(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
8 December 2005 (08.12.2005)

PCT

(10) International Publication Number
WO 2005/116316 A1

(51) International Patent Classification[7]: D04B 11/12, 21/12, 21/14, 21/16, 21/18, 23/06

(21) International Application Number: PCT/US2005/018220

(22) International Filing Date: 24 May 2005 (24.05.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/852,561 24 May 2004 (24.05.2004) US

(71) Applicant *(for all designated States except US)*: **WELLS LAMONT INDUSTRY GROUP** [US/US]; 6640 West Touhy Avenue, Niles, IL 60714-4587 (US).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: **HUMMEL, Joseph** [US/US]; 374 Essex Court, Perkasie, PA 18944 (US).

(74) Agent: **HLAVKA, John, R.**; Watts Hoffmann Co., L.P.A., P.O. Box 99839, Cleveland, OH 44199-0839 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for all designations*

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CUT RESISTANT GARMENT

(57) Abstract: Disclosed is a cut-resistant sleeve. The sleeve is generally tubular in construction having a pair of opposite ends and defining an essentially tubular cavity extending between the opposites ends. The sleeve is knitted from a cut-resistant fiber where the knitting is formed using a rib type knitting stitch. The preferred knitting stitch for knitting the inventive sleeve is a 1 X 1 rib rib knit stitch. This type of knitting stitch is preferably knitted on a circular knitting machine.

WO 2005/116316 A1

CUT RESISTANT GARMENT

FIELD OF THE INVENTION

The present invention relates to the field of protective cut-resistent garment, and more specifically, to a cut-resistive sleeve.

BACKGROUND

In industries where cutting implements are employed, such as the meat packing industry or the automotive industry, workers wear protective clothing, including arm protectors that are cut-resistant and the protect against injury. One type of protector is a cut-resistant sleeve which covers a large portion of a workers arm. Sleeves are typically made from cut-resistant yarns and are constructed using a machine that is designed to knit protective gloves. The reason for using the glove machine is that typical composite yarns that are used in the knitting process have a tendency to be harsh, stiff and generally hard to process due to their construction. The sleeves are conventionally knitted using a jersey knit stich. The jersey knit is a circular knit or flat knitted fabric made with a plain stitch in which the loops of the yarn intermesh in only one direction. As a result, the appearance of the face and the back of the jersey fabric takes on a distinct pattern.

Conventional sleeves are constructed as tubular members and are provided with elastic in the stiching to provide support and comfort to the user. Even though the prior design included elastic bands within the knitting, the sleeves still have to be supported at the upper arm end to prevent the sleeves from falling down and interfering with the workers hands. In addition, prior sleeves cannot be custom made based on the individual users needs. Because the sleeves are made on the glove machine with a jersey knit stitch, customizing the sleeves is not possible.

The present invention provides a cut-resistant sleeve constructed in an inventive manner which allows for customizing the sleeve to individual needs while at the same time providing superior protection, support and comfort to the user. Further, the invention relates to a method of making a sleeve by employing a knit stitch which allows for customizing the sleeve and well as improving productivity and efficiency in the construction process.

SUMMARY OF THE DISCLOSRUE

The present invention provides both a novel cut-resistant sleeve and a method of making such sleeve. In its broader aspect, the novel sleeve is an elongated generally tubular sleeve of flexible, cut-resistant material having a pair of opposite ends. The material between the opposite ends defines an essentially tubular cavity. The sleeve is knitted from a cut-resistant fiber using a rib type knitting stitch. In one embodiment, a portion of the sleeve is knitted from a more relaxed stitch than the opposing portion.

The rib knit stitch employed in the novel sleeve allows much greater flexibility in knitting to an individual's specifications. The width of the sleeve can be increased or decreased depending on the needs of the user. The present invented sleeve is preferably knitted from a 1 X 1 rib knit stitch. This type of stitching is preferably knitted on a circular knitting machine.

