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(54) **Protective fabric for garments**

(57) Protective fabric for garments comprising a perforated weave wherein at least one polyamide and/or polyester fibre and/or microfibre is present with count comprised between 20 and 1500 deniers, and at least one high performance fibre is present to improve the abrasion and friction resistance properties with count comprised between 40 and 1200 deniers.

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Description

[0001] The present invention refers to a protective fabric for garments.

[0002] Not exclusive field of application is that of packaging sportswear.

[0003] More in particular, a fabric suitable for practicing sport activities such as cycling, both competitive and cycle-touring on roads and other surfaces, must be generally light, comfortable, functional and attractive.

[0004] In particular, the fabrics used for summer articles must be as transpiring as possible, while those made for spring/fall or winter must maintain the heat while allowing a certain amount of transpiration in the right proportion.

[0005] During the sporting activity, such as cycling, the athlete undertakes heavy exertions, even for a very long period of time: sweating is a constant and the sweat must not excessively cool the body during the descents or when the outside temperature is very cold.

[0006] It appropriate the add to the lightness and comfort features the characteristics of resistance to abrasion and fabric tearing, because the cyclist in his competitive or cycle-touring activity risks falling: slipping on an irregular surface, due to the friction with the road-bed and/or ground, the fabric may be torn.

[0007] The fabrics traditionally employed for this need comprise polyamide, polyester, spandex, acrylic fibres and combinations of these, but they are not always capable of responding to the specific abovementioned needs.

[0008] Object of the present invention is to provide a functional, resistant and comfortable fabric, also attractive from the aesthetic standpoint, which protects the wearer while permitting his perspiration in manner so that it is adapted to use even in conditions of intense physical activity, sport or work, which leads to sweating.

[0009] Another object of the present invention is to provide a protective fabric for garments which may be easily packaged at low cost.

[0010] These and other objects of the present invention are carried out by a protective fabric for garments characterised in that it comprises a perforated weave wherein at least one polyamide and/or polyester fibre and/or microfibre is present with count comprised between 20 and 1500 deniers, and at least one high performance fibre is present to improve the abrasion and tear resistance properties with count comprised between 40 and 1200 deniers.

[0011] The transpiration of the fabric of the invention is ensured by the perforated weave, while the resistance to abrasion and tearing is optimised by the specific fibres utilised, by the type of weave, by the fineness and weight of the fabric itself.

[0012] In particular, the invention is adapted, but not in an exclusive manner, for sportswear, when it is necessary to protect the person who wears the garment from lacerations of the skin due to abrasion after accidental falls: the shorts and/or pants and/or tracksuit and/or overalls and/or short-sleeves or long-sleeves shirts for cycling use, whether competitive or cycle-touring, whether summer or winter, are an application example.

[0013] The fabric of the present invention is coupled to traditional fabric and positioned with variable shapes such to cover the areas of the body most at risk, thus to confer both the adequate protection of the body in the case of accidental falls due to its resistance to abrasion, and the right comfort to the athlete, due to its knit work which ensures the correct transpiration.

[0014] The fabric of the invention, due to its weave and constituent fibres, maintains its structure when one slides on an abrasive surface and dispels heat in an efficient manner, reducing in this manner the skin lacerations due to abrasion.

[0015] The protective fabric comprises a perforated weave wherein at least one polyamide and/or polyester fibre and/or microfibre is present with count comprised between 20 and 1500 deniers, and at least one high performance fibre is present to improve the abrasion and tear resistance properties with count comprised between 40 and 1200 deniers.

[0016] Preferably, the fabric comprises an elastomeric fibre with count comprised between 10 and 230 deniers.

[0017] The polyamide and/or polyester fibre and/or microfibre has a count comprised between 70 and 420 deniers.

[0018] The elastomeric fibre has a count preferably between 20 and 40 deniers.

[0019] The elastomeric fibre has the capacity to return to its original length after a quick stretching of at least twice its original length.

[0020] The high performance fibre has a count preferably comprised between 75 and 215 deniers.

[0021] The high performance fibre in general is characterised by having a high toughness and excellent heat stability.

[0022] Examples of polyamide fibres and/or microfibres adapted for the invention are produced and sold with the Cordura® (Du Pont) trademark), as well as Dynafil® (Schoeller), Meryl® and Meryl® Techno (Nylstar) etc.

[0023] Examples of elastomeric fibres are the elastomeric polyurethane fibres sold with the name Dorlastan® (Bayer), Lycra® (Du Pont), Linel® (Fillatice). Another type of elastic fibre is DOW XLA® of olefinic base.

[0024] Examples of high performance fibres comprise the aramidic fibres (for example produced by Du Pont with the name Kevlar® and Nomex®; by Teijin Limited with the name Technora® etc.), PBI fibres (produced for example by Celanese Co of Chatham), phenolic fibres (for example produced by Nippon Kynol Corp), PBO fibres produced for example by Toyobo with the name Zylon®) UHMWPE polyethylene fibres (produced for example by Honeywell with the name Spectra® 2000 and Spectra® 1000), polyacrylates (for example Leacril® produced by Montefibre), PAN. The weight of the high per-

formance fibre is comprised between 0.5 and 99.9% of the total weight of the fabric.

