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(54) **IMPACT ABRASION AND CUT RESISTANT MONO-FABRIC**

(57) The invention relates to an impact, abrasion and cut resistant mono-fabric consisting of three different layers: an outer layer, an intermediate binding layer and an inner layer. The three layers woven and bound in one and the same structure form a single fabric from bicomponent technical yarns, in which the yarns of the outer and inner layers of the fabric are formed by warp yarns and the yarns of the intermediate layer are formed by weft yarns, such that the intermediate layer has binding points on which the yarns of the outer layer progress and shifted with respect to the binding points of the intermediate layer with the binding points of the inner layer, the yarns of the outer and inner layers being kept such that they are not bound to one another.

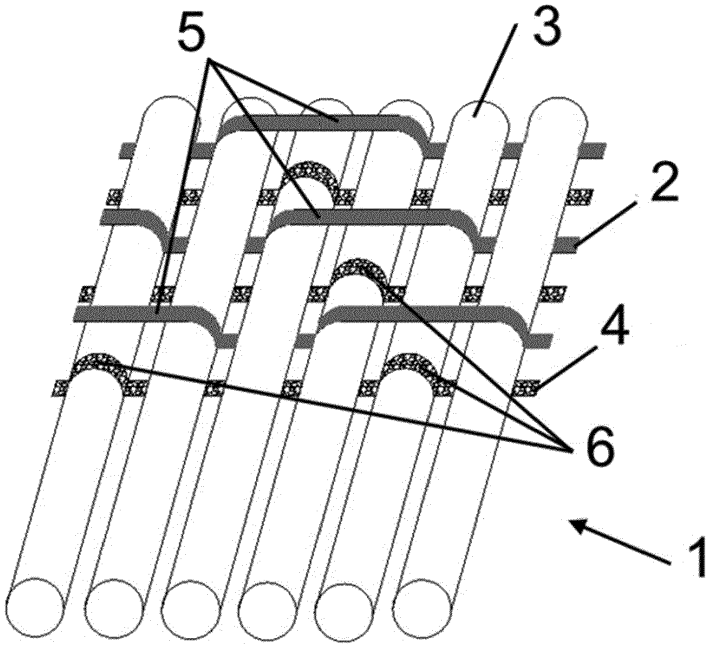


FIG. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a fabric referred to as mono-fabric, consisting of three layers of yarns, that is, an outer layer, an intermediate binding layer, and an inner layer, where the yarns of the outer and inner layers are not bound to one another, said mono-fabric standing out because of its impact abrasion and cut resistance.

[0002] The yarns of the outer and inner layers of the fabric are formed by warp yarns, and the yarns of the intermediate layer are formed by weft yarns. Therefore, the intermediate layer has binding points with the yarns of the outer layer, and in turn, the intermediate layer has binding points with the yarns of the inner layer, such that the intermediate layer to outer layer binding points are shifted with respect to the intermediate layer to inner layer binding points.

[0003] The object of the invention is to obtain a single fabric, or mono-fabric, that protects motorcycle riders in the event of possible accidents and protects people who practice extreme sports from skin burns and injuries caused by abrasion and friction when sliding on asphalt, and from cuts that may occur when hitting against a sharp object, such as guard rails or other vehicles, for example. Furthermore, the mono-fabric of the invention has insulating and low thermal conductivity properties, is breathable and waterproof, being a mono-fabric which as a whole offers features and properties that are completely innovative and inexistent today.

[0004] The fabric can be used as a fabric for making garments in general, protective garments and technical garments, and it can also be used as a technical fabric.

PRIOR ART

[0005] Motorcycle riders generally use textile garments for protection against the elements such as the wind, the rain and the cold.

[0006] Only just a few years ago, textile garments provided components in specific areas to protect against impact. These products were able to absorb impacts and prevent the injuries for the motorcycle driver or passenger.

[0007] Compared to users travelling by car, the only protection for motorcycle riders is their helmet and the textile garments they are wearing, including gloves and boots.