The present invention is also directed to a method of knitting a cut-resistant sleeve which includes selecting a cut-resistant yarn and knitting a sleeve from the cut-resistant yarn using a rib type knitting stitch. In the preferred method, the knitting is accomplished on a circular knitting machine using a 1 X 1 rib knit stitch.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the sleeve of the present invention in it's proper using position;

Figure 2 is a perspective view of a cut-resistant sleeve according to the present invention; and

Figure 3 is a enlarged view of the dashed section shown in Fig. 1.

DISCLOSRE

Turning now to the figures, Figure1 and Figure 2 show a sleeve 10 according to the present invention. The sleeve 10 is generally tubular in shape and includes an upper arm portion generally shown as reference character 12 and an lower arm portion generally shown as reference character 14. The upper arm portion 12 includes an upper elastic member 16 located at the upper end portion 15 of the sleeve 10. As shown in Figure 1, during use, the upper arm portion 12 fits over the user's upper arm, normally above the elbow where the upper elastic portion 16 stretches to conform to the user's

upper arm. The upper arm portion 12 is of a larger diameter than the lower arm portion 14. This difference in diameter provides comfort to a user since ones upper arm is typically larger than their lower arm. During typical use, the user will be wearing a cut-resistant glove 11.

The lower arm portion 14 includes a lower elastic member 18 at the cuff end 17 of the sleeve 10. The elastic portions 16, 18 are sewn into the end portions of the sleeve and are typically a ring-shaped elastic band. The elastic portions are those that are typically used in the field and would be apparent to one of ordinary skill in the art in view of this disclosure. The lower elastic member 18 is smaller in diameter than the upper elastic portion 16. Further, the stitching used in knitting the upper arm portion 12 is integral with the stitching used in knitting the lower arm portion 14. The lower arm portion 14 and the upper arm potion 12 are constructed from a rib type of knitting stitch. The rib type stitching of the lower arm portion 14 is a more compact and tighter stitching than that used to knit the upper arm portion 12. This allows the upper arm portion 12 to be larger and more flexible than the lower arm portion 14. As stated, the lower arm portion 14 requires a more compact and smaller stitching due to the fact that a user's lower arm is smaller than their upper arm. This allows for more comfort when wearing the sleeve 10. In both the lower arm potion 14 and the upper arm portion 12, the rib type stitching provides a degree of elasticity within the nature of the stitch. This provides an elastic quality without the need for elastic type materials to be stitched into the stitching of the sleeve. Further, the use of the rib stitch allows various changes in the size and shape of the final sleeve product. As such, the sleeve 10 can be customized to an individual user's specifications for maximum comfort and safety. The process of customizing the sleeve 10 would be apparent to one of ordinary skill in the art in view of this disclosure.

Figure 3 shows a 1 X 1 rib type of knitting stitch 30 employed in the present sleeve 10. The rib type knitting stitch 30 includes a series of opposing wales 32 and 36 and courses 34. In a rib type knitting stitch, the loops 32a of the wales 32 intermesh in one direction while the loops 36a of the opposing wales 36 intermesh in the opposite direction. The 1 X 1 rib stitch is commonly used in the production of socks, particularly hockey socks, and is, therefore, known in the art of producing socks. The common 1 X 1

rib stitch is further explained in the Man-Made Fiber and Textile Dictionary, New York Celanese Corporation, 1974, which is hereby incorporated by reference. The use of the rib stitch gives the sleeve the ability to stretch without elastic, as compared to the jersey stitch that is used in prior sleeves.

The sleeve 10 of the current invention is constructed via a method using a circular knitting machine. The circular knitting machine used in the current process includes a seven (7) inch cylinder and dial where both the cylinder and dial include sixty-six needles. A circular knitting machine such as described is commercially available from Tompkins®, having a principal place of business at 623 Oneida Street, Syracuse, NY 13202 and sold under the model number and name B2-E Electronic Knitting Machine. It has been advantageously found by the inventors that with the development of new, thinner cut-resistant yarns, this new technique for knitting cut-resistant sleeves could be realized. The circular knitting machine described for knitting the inventive sleeve further includes a 1901H1 cylinder needle and a 2781D1 dial needle. The machine cylinder can be changed to accommodate thinner cut-resistant yarns to address different levels of protection. The circular knitting machine, as described, stitches a 1X1 rib knit stitch.

