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(54) Cut resistant sports sock

(57) A knitted sports garment (10) to be worn on a limb and for protecting a body part. The garment is made of an ordinary textile material and a cut resistive material and includes at least one first protection section (14) only including cut resistive material joined with at least one adjacent section (12, 16) with ordinary textile material. The cut resistive material of the first protection section is knit with stitches forming a number of full loops for encircling the limb when the garment is worn, where each stitch in the protection section is formed using at least two yarns, while the adjacent section with ordinary textile material is knit using fewer yarns in each stitch.

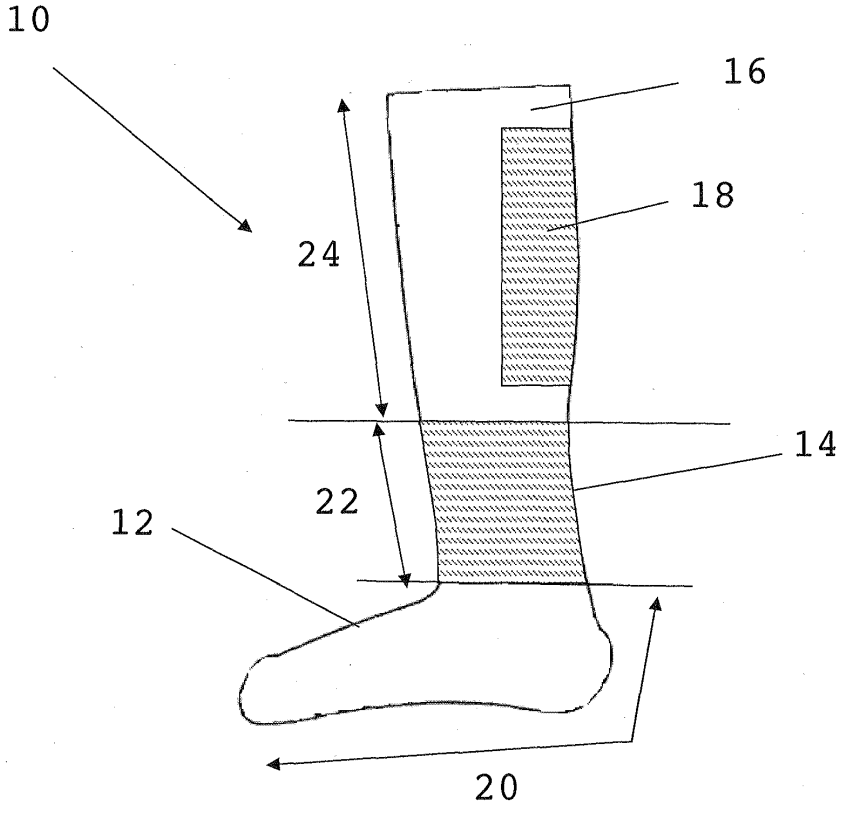

FIG. 1

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Description

TECHNICAL FIELD

[0001] The invention concerns a knitted sports garment, like a sock, a mitt or glove, which garment includes a cut resistive material together with an ordinary textile material.

BACKGROUND ART

[0002] In some sports it is common to use sharp equipment that can cut the participants. In for instance winter sports like ice hockey, bandy and figure skating, the skates have sharp blades that can cut the users. Such cuts can be very dangerous and even lethal.

[0003] In ice hockey it is known to use a special neck protector, a so called neck guard, in order to avoid severing the artery of the neck. Here it is common to have a plate knit of Kevlar® yarn that is sewn into a cavity or pocket of a textile material, like cotton. This neck protector is thus an additional piece of protective equipment in addition to the garments normally worn by the participants. Because the protective material is sewn into a cavity or pocket of the textile material, the protector is also fairly thick.

[0004] However, it is in many sports of interest to protect also the limbs, such as the arms and the legs in order to protect such body parts as the Achilles' tendon, the wrist, the ankle and calf. Although injuries on these parts are normally not lethal, they can lead to long injury periods. In for instance professional sports organisations, the costs involved with having players unable to participate because of injuries can be considerable. It is therefore of interest also to protect these bodily parts.

[0005] As protection is to be provided in relation to sports, where physical activity is the rule and not the exception, it is important that the influence on the agility of a person wearing such a protection is limited. If for instance the principle of the above-described neck guard, i.e. a plate in a pocket of a textile material, is applied on protective means provided for a limb, the movement of the limb may be impeded.