[0008] Up until now, protective garments for motorcycle riders existing on the market par excellence are made from leather. Leather is highly efficient in terms protection against impact abrasion and cutting, and up until now no other textile material has even come close to matching it, but it is a rigid material conferring limited freedom of movement, is uncomfortable, offers little breathability, makes sweat condensate and is not waterproof.

[0009] Furthermore, leather garments are hard to maintain since they have to be cared for with moisturizing creams, crack over time and are very hot in the summer

[0010] Other developed mono-layer fabrics have a combination of Cordura®, Kevlar®, cotton, polyamide, etc., but they do not offer a sufficient degree of protection in the case of the impact abrasion and cut resistance.

[0011] The only garments today capable of meeting the impact abrasion and cut resistance requirements in the event of an accident, in addition to leather garments, are:

- Very heavy, single-layer textile garments increasing fabric thickness and weight per square meter to increase its impact abrasion and cut resistance level, but this renders them rather uncomfortable for use due to the increase in weight and rigidity, achieving limited improvement to the protection levels.

- Garments produced with several layers of fabrics, or multilayer garments, obtained from two or more fabrics made together. For example, a multilayer garment in which the outer layer is a high tenacity Cordura® polyamide-type fabric to which there is added another fabric, generally a knitted or mesh fabric made of an abrasion resistant material such as Kevlar®, a fiber that is highly resistant to abrasion but not tensile stress. Therefore, the first layer of polyamide worn away by the road surface asphalt is mechanically assured by the second layer, rendering the fabric more abrasion resistant than garments with mono-layer fabrics.

[0012] The garment thus made with these multiple layers of fabrics prevents the injuries to the skin caused during the accidents due to falling, in which movement between layers of fabrics forming the garment and the inner layer of fabric in contact with the skin, which does not move, causes forces to be distributed to the outer layer.

[0013] These multilayer garments provide an improvement to garments made of mono-layer fabrics (that are not very resistant to impact abrasion and to cutting) for motorcycle riders. However, the resulting final garment weight is high and this makes it uncomfortable, rather inflexible (as it provides no elasticity), difficult to put together when cutting and making the fabrics, the garment looking as if it is padded, and too hot in the summer.

[0014] All this means that these garments have a high manufacturing cost, and since they are not elastic garments they cannot be fitted snugly to the body, which means that drag cannot be avoided, making driving more unsafe.

- Garments produced with mono-layer fabrics consisting of yarns based on a blend of abrasion and cut resistant natural fibers and technical fibers, where a mono-layer fabric is understood as single layer formed by a warp and a weft, in which the warp is

technical yarn and the weft is comfort yarn. In the event of falling onto the asphalt, these garments offer certain protection against the impact abrasion, but they have no insulating capability, so they transmit the heat produced by the abrasion due to the fabric rubbing on the asphalt, producing burns on the user through convective heat because in the event of a motorcycle rider falling onto the asphalt, the fabric rubbing against the asphalt generates a significant increase in temperature due to friction and at the same time the abrasion resistant technical fiber melts, creating plastic-coated parts accentuating any injury when they rub against the skin.

[0015] Therefore, it can be observed that no fabric suitable for being used by motorcycle riders or extreme sports athletes is known in the prior art, being understood as a single fabric, providing high impact, abrasion and cut resistance, with the ability to isolate convective heat, is elastic and prevents burns, and it has impact abrasion protection levels according to UNE EN standard 13595-2:2002 both for level 1 (longer than 4 seconds) and for level 2 (longer than 7 seconds).

DISCLOSURE OF THE INVENTION

[0016] The proposed fabric has been designed for the purpose of solving following aspects required by motorcycle riders, professional motorcycle riders and extreme sports athletes:

- Protection in the event of any accidental fall, impact abrasion and cut resistance, with protection levels complying with UNE EN standard 13595-2:2002, Level 1 and Level 2
- Protection against burns caused by friction.
- Breathability and thermal insulation.
- Fitting snugly against the body, flexibility, ease of movement and little drag.
- Easy to maintain and long-lasting.