The circular knitting machine is adapted to knit with flexible cut-resistant yarns. Such yarns are commercially available from Wells Lamont Industry Group, having a principal place of business Niles, Illinois. A first such yarn that may be employed to provide cut-resistance to a sleeve manufactured on the circular knitting machine described above is sold under the tradename Spectra® and includes a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of polyester having a denier of about 840. A second yarn also sold under the tradename Spectra® includes a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of blue colored polyester having a denier of about 840. In the preferred embodiment, the fourth wrap of polyester is blue.

The method of the current invention includes selecting an appropriate cut-resistant yarn and using the circular knitting machine to stitch a 1 X 1 rib knit stitch. The sleeve is knitted in a generally tubular shape having one end portion of a larger diameter than an opposing end portion. An elastic band is sewn at each end of the sleeve. In the illustrated embodiment, the method includes stitching one end of the sleeve having a tighter stitch such that when the sleeve is on the user, the tighter stitch surrounds the lower arm portion and helps to maintain a better fit for the user. The opposing end portion is stitched with a less compact or looser stitch such that the opposing end can more comfortably protect the upper arm of the user. The illustrated method employs the cut resistant yarns as described above.

Many modifications and variations of the invention will be apparent to those of ordinary skill in the art in light of the foregoing disclosure. Therefore, it is to be understood that, within the scope of the appended claims, the invention can be practiced otherwise than has been specifically shown and described.

CALIMS

I Claim:

1. A cut-resistant protective sleeve comprising:

an elongated generally tubular sleeve of flexible, cut-resistant material having a pair of opposite ends and defining an elongated essentially tubular cavity extending between said opposite ends, wherein said sleeve is knitted from a cut-resistant fiber, said knitting being formed from a rib type knitting stitch.

2. The protective sleeve of claim 1 wherein one end portion comprises a more relaxed rib knitting stitch with respect to the other end portion.

3. The protective sleeve of claim 1 wherein the sleeve is fabricated based on measurements of the arm of an individual user.

4. The protective sleeve of claim 1 wherein the rib knit stitch is a 1 X 1 rib knit.

5. The cut-resistant protective sleeve of claim 4 wherein the rib type knitting stitch is accomplished on a circular knitting machine.

6. The protective sleeve of claim 1 wherein the cut-resistant material comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of polyester having a denier of about 840.

7. The protective sleeve of claim 1 wherein the cut-resistant material comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of

about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of colored polyester having a denier of about 840.

8. A cut-resistant protective sleeve comprising:

an elongated generally tubular sleeve of flexible, cut-resistant material having a pair of opposite ends and defining an elongated essentially tubular cavity extending between said opposite ends, wherein said sleeve is knitted from a cut-resistant fiber said knitting being formed in a rib knitting fashion;

wherein the rib knit stitch is a 1 X 1 rib stitch knitting; and

wherein the cut-resistant material comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of polyester having a denier of about 840.

9. A cut-resistant protective sleeve comprising:

an elongated generally tubular sleeve of flexible, cut-resistant material having a pair of opposite ends and defining an elongated essentially tubular cavity extending between said opposite ends, wherein said sleeve is knitted from a cut-resistant fiber said knitting being formed in a rib knitting fashion;

wherein the rib knit stitch is a 1 X 1 rib stitch knitting; and

wherein the cut-resistant material comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of colored polyester having a denier of about 840.

10. A method of making a cut resistant protective sleeve, the sleeve made from the steps comprising:

selecting a cut resistant yarn; and

knitting the sleeve member with the cut resistant yarn using a rib type knitting stitch.

11. The method of claim 10 wherein the cut resistant yarn comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of polyester having a denier of about 840.

12. The method of claim 10 wherein the cut-resistant yarn comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of colored polyester having a denier of about 840.