[0006] Thus, as the limbs are often moved, the protection of them should restrain the movement as little as possible. This is an equation that is hard to solve.

[0007] Reebok™ markets a product named "Perform Kneesock", which is a knitted sock to be used when playing ice hockey and for protecting the ankle. This sock includes a section made of Cordura® that is combined with textile material. The protection section is here only provided at the back side of the sock just above the heel. The knitting is also made using single stitches of both the ordinary sock material and the protective material.

[0008] This product is comfortable. However, there is room for improvement in the cut resistance properties of this sock.

SUMMARY OF THE INVENTION

[0009] The present invention is thus directed towards the problem of increasing the cut resistance provided by a knitted sports garment while retaining it's comfortable properties.

[0010] This is achieved through the features of the independent claim.

[0011] More particularly, this is solved through a knitted sports garment to be worn on a limb and for protecting a body part, where the garment comprises an ordinary textile material and a cut resistive material and includes at least one first protection section only including cut resistive material joined with at least one adjacent section with ordinary textile material. The cut resistive material of the first protection section is knit with stitches forming a number of full turns for encircling the limb when the garment is worn, where each stitch in the protection section is formed using at least two yarns and the adjacent section with ordinary textile material is formed using fewer yarns in each stitch.

[0012] The present invention has a number of advantages. It provides improved protection of a body part together with good comfort in the wearing of the garment. It does furthermore not limit the agility of the wearer.

[0013] According to one variation of the invention of the invention, the first protection section covers a larger area than an area of the limb that is to be protected.

[0014] The yarn of the cut resistive material may be made of fibres having a thickness in the range of 30 - 70 Nm. The cut resistive material may have a tensile strength in the range of 3 - 7 GPa. It may also have a density in the range of 1.3 - 1.5 g/cm3. It may furthermore have a tenacity in the range of 80 - 160 cN/tex. The cut resistive material is with advantage a para-aramid and preferably Kevlar® or a similar material.

[0015] The first protection section may furthermore be provided in-between sections of ordinary textile material. Here it is possible that the turns of the cut resistive material in the cut protection section are wider than at least the closest turns of the adjacent sections with ordinary textile material.

[0016] The garment may also have a second protection section with a patch of cut resistive material sewn or stitched onto a section of ordinary textile material.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 schematically shows a side view of a garment according to one embodiment of the present invention, and

Fig. 2 schematically shows two stitches of different sections of the garment according to the first embodiment being joined to each other.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] The present invention is directed towards using a cut resistive material in a garment. A cut resistive material is a material that is hard to cut with sharp instruments such as knives. It provides a resistance to the cutting.

[0019] As mentioned above, it is of interest to improve the cut resistive ability of a knitted garment, like a sock, such as the sock named "Perform Kneesock" mentioned above.

[0020] One way to improve this ability is to select a tougher yarn material used for the protection section of the sock. One suitable choice in this regard is to select a para-aramid, such as Kevlar®.

[0021] However, this may not be enough. A sock may need to receive further strengthening in the protection section. The present invention is directed towards providing this further strengthening through increasing the number of yarns used in the knitting. This means that according to the principles of the present invention each stitch in a protection section is formed using at least two yarns. In an embodiment of the invention to be described later, the number of yarns used in the protection section are two. However, it should be realized that it is possible to use more.

[0022] If increasing the number of yarns used in this way, when a sock of the type described above is being knitted, it is also necessary to increase the number of yarns used for the other sections of the sock. This means that if the number of yarns used in the sock named "Perform Kneesock" is increased in the protection section for protecting the ankle, then it is necessary to increase the number of yarns used also in the neighbouring sections. This means that also the sections that are to be made of ordinary textile material, like cotton, need to have more yarn in this way.

[0023] When this is done the sock will become thicker. A thicker sock will in many cases become less comfortable to wear. This is especially the case if the sock is combined with other garments like underwear and protective elements like shin guards. This means that such a sock will limit the agility of the sportsman and may be undesirable for this reason.

[0024] It is thus clear that it is necessary to do something about the situation in case the original comfort is to be combined with an increased cut resistance.

[0025] The present invention is directed towards solving this problem.

[0026] According to the principles of the present invention the number of yarns per stitch can be retained in the sections of ordinary garment material, while the number of yarns per stitch is increased in the protection section.