[0017] Therefore, the impact abrasion and cut resistant mono-fabric consists of three layers of yarns, in which there are distinguished an outer layer, an intermediate binding layer and an inner layer. In this sense, the three layers are woven and bound in one and the same structure, forming a single fabric, or mono-fabric, from natural, artificial, cellulosic and synthetic fiber yarns or blends thereof, and in which the yarns of the outer layer and the yarns of the inner layer of the fabric are not bound to one another.

[0018] In the mono-fabric of the invention, the yarns of the outer and inner layers of the fabric are formed by warp yarns and the yarns of the intermediate or binding layer are formed by weft yarns.

[0019] The yarns of the intermediate layer have binding points with the outer and inner layers, respectively, such that the binding points of the intermediate layer with the yarns of the outer layer are shifted with respect to the binding points of the intermediate layer with the yarns of the inner layer, such that the yarns of the outer and inner layers are not bound to one another.

[0020] "Shifted" is understood to mean that the position a binding point of the intermediate layer with the outer layer occupies never coincides with the position of the binding point of the intermediate layer with the inner layer.

[0021] Advantageously, the obtained result is a structure integrated in a single fabric, a mono-fabric, characterized by having an outer layer and another inner layer that are completely separated from one another, although structurally integrated in a single ensemble by means of the yarns of the intermediate layer, but maintaining the features and properties thereof distinguishing them from one another. Therefore, the present invention keeps the layers isolated from one another and forms a technical barrier between the outer and inner layers.

[0022] The fabric in question provides, as a result of how it is produced, high impact abrasion and cut resistance in the event of falls and accidents. At the same time, since it is made up of two layers of yarns that are not bound to and different from one another, there is created a layer of intermediate air resulting in thermal insulation and breathability; furthermore, due to the fabric's elasticity and original shape recovery properties, it makes it easier to move and adapt to the user anatomy, offering comfort and reducing drag, and also providing greater driving safety.

[0023] Optionally, the yarns forming the layers are technical bicomponent yarns, bicomponent yarns being formed by cores covered with wicks of cut fibers in which the core consists of continuous, textured, elastic and rigid filaments.

[0024] The outer layer of the impact abrasion and cut resistant mono-fabric consists of bicomponent yarns, the inside of the yarn being made up of at least one core formed by technical fiber preferably consisting of filaments having high abrasion and cut resistance properties, and the outside being covered with wicks of natural, artificial, cellulosic or synthetic cut fibers, or blends thereof.

[0025] The outer layer therefore acts as a first protection or armor, being a textile structure with high impact abrasion and cut resistance. It also protects the user from possible impacts against gravel, screws, insects or small foreign bodies they may run into while driving.

[0026] Optionally, the yarns forming the outer layer of the protective mono-fabric can be dyed with indigo or sulfur dyes to make it look like a denim or jean fabric.

[0027] Optionally, the yarns of the outer layer of the mono-fabric are treated with products rendering it waterproof, resulting in a rainproof fabric.

[0028] The inner layer, which is in contact with the user's skin, is what regulates thermal insulation. This inner layer consists of natural, cellulosic, synthetic or artificial fiber yarns, or blends thereof.

[0029] Optionally, this inner layer consists of bicompo-

nent yarns made up of a core formed by filaments with abrasion and cut resistance properties, and externally covered with natural fibers, artificial, cellulosic, synthetic fibers, or blends thereof, giving this layer dual protection. At the same time, since the yarns are completely separated between the outer and inner layers, there is air between them that leads to thermal insulation, first allowing dissipation of the heat produced by friction due to the outer layer rubbing against the road asphalt in the event of falling due to an accident, increasing protection time and preventing it from being transmitted to the inner layer, and second, this insulation favors temperature regulation.

[0030] The intermediate layer consists of elastic bicomponent yarns made up of at least one core of the yarn formed by filaments of technical fibers having with high abrasion and cut resistance, along with elastomeric filaments, covered on the outside by natural, cellulosic, or synthetic fibers, or blends thereof, conferring to same elastic and original shape recovery properties.

[0031] Advantageously, given the elasticity and recovery of the fabric of the invention, said fabric makes it easier to move and to adapt to the user's anatomy, providing comfort and reducing drag, offering greater driving safety for motorcycle riders.