[0025] Preferably, the weight of the high performance fibre is comprised between 2 and 50% of the total weight of the fabric.

[0026] Essential part of the invention is, as stated above, that the fabric has a perforated weave, so to ensure the correct transpiration.

[0027] The perforated effects may be obtained both with weft knits and warp knits; in the first case, they occur due to an interruption of the normal procedure of the knitting cycles and use of special needles with additional work systems and drive cycles of the modified needles; in the second case, obtaining the perforated effects is possible by a simple combination of interlacing and threading of the combs.

[0028] In order to obtain the perforated fabric which best responds to the characteristics of comfort and resistance to tearing, when the working of the weft knit is used, one may employ stocking stitch, plain stitch, purl stitch, ribbed and with derived interlacing.

[0029] In order to obtain the perforated fabric which better responds to the characteristics of comfort and resistance to tearing, when the warp knit are used one may employ basic interlacing (simple, double, triple, quadruple zigzags) and those derived.

[0030] Not exclusive manufacture example is the jersey (used in the manufacture of the traditional cyclist fabric) with jacquard motif.

[0031] Different perforated figures are possible without departing from the object of the invention: oval, hexagonal, diamond, square, circular, rectangular. Preferred but not exclusive perforated figure example is the so-called honeycomb (it provides improved comfort with respect to a square-type perforation) .

[0032] To ensure the correct transpiration, the fabric has the widest possible holes, through they are not so wide as to cause weak points or tension in the fabric.

[0033] The average diameter of the hole ranges from 10 to 0.02 mm, preferably from 3 to 0.5 mm.

[0034] The fabric may be in a single layer, spaced or multilayer: the different possibilities of combination are intended to optimise the comfort and resistance to tearing of the final garment.

[0035] In the case of spaced or multilayer fabric, the inner layer in contact with the wearer is preferably but not exclusively composed of the fabric without the high performance fibre, the outer side of the perforated fabric containing the high performance fibre.

[0036] The traditional fabric and that of the invention are preferably coupled by sewing, using high resistance fibres according to traditional systems, and/or for use of specific adhesives and/or elastic bands positioned and sewn between the two fabrics.

[0037] In order to optimise the comfort and resistance to tearing of the garment, the weight of the fabric of the invention may vary according to the combinations of both the fibres used and the stitch working.

[0038] Several manufacturing modes of the fabric of the present invention are reported, as exemplifying but not limiting examples.

Example 1:

[0039] The Lycra® (Du Pont) fibre of 40 deniers is 100% covered with the fibre Cordura® (Du Pont) of 160 deniers.

[0040] In particular, the Lycra® is covered a first time with 160-denier Cordura® in the direction S with approximately 1200 coils/m, and a second time with 160-denier Cordura® in the opposite direction Z with approximately 1200 coils/m.

[0041] The covering machine is set such that the stretching of the elastomer is equal to 2.5 and the number of coils for each single covering is approximately 1200 coils/m; the covered fibre is balanced by setting the speed of the second spindle equal to 20-30% less than that of the first spindle.

[0042] The Lycra-Cordura fibre thus obtained is used together with the high performance fibre Technora® of 200 deniers for the preparation of the fabric described in the invention: the high performance fibre accounts for around 15% in weight.

[0043] The perforated jacquard knit jersey fabric (holes with 3 mm diameter and density equal to 11 holes/cm^2) is prepared by using a circular machine with 36" diameter, 20/22 gauge, 72 feed.

[0044] The jersey fabric thus obtained is coupled with a traditional jersey fabric by using a hemmer with round point needle.

Example 2:

[0045] The Lycra® (Du Pont) fibre of 40 deniers is 100% covered with the fibre Cordura® (Du Pont) of 160 deniers.

[0046] In particular, the Lycra® is covered a first time with 160-denier Cordura® in the direction S with approximately 1200 coils/m, and a second time with 160-denier Cordura® in the opposite direction Z with approximately 1200 coils/m.

[0047] The covering machine is set such that the stretching of the elastomer is equal to 2.5 and the number of coils for each single covering is approximately 1200 coils/m; the covered fibre is balanced by setting the speed of the second spindle equal to 20-30% less than that of the first spindle.

[0048] The Lycra-Cordura fibre thus obtained is used together with the high performance fibre Technora® of 100 deniers for the preparation of the fabric described in the invention: the high performance fibre accounts for around 25% in weight.

[0049] The perforated jacquard knit jersey fabric (holes with 3 mm diameter and density equal to 11 holes/cm^2) is prepared by using a circular machine with 36" diameter, 20/22 gauge, 72 feed.

[0050] The jersey fabric thus obtained is coupled with a traditional jersey fabric by using a hemmer with round point needle.

Example 3:

[0051] The Lycra® (Du Pont) fibre of 40 deniers is 100% covered with stiff fibres.

[0052] In particular, the Lycra® is covered a first time with 160-denier Cordura® of 160 deniers in the direction S with approximately 1200 coils/m, and a second time with 180-denier Spectrum2000® (Honeywell) in the opposite direction Z with approximately 1200 coils/m.