[0027] This is done through increasing the number of yarns per stitch in the protection section in a number of full turns for encircling the limb when the garment is worn. This means that the protection section is made larger than the area of the limb to be protected. It is thus made so large that it covers also areas of the limb that are not necessary to protect, such as the front of the leg, like the shin, which in many sports is already protected by a shin guard. The protection section is thus extended to an area where it is in fact not needed. The protection section is here formed using at least two yarns and the ordinary textile material is knit using fewer yarns in each stitch.

[0028] In this way it is possible to provide an increased protection of an area of a limb, while at the same time combining it with a section with ordinary textile material. This combination results in a garment that is still comfortable. It is here possible to select the yarn of the protection section to be thinner than the yarn of the ordinary textile material section so that the overall thickness of the garment is not increased

[0029] One embodiment of the present invention will now be described in more detail with reference being made to fig. 1, which schematically shows a side view of a garment in the form of a sock having a first and a second protection section and to fig. 2, which schematically shows a stitch of a protection section with cut protective material being joined to a stitch of an adjacent section with ordinary textile material.

[0030] The garment is a knitted sock 10 and has a first section 12 of knitted ordinary textile material, which may be cotton, polyester or any other suitable ordinary material. This ordinary textile material has low or insignificant cut protective ability. The material thus has poor cut protective properties. The material may typically have a tenacity at or below 1 cN/tex and a density of about 1.5 g/cm3. The tenacity of such materials may typically be below 10 cN/tex. In this embodiment it is bamboo. This ordinary textile material 12 is knitted using yarn, where the section is knitted with one yarn 34 in every stitch 28. This ordinary textile material section 12 is here knitted in a number of full turns that are provided one after the other from an end, a toe section to above a heel section, thereby forming a foot area 20. When the sock is worn, the ordinary textile material is thus wound a number of full turns around the foot from the toes up till above the heel.

[0031] After this first ordinary material section 12 follows a first protection section 14 that includes cut resistive material. The cut resistive material is here knitted a number of full turns from the foot area to a calf beginning end, thereby forming an ankle area 22. The first protection section here encircles the limb, when the garment is worn. Moreover, the first protection section 14 here covers the Achille's tendon and is knitted a number of full turns around the part of the leg to be covered, where the stitches 26 are made from two yarns 30 and 32 of cut resistive material. The textile material section 12 is therefore a first adjacent section with ordinary textile material in relation to the first protection section 14.

[0032] Thereafter follows a second section 16 of ordinary textile material, being knitted a number of full turns with only one yarn per stitch. This section stretches from the ankle area 22 to an upper calf end of the sock, which typically is provided at a knee, which is here below the

knee cap. This section is thus provided in a calf area 24. Alternatively the calf area 24 may end above the knee cap. The second section 16 of ordinary textile material is here a second adjacent section with ordinary textile material in relation to the first protection section 14. When the sock is worn, the ordinary textile material of the section 16 is thus wound a number of full turns around the calf. This means that the garment can be seen as being knitted a number of full turns around a central curve, which central curve has a curvature that is essentially the curvature of the part of the limb which the garment is to be put on.

[0033] In this embodiment there is furthermore a second protection section 18. The second protection section 18 is provided on top of a part of the second ordinary textile material section 16 of the calf area 24, and typically covering parts of a number of turns of the ordinary textile material. In this embodiment the second protection section 18 covers less than half of each of the turns of the ordinary textile material in a part of the calf area 24. The cut resistive material is furthermore provided in a part of the calf area 24 that covers a back part of the limb, here a back part of the leg, in order to cover the calf of the user. This second protection section 18 can be provided in the form of a patch of cut resistive material being stitched or sewn onto the sock and thus sewn onto the ordinary textile material.

[0034] The first protection section 14 is optionally wider than the neighbouring ordinary material sections. The turns in the first protection section may thus be wider than at least the closest turns in the neighbouring ordinary material sections. This has the advantage that it is easier to put on the sock.

[0035] The cut resistive material is with advantage a yarn made of fibres with high tensile strength combined with fairly low density and is with advantage Kevlar® or a similar material. The cut resistance is thus provided in a first protective area of the garment that is to protect a body part, like an Achille's tendon, from being cut. This principle can with advantage be provided for other parts of a limb like the wrist, the ankle, thigh and calf.