[0032] Optionally, the yarns of the intermediate layer or framing are dyed to make the ensemble look like denim fabric.

[0033] For the purpose of offering a bicomponent yarn having high abrasion, tear and cut resistance properties, the core of the bicomponent yarn is preferably a yarn formed by continuous or textured filaments of: polyethylene (UHMWPE), HT (high tenacity) polyamide, metaramid, aramid and/or HT (high tenacity) polyester.

[0034] The core of the bicomponent yarn is covered with natural, artificial, cellulosic or synthetic fibers, or blends thereof.

[0035] Furthermore, the bicomponent yarns of the outer face can optionally be externally covered with a blend of synthetic fire resistant or fireproof fibers, making the fabric flame or fire resistant.

[0036] The counts of the yarns used in the mono-fabric of the invention are preferably counts ranging between 8 and 50 metric counts.

[0037] In addition, the structure of the resulting mono-fabric is warp or weft backed fabric with plain or twill weaves.

[0038] The combination of the binding of the bicomponent yarns of the outer and inner layers combined with the elastic bicomponent weft yarns of the intermediate layer, according to the invention, allows obtaining elasticity along the width of the fabric exceeding the fabrics on the market today, and also being able to adjust the garment perfectly to the body with greater user comfort and safety.

[0039] Therefore, the fabric of the invention is elastic with an elasticity greater than 18%, being comfortable in the event of movements and having the ability to recover the initial shape less than 4% due to the properties of the fibers used, which is highly relevant due to the excessive time a motorcycle rider's knees are bent while riding the motorcycle.

[0040] The developed mono-fabric can have up to 50% more yarns per square centimeter than known mono-layer fabrics, so it does not lead to injuries and burns in the event of possible accidents due to falling or collisions, and provides very high protection and heat dissipation levels greater than those offered by known mono-layer fabrics.

[0041] Among the advantages provided by the mono-fabric of the invention, it is necessary to point out its temperature regulating feature, making it a hybrid structure suitable for all seasons and weather conditions. At the same time, it acts as a technical protective barrier and as an impact abrasion barrier (when the textile structure hits against the pavement and slides over the asphalt). During this physical friction process, the heat produced by the kinetic energy produced is dissipated to the intermediate layer of the structure, preventing and delaying this heat from being transferred to the inner structure, i.e., the one in contact with the skin, preventing burns and scratching on the user's skin.

[0042] In addition, among the advantages of the fabric of the invention over garments developed with several fabrics (multilayer garments), it is necessary to point out that it is easy to cut, make and put together, and therefore its production cost must also be pointed out, as they are more lightweight garments that can be used during every season of the year.

[0043] The fabric of the invention is also ergonomic given its elastic structure with shape memory, which allows the ability to adapt to the human anatomy, where it is a novel product with respect to solutions existing on the market, such as leather or multilayer garments. This proposal allows adaptation to the human body, which renders it more comfortable and provides greater driving safety.

[0044] Advantageously, the fabric stands out because it is easy to maintain, since it can be washed in a washer and dried in a dryer, which makes it easier to maintain over other materials such as leather or multilayer garments, formed by two or more fabrics.

[0045] It must be indicated that in the tests that were conducted, it was found that the fabric of the invention can have 50% more yarns per square centimeter than mono-layer fabrics, that it assures protection for up to 32 meters that the user skids on asphalt, and that, it has an impact abrasion protection level according to UNE EN standard 13595-2:2002 both for level 1 (longer than 4 seconds) and for level 2 (longer than 7 seconds).

BRIEF DESCRIPTION OF THE DRAWINGS

[0046] To complement the description that will be made below and for the purpose of aiding to better understand the features of the invention according to a pre-

ferred practical embodiment thereof, a set of drawings is attached as an integral part of said description, in which the following is depicted with an illustrative and non-limiting character:

Figure 1 shows a perspective view of the mono-fabric object of the present invention.

Figure 2 shows a side view of an example of bicomponent yarn.