[0053] The covering machine is set such that the stretching of the elastomer is equal to 2.5 and the number of coils for each single covering is approximately 1200 coils/m; the covered fibre is balanced by setting the speed of the second spindle equal to 20-30% less than that of the first spindle.

[0054] The Lycra-Cordura-Spectrum fibre thus obtained is used together with the Lycra-Cordura fibre (see example No. 2) for the preparation of the fabric described in the invention: the high performance fibre accounts for around 20% in weight.

[0055] The perforated jacquard knit jersey fabric (holes with 3 mm diameter and density equal to 11 holes/cm^2) is prepared by using a circular machine with 36" diameter, 20/22 gauge, 72 feed.

[0056] The jersey fabric thus obtained is coupled with a traditional jersey fabric by using a hemmer with round point needle.

Example 4:

[0057] Using the circular machine (with 36" diameter, 20/22 gauge, 72 feed) with elastomer feeder, the Lycra® (Du Pont) fibre of 40 deniers is used along with the Cordura® fibre of 330 deniers, the Spectrum2000® fibre of 180 deniers for preparing the perforated jacquard knit jersey fabric (holes with 3mm diameter and density equal to 11 holes/cm^2). The content of high performance fibre accounts for around 20% in weight.

[0058] The jersey fabric thus obtained is coupled with a traditional jersey fabric by using a hemmer with round point needle.

Example 5:

[0059] Using the circular machine (with 36" diameter, 20/22 gauge, 72 feed) with elastomer feeder, the Lycra® (Du Pont) fibre of 40 deniers is used along with the Cordura® fibre of 330 deniers, the Kevlar® fibre of 180 deniers for preparing the perforated jacquard knit jersey fabric (holes with 3mm diameter and density equal to 11 holes/cm^2). The content of high performance fibre accounts for around 20% in weight.

[0060] The jersey fabric thus obtained is coupled with a traditional jersey fabric by using a hemmer with round point needle.

[0061] In all of the above mentioned examples, the fabric resistant to abrasion and transpiring is positioned on the garment so that the areas most at risk to abrasion, in case of accidental falls, are protected.

Claims

1. Protective fabric for garments **characterised in that** it comprises a perforated weave wherein at least one polyamide and/or polyester fibre and/or microfibre is present with count comprised between 20 and 1500 deniers, and at least one high performance fibre is present to improve the abrasion and tearing resistance properties with count comprised between 40 and 1200 deniers.

2. Protective fabric according to claim 1, **characterised in that** at least one elastomeric fibre is present in said weave with count comprised between 10 and 230 deniers.

3. Protective fabric according to claim 1, **characterised in that** said polyamide and/or polyester fibre and/or microfibre has a count comprised between 70 and 420 deniers.

4. Protective fabric according to claim 2, **characterised in that** said elastomeric fibre has a count comprised between 20 and 40 deniers.

5. Protective fabric according to claim 1, **characterised in that** said high performance fibre has a count comprised between 75 and 215 deniers.

6. Protective fabric according to claim 1, **characterised in that** the weight of said high performance fibre is comprised between 0.5 and 99.9% of the total weight of said fabric.

7. Protective fabric according to claim 6, **characterised in that** the weight of said high performance fibre is comprised between 2 and 50% of the total weight of said fabric.

8. Protective fabric according to claim 1, **characterised in that** said perforated weave is obtained with weft knitting.

9. Protective fabric according to claim 1, **characterised in that** said perforated weave is obtained with warp knitting.

10. Protective fabric according to claim 1, **characterised in that** the diameter of the holes of said perforated weave is comprised between 0.02 and 10 mm.

11. Protective fabric according to claim 10, **characterised in that** the diameter of the holes of said weave is comprised between 0.5 and 3 mm.

12. Protective fabric according to claim 1, **characterised in that** it has a single layer structure.

13. Protective fabric according to claim 1, **characterised in that** it has a spaced structure.

14. Protective fabric according to claim 1, **characterised in that** it has a multilayer structure.

15. Protective fabric according to claim 1, **characterised in that** said polyamide and/or polyester fibre and said elastomeric fibre are used bare.

16. Protective fabric according to claim 1, **characterised in that** said polyamide and/or polyester fibre is used in the simple helical covering (S or Z) of a core of said elastomeric fibre.

17. Protective fabric according to claim 1, **characterised in that** said polyamide and/or polyester fibre is used in the double helical covering (S + Z) of a core of said elastomeric fibre.

18. Garment which is **characterised in that** it bears, associated in at least one area, a protective fabric in accordance with one or more of the preceding claims.

19. Garment according to the preceding claim, **characterised in that** said fabric is united by means of sewing to said garment.

20. Garment according to the preceding claim, **characterised in that** said fabric is united by means of an adhesive to said garment.

21. Cycling garment which is **characterised in that** it bears, associated in at least one of its areas, a protective fabric in accordance with one or more of the preceding claims.

22. Garment which is **characterised in that** it is composed of a protective fabric in accordance with one or more of the preceding claims.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5168

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 August 2006	Hannam, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 42 5168

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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