13. The method of claim 10 wherein the rib type knitting stitch comprises a 1 X 1 rib knit stitch.

14. The method of claim 13 wherein said knitting is accomplished on a circular knitting machine.

15. A method of making a cut resistant protective sleeve, the sleeve made from the steps comprising:

selecting a cut resistant yarn; and

knitting the sleeve member from the cut resistant yarn using a rib type knitting stitch, wherein the cut-resistant yarn comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of polyester having a denier of about 840.

16. A method of making a cut resistant protective sleeve, the sleeve made from the steps comprising:

selecting a cut resistant yarn; and

knitting the sleeve member from the cut resistant yarn using a rib type knitting stitch, wherein the cut-resistant yarn comprises a polyester core having a denier of about 440, a first wrap of stainless steel having a diameter of about 0.002 inches, a second wrap of stainless steel having a diameter of about 0.002 inches, a third wrap of high strength, polyethylene having a denier of about 375, and a fourth wrap of colored polyester having a denier of about 840.

17. A method of making a cut resistant protective sleeve, the sleeve made from the steps comprising:

selecting a cut resistant yarn; and

knitting the sleeve member from the cut resistant yarn using a rib type knitting stitch, wherein the rib type knitting stitch is a 1 X 1 rib knit stitch knitted on a circular knitting machine.