[0036] The yarn of the cut resistive material is with advantage made of fibres, each having a thickness in the range of 30 - 70 nM (numerical metric) and preferably 50 nM. The yarn is then with advantage made up of two such fibres with a thickness in the above range and then with advantage 50/2 nM. If two yarns are used, the total thickness of the protection section may then be defined as four times the fibre thickness. The yarn material may with advantage have a tensile strength in the range of 3 - 7 GPa, even more preferred in the range of 3.3 - 4.1 GPa and in the first embodiment of 3.5. It may also with advantage have a density in the range of 1.3 - 1.5 g/cm3, preferably in the range 1.38 - 1.47 g/cm3 and in the first embodiment at 1.45 g/cm3. The yarn may with advantage have a tenacity expressed in cN/tex. This tenacity is with advantage in the range of 80 - 160 cN/tex, preferably 90 - 150 cN/tex, more preferred 100 - 140 cN/tex and most preferably 100 - 130 cN/tex. The tenacity is with advantage higher than 80 CN/tex and preferably higher than 120 cN/tex. The cut resistive material may furthermore have a performance rating of 3, 4 or 5 for cut resistance according to EN388.

[0037] It should here be realized that the present invention can be varied in a number of ways. The cut resistive material has been described as being Kevlar®. However, it should be realized that it is not limited to this. It is possible also with other materials, for instance Cordura®. In the above described embodiment there were two ordinary textile material sections on each side of the first protection section. There were thus two adjacent sections of ordinary textile material. It is possible with variations of this. There may be only one such ordinary textile material section that is a neighbour to a protection section. It is here possible that a single protection section may be provided below or above such a single ordinary textile material section. It is furthermore possible with more first protection sections being separated by ordinary textile material sections. It is also possible with several second protection sections being stitched or sewn onto the garment. The garment is also not limited to a sock but can for instance be a mitt or a glove.

[0038] It should therefore be realized that the present invention is only to be limited by the following claims.

Claims

1. A knitted sports garment (10) to be worn on a limb and for protecting a body part, said garment comprising an ordinary textile material and a cut resistive material, the garment including at least one first protection section (14) only including cut resistive material joined with at least one adjacent section (12, 16) with ordinary textile material, **characterised in that:**

   the cut resistive material of the first protection section is knit with stitches (26) forming a number of full turns for encircling the limb when the garment is worn, where each stitch (26) in the protection section is formed using at least two yarns (30, 32), and
   the adjacent section with ordinary textile material is knit using fewer yarns (34) in each stitch (28).

2. The garment according to claim 1, wherein the first protection section covers a larger area than an area of the limb to be protected.

3. The garment according to claim 1 or 2, wherein the yarn of the cut resistive material is made of fibres having a thickness in the range of 30 - 70 Nm.

4. The garment according to any previous claim,

wherein the cut resistive material has a tensile strength in the range of 3 - 7 GPa.

5. The garment according to any previous claim, wherein the cut resistive material has a density in the range of 1.38 - 1.47 g/cm3.

6. The garment according to any previous claim, wherein the tenacity of the cut resistive material is in the range of 80 - 160 cN/tex.

7. The garment according to any previous claim, wherein the first protection section is provided in-between sections of ordinary textile material.

8. The garment according to claim 7, wherein the turns of the first protection section are wider than at least the closest turns of the adjacent sections with ordinary textile material.

9. The garment according to any previous claim, further comprising a second protection section (18) with a patch of cut resistive material sewn or stitched onto a section (16) of ordinary textile material.

