(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 233 089 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.08.2002 Bulletin 2002/34

(51) Int Cl.[7]: **D03D 15/00**, D04B 1/12

(21) Application number: **02251102.6**

(22) Date of filing: **19.02.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **20.02.2001 GB 0104148**

(71) Applicant: **Sara Lee Corporation**
Winston-Salem, NC 27105 (US)

(72) Inventors:
- **Sharrocks, Phillip**
  Slough, Berkshire SL1 4AU (GB)
- **Daves, Nigel**
  Slough, Berkshire SL1 4AU (GB)
- **Ratcliffe, Andrew**
  Slough, Berkshire SL1 4AU (GB)
- **Starbuck, Michael**
  Slough, Berkshire SL1 4AU (GB)
- **Young, Jane**
  Slough, Berkshire SL1 4AU (GB)

(74) Representative: **Dealtry, Brian**
Eric Potter Clarkson,
Park View House,
58 The Ropewalk
Nottingham NG1 5DD (GB)

(54) Reinforced fabric

(57) A method of producing a reinforced fabric including producing by a knitting or weaving process a ground fabric using ground yarns and incorporating into the ground fabric during the knitting or weaving process reinforcement yarns (10) in a predetermined pattern to form predetermined areas of reinforcement, the reinforcement yarn (10) being a stretch resistive yarn (11) coated with a weldable material (12), and subsequently exposing the fabric to a weldable condition in order to cause said weldable material (12) to weld to itself and to ground yarns with which it is in contact.

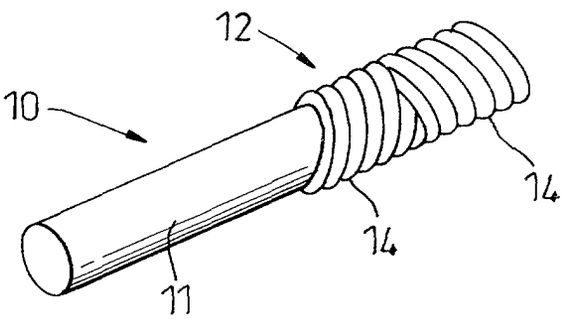

Fig. 1

EP 1 233 089 A1

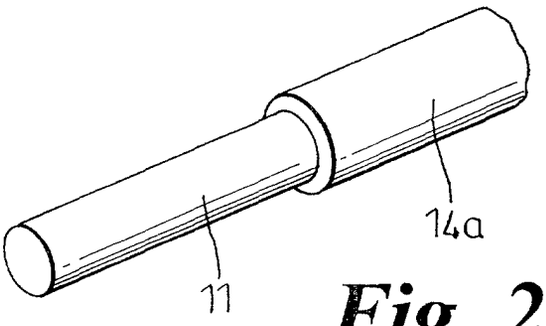

Fig. 2

Description

[0001] The present invention relates to a method of producing reinforced fabrics and to reinforced fabrics.

[0002] In the production of garments such as brassieres and foundation garments, it is often necessary to provide reinforcement in specific areas of the garment in order to enable the garment to provide the desired support to the wearer.

[0003] Typically the reinforcement is provided by incorporating into the garment separate reinforcement members, e.g. wires or bones. The provision of separate reinforcement members is highly undesirable as they require the garment to be specially modified, e.g. by the incorporation of pockets in order to accommodate the reinforcement members. This increases the production cost of the garment and also can render the garment uncomfortable to wear. In addition, the size, shape and number of areas which can be reinforced are restricted due to the shape and size of the reinforcement and to the resultant modifications to the garment which are required in order to incorporate the reinforcement members.

[0004] A general aim of the present invention is to provide a method of producing a reinforced fabric having areas of reinforcement which are integrally formed with the fabric structure.

[0005] This enables reinforcement areas of desired size and location and desired degree of reinforcement to be produced simultaneously with the production of the fabric by suitable pattern control techniques.

[0006] According to one aspect of the present invention there is provided a method of producing a reinforced fabric including producing by a knitting or weaving process a ground fabric using ground yarns and incorporating into the ground fabric during the knitting or weaving process reinforcement yarns in a predetermined pattern to form predetermined areas of reinforcement, the reinforcement yarn being a stretch resistive yarn coated with a weldable material, and subsequently exposing the fabric to a weldable condition in order to cause said weldable material to weld to itself and to ground yarns with which it is in contact.

[0007] According to another aspect of the present invention there is provided a reinforced fabric comprising a knitted or woven ground fabric incorporating a predetermined pattern of reinforcement yarns which define integral areas of reinforcement, the reinforcement yarns being stretch resistive yarns coated with a welded weldable material.

[0008] Various aspects of the present invention are hereinafter described with reference to the accompanying drawings in which:-

Figure 1 is a schematic broken away perspective view of a reinforcement yarn according to an embodiment of the invention;

Figure 2 is a similar view to Figure 1 showing the yarn after being exposed to welding conditions;

Figures 3a, 3b are respectively a schematic stitch diagram of a first stitch structure and a fabric produced by the first stitch after being exposed to welding conditions;

Figures 4a, 4b are respectively a schematic stitch diagram of a second stitch structure and a fabric produced by the second stitch structure after being exposed to welding conditions;

Figures 5a, 5b are respectively a schematic stitch diagram of a third stitch structure and a