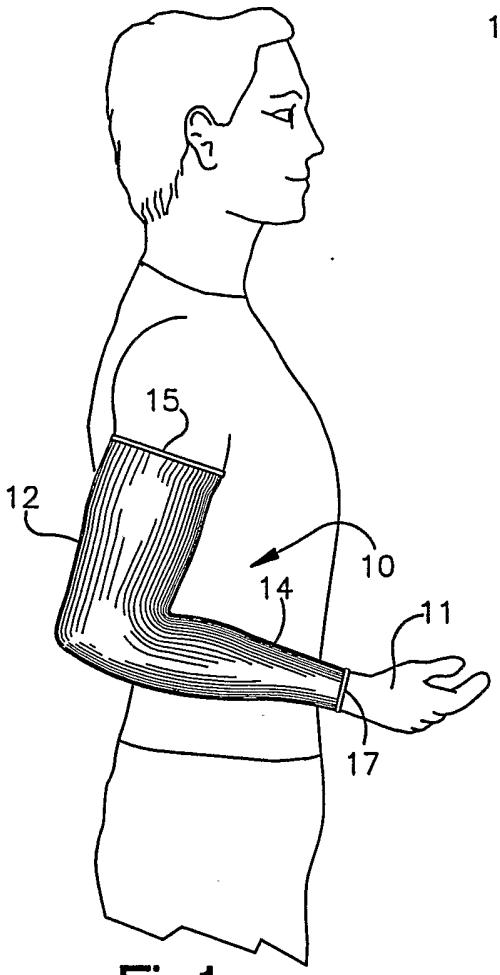

Fig.1

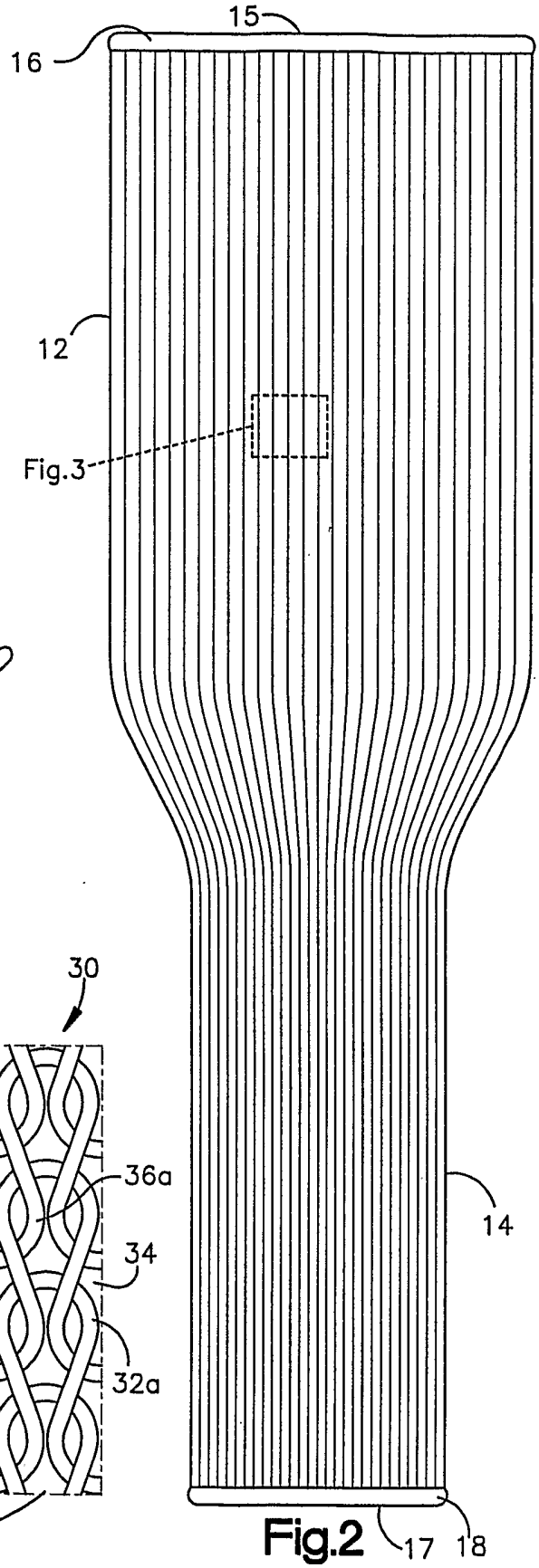

Fig.2

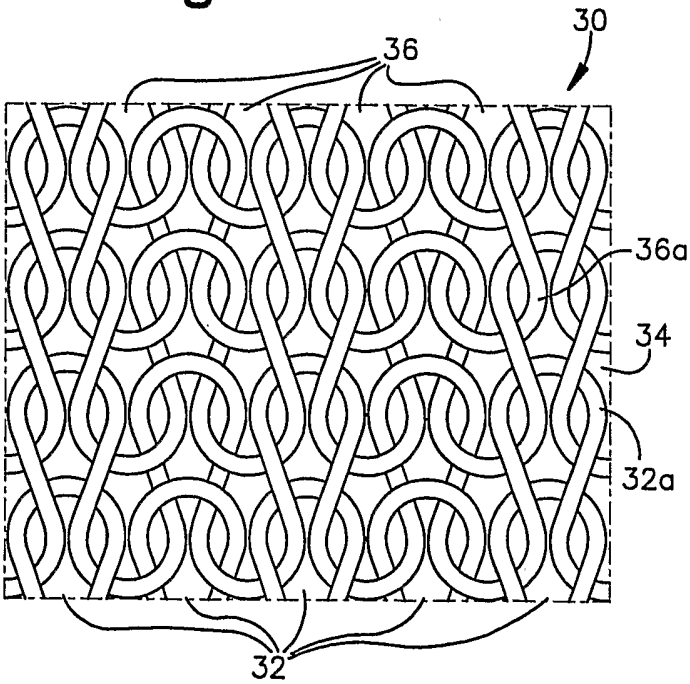

Fig.3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US05/18220

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : D04B 11/12; 21/12, 21/14, 21/16, 21/18; 23/06
US CL : 66/202
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 66/202, 174, 16, 159-167; 2/455, 456, 16

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,155,084 A (ANDREWS et al.) 5 December 2000 (05.12.2000), entire document.	1-17
Y	US 6,053,014 A (COOPER) 25 April 2000 (25.04.2000), entire document.	1-17

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"B" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
12 August 2005 (12.08.2005)

Date of mailing of the international search report
01 SEP 2005

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (703) 305-3230

Authorized officer
Marianne Seidel
Telephone No. (571) 272-1600

Form PCT/ISA/210 (second sheet) (January 2004)