Figure 3 shows a cross-section view of a bicomponent yarn dyed with indigo dyes.

DETAILED DISCLOSURE OF THE INVENTION

[0047] Figure 1 depicts an embodiment of the invention.

[0048] In this case, the fabric of the invention preferably consists of yarns forming the outer layer (1) and yarns forming the inner layer (3) having high abrasion and cut resistance. These yarns (1 and 3) are bicomponent yarns, formed by a core of one or more yarns consisting of continuous filament of technical fibers having high impact abrasion and cut resistance, preferably high modulus polyethylene (UHMWPE) or high density polyamide, covered with natural, cellulosic, synthetic, or fireproof fibers protecting the cores of continuous filament, the yarns of the outer layer being dyed with indigo or sulfur dyes to make them look like denim.

[0049] The intermediate layer of the fabric is preferably formed by elastic and abrasion and cut resistant yarns (2). These yarns (2) are bicomponent yarns formed by two cores, one core consisting of an elastomeric filament and the other core consisting of a filament of technical fibers having high abrasion and cut resistance, both covered with natural fibers.

[0050] The yarns of the intermediate weft layer (2) have binding points with the yarns of the outer layer (4) and with the yarns of the inner layer (5), thereby forming a single fabric, i.e., a mono-fabric, in which the yarns of the outer layer and the yarns of the inner layer are not bound to one another.

[0051] Garments made with these fabrics have elastic and high impact abrasion and cut resistance properties, exceeding multilayer textile garments or mono-layer textile garments.

[0052] Figures 2 and 3 are included in the present specification for the purpose of providing greater understanding of the bicomponent yarns forming the layers of the fabric of the invention.

[0053] Figure 2 shows a side view of an example of bicomponent yarn, in which the core of the yarn (6) is formed by filaments arranged in parallel, in the center of the yarn, and these filaments are externally covered with cut fibers (7)

[0054] Finally, Figure 3 depicts a cross-section of a dyed bicomponent yarn of the type used to form the outer layer. The core formed by filaments (6) is thereby covered with outer cut fibers (7) that are partially dyed with indigo or sulfur dyes (7').

[0055] All of these bicomponent yarns dyed with indigo or sulfur dyes make the fabric look like denim or jean.

Claims

1. An impact abrasion and cut resistant mono-fabric comprising three layers of yarns, distinguishing an outer layer, an intermediate or binding layer and an inner layer, **characterized in that:**

   the three layers are woven in one and the same structure, forming a single fabric from natural, artificial, cellulosic and synthetic fiber yarns or blends thereof, and in which the yarns of the outer layer and the yarns of the inner layer of the fabric are not bound to one another,
   wherein the yarns of the outer and inner layers of the fabric are formed by warp yarns and the yarns of the intermediate or binding layer are formed by weft yarns, such that the yarns of the intermediate layer have binding points with the outer and inner layers, respectively, such that the binding points of the yarns of the intermediate layer with the yarns of the outer layer do not coincide with the binding points of the intermediate layer with the yarns of the inner layer.

2. The impact abrasion and cut resistant mono-fabric according to claim 1, **characterized in that** the yarns forming the layers are bicomponent yarns, these bicomponent yarns being formed by cores covered with wicks of cut fibers, and in which the core consists of continuous, textured, elastic, and/or rigid filaments.

3. The impact abrasion and cut resistant mono-fabric according to claim 1 or 2, **characterized in that** the outer layer is formed by bicomponent yarns, the inside of the yarn being made up of at least one core formed by technical fiber preferably consisting of filaments having high abrasion and cut resistance properties, and the outside being covered with natural, artificial, cellulosic or synthetic cut fibers, or blends thereof.

4. The impact abrasion and cut resistant mono-fabric according to the preceding claims, **characterized in that** the yarns of the outer layer are dyed with indigo or sulfur dyes to yield a denim or jean fabric.

5. The functional, protective mono-fabric according to claims 3 or 4, **characterized in that** the yarns of the outer layer are treated with products rendering it waterproof, resulting in a rainproof fabric.

