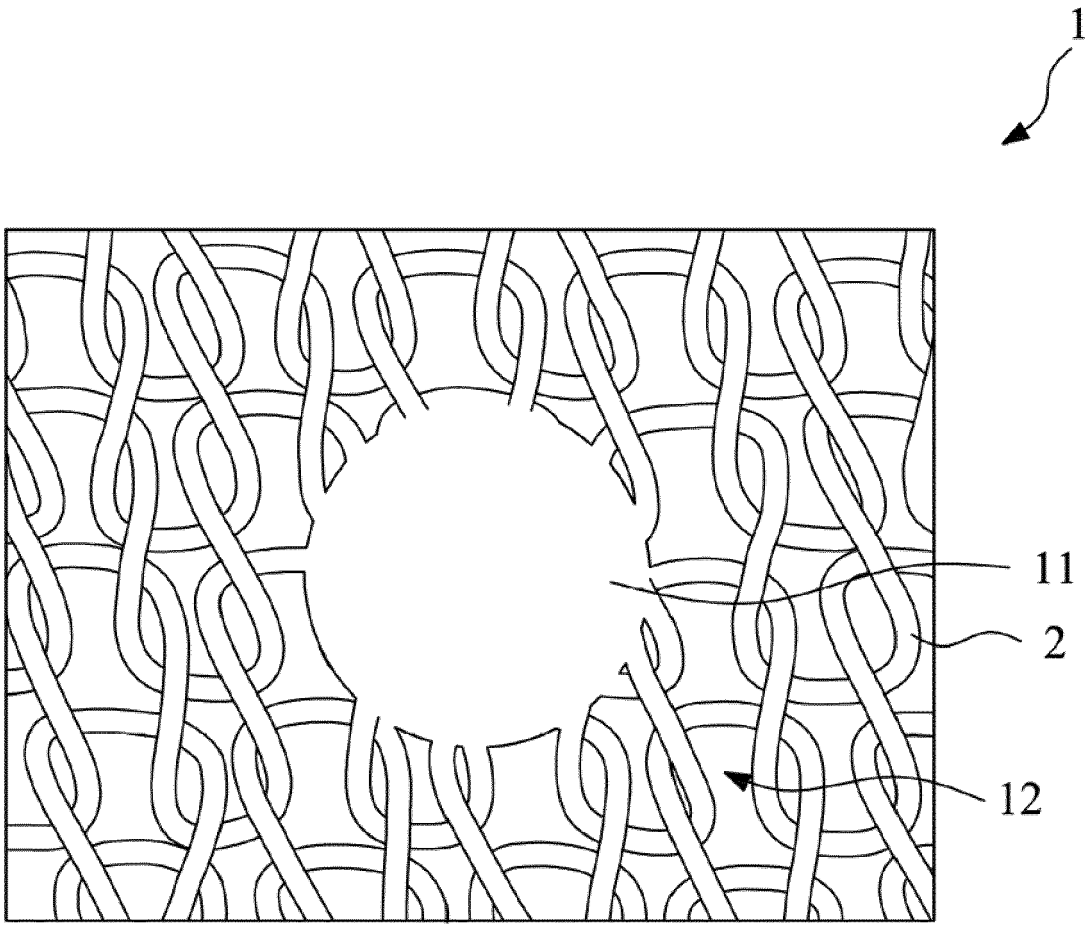

FIG. 3

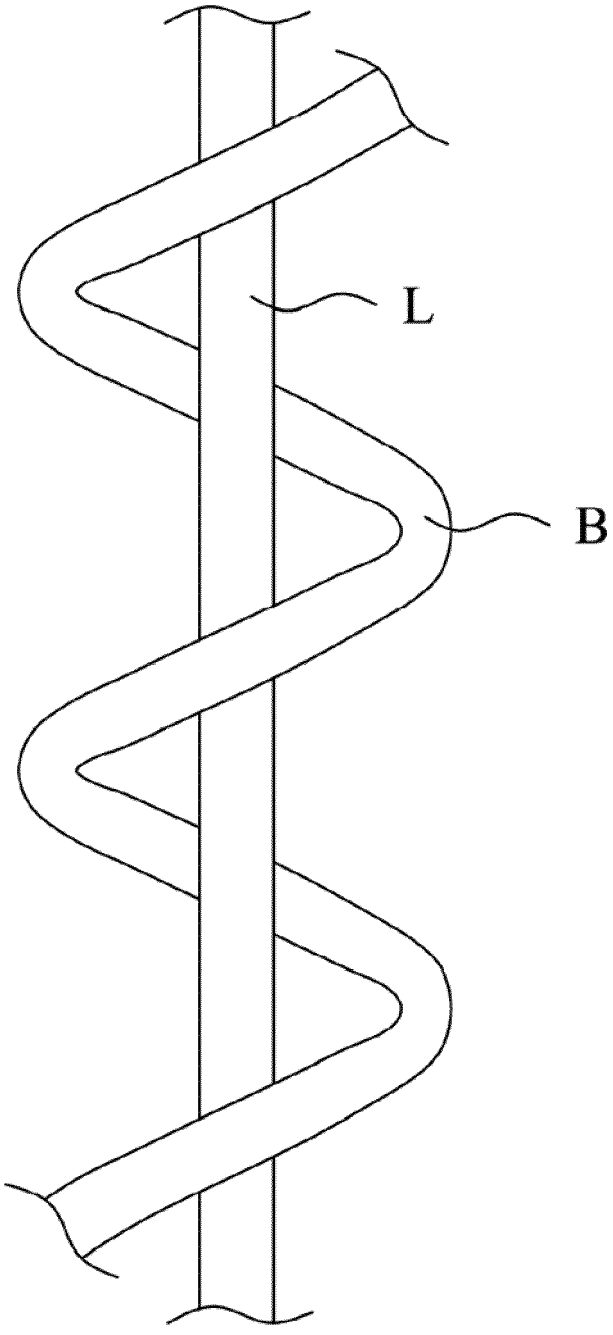

FIG. 4

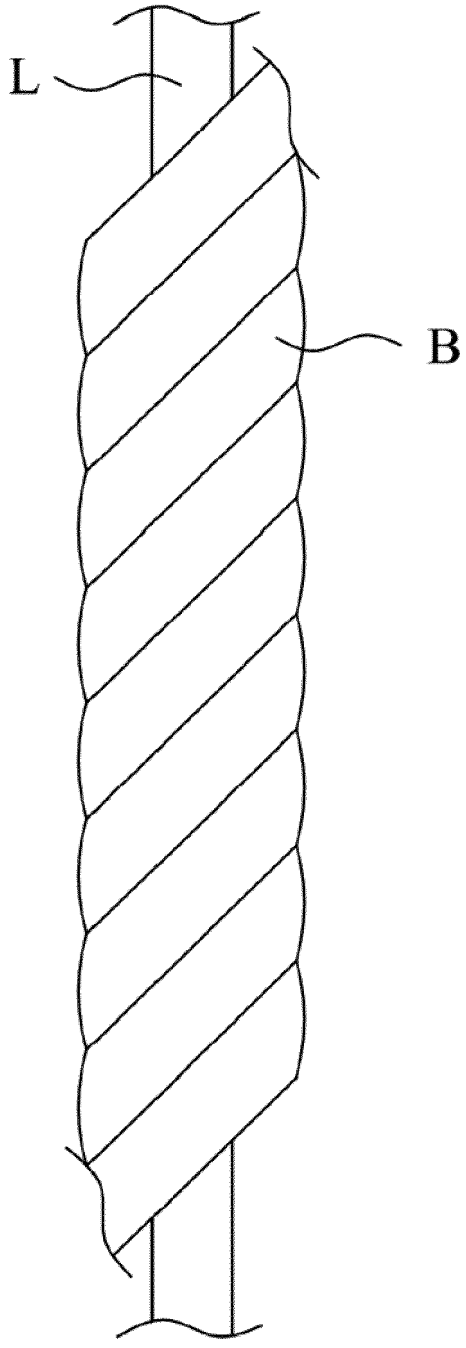

FIG. 5

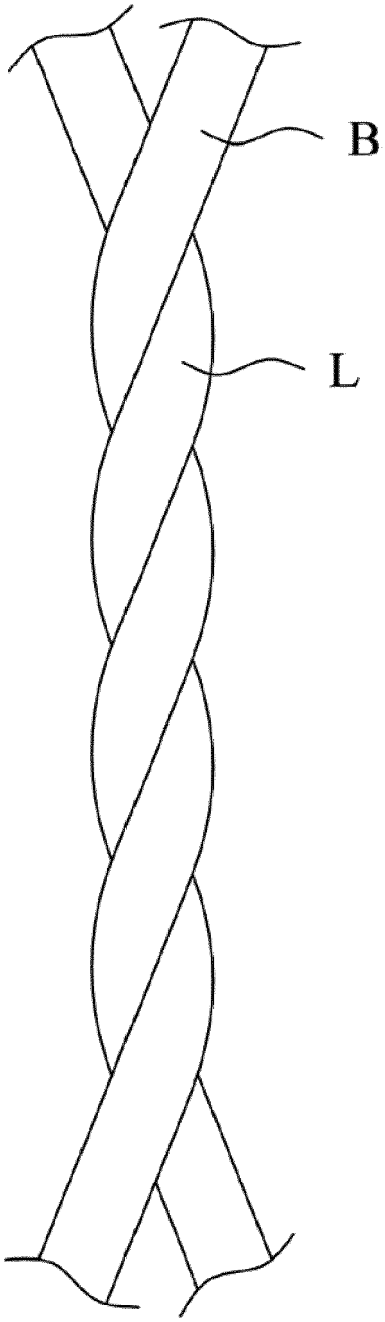

FIG. 6

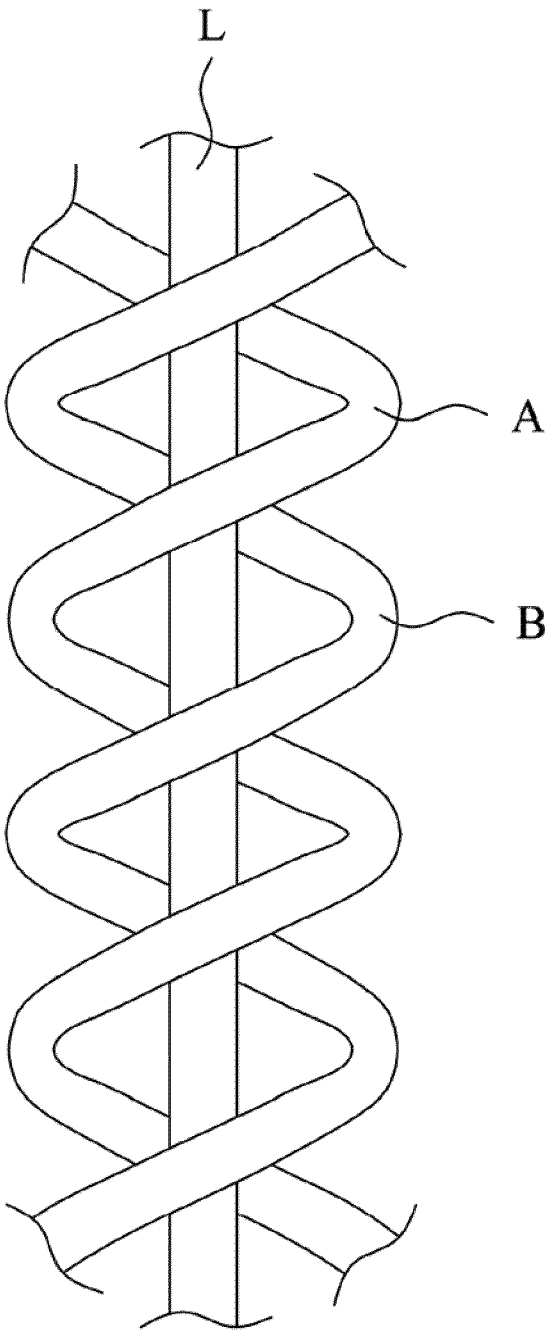

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 3962

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 A	US 2013/260104 A1 (DUA BHUPESH [US] ET AL) 3 October 2013 (2013-10-03) * paragraphs [0080] - [0114]; claims 11-15, 18-21; figures 1-5, 7-24 * * paragraphs [0076] - [0077]; claims 16, 22 * -----	1-6,8-15 7	INV. D04B1/18 ADD. D02G3/32 D02G3/38
A	WO 2014/194070 A1 (INVISTA NORTH AMERICA SARL [US]; INVISTA TECH SARL [CH]) 4 December 2014 (2014-12-04) * page 14, paragraph 9 - page 15, paragraph 3; claims 1, 2, 6, 11, 26; table 1 * -----	7	
A	EP 1 746 189 A1 (COGNON MORIN SA [FR]) 24 January 2007 (2007-01-24) * paragraphs [0031] - [0035]; claims 2, 4, 7, 10, 11; figures 1-7 * -----	7	

TECHNICAL FIELDS SEARCHED (IPC)

D04B
D02G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 March 2019	Sterle, Dieter

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 20 3962

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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