10. The garment according to any previous claim, wherein the cut resistive material is a para-aramid.

11. The garment according to claim 10, wherein the material is Kevlar® or a similar material.

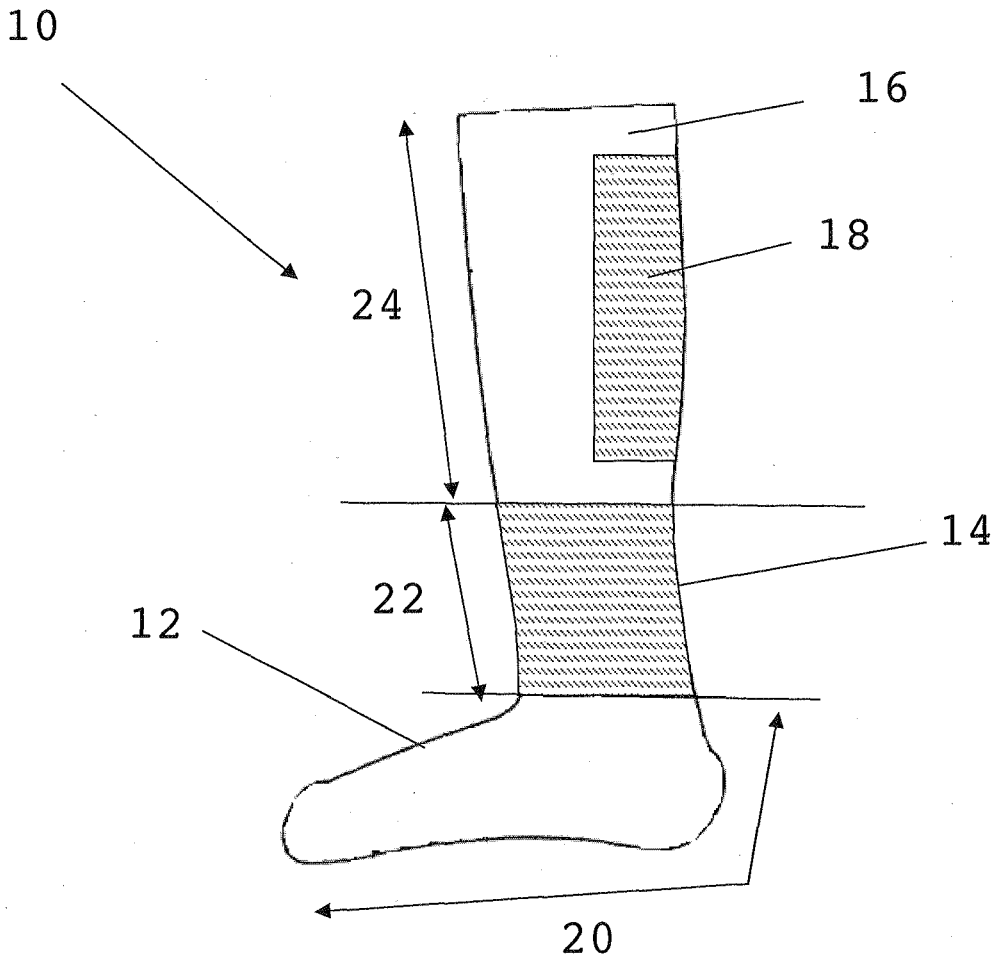

FIG. 1

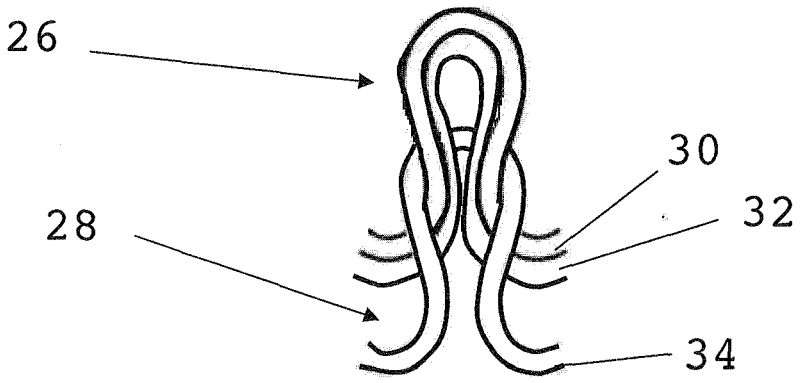

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 8154

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2009/044571 A1 (THOMPSON ERIC [US] ET AL THOMPSON ERIC [US] ET AL) 19 February 2009 (2009-02-19) * paragraph [0032] - paragraph [0049]; figures 3, 8 *	1-11	INV. A41D13/05 A63B71/12 D04B1/26
A	US 2009/019612 A1 (SCHULEIN WALTER GORDON [US] ET AL) 22 January 2009 (2009-01-22) * paragraphs [0002], [0013], [0027] * * paragraph [0042] - paragraph [0047] *	1-11	

TECHNICAL FIELDS SEARCHED (IPC)

A41D
A63B
D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	23 April 2010	Zirkler, Stefanie

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 17 8154

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23-04-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009044571 A1	19-02-2009	NONE	
US 2009019612 A1	22-01-2009	AU 2008307344 A1	09-04-2009
		EP 2176619 A1	21-04-2010
		WO 2009045600 A1	09-04-2009

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