6. The impact abrasion and cut resistant mono-fabric according to claim 1 or 2, **characterized in that** the intermediate layer or framing is formed by bicomponent yarns made up of at least one core of the yarn formed by filaments of technical fibers having high abrasion and cut resistance covered on the outside by natural, artificial, cellulosic or synthetic cut fibers, or blends thereof.

7. The impact abrasion and cut resistant mono-fabric according to claim 6, **characterized in that** at least one of the filaments of the bicomponent yarns of the intermediate layer or framing is formed by elastomeric filaments, conferring to same elastic and original shape recovery properties.

8. The impact abrasion and cut resistant mono-fabric according to claim 6 or 7, **characterized in that** the yarns of the intermediate layer or framing are dyed.

9. The impact abrasion and cut resistant mono-fabric according to claim 1, **characterized in that** the inner layer is formed by natural, cellulosic, synthetic or artificial fiber yarns, or blends thereof.

10. The impact abrasion and cut resistant mono-fabric according to claim 1 or 2, **characterized in that** the inner layer is formed by bicomponent yarns made up of at least one core formed by filaments with abrasion and tear resistance properties, and the outside being covered with natural, cellulosic, synthetic or artificial cut fibers, or blends thereof.

11. The impact abrasion and cut resistant mono-fabric according to claims 3, 6, and 10, **characterized in that** the core of the bicomponent yarn with high abrasion and cut resistance properties is a yarn formed by continuous or textured polyethylene (UHMWPE), high tenacity polyamide, metaramid, and high tenacity polyester filaments.

12. The impact abrasion and cut resistant mono-fabric according to the preceding claims, **characterized in that** the counts of the yarns used range between 8 and 50 metric counts.

13. The impact abrasion and cut resistant mono-fabric according to the preceding claims, **characterized in that** the structure of the resulting mono-fabric is a warp or weft backed fabric with plain or twill weaves.

14. The impact abrasion and cut resistant mono-fabric according to the preceding claims, **characterized in that** in bicomponent yarns the core is externally covered with a blend of fire resistant or fireproof fibers.

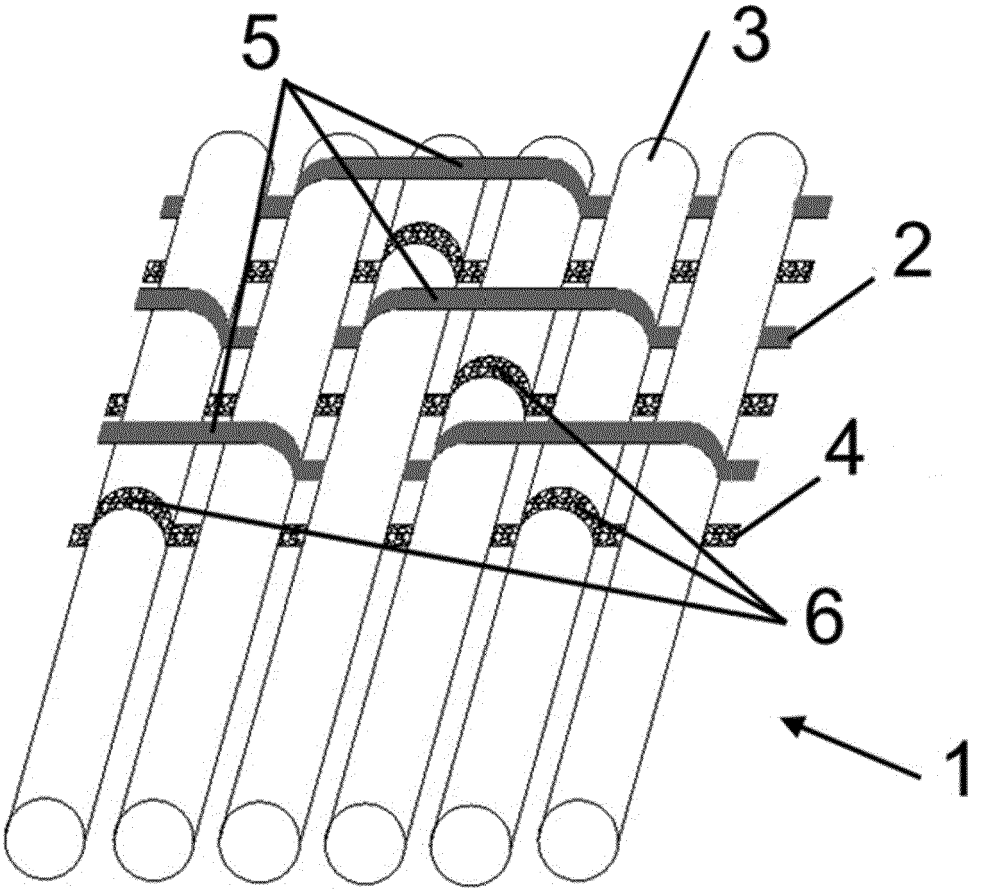


FIG. 1

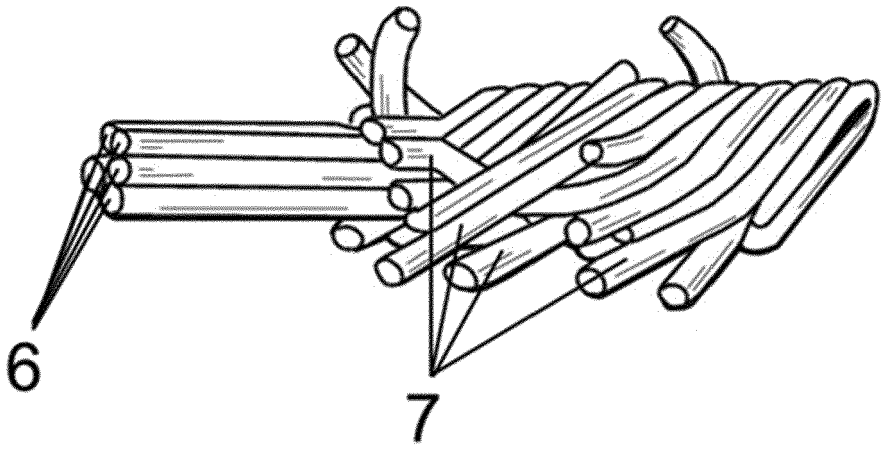


FIG. 2

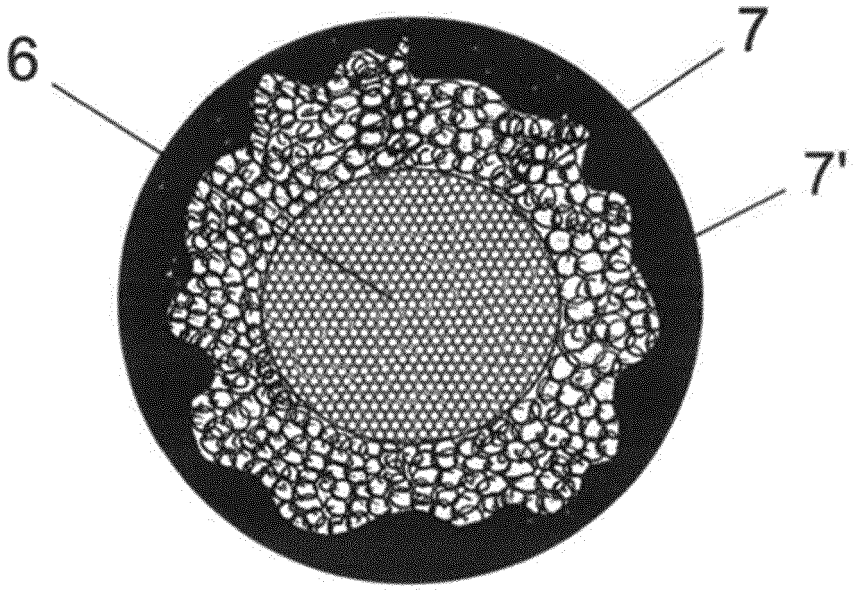


FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 17 15 8660

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D03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 October 2017	Hausding, Jan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 15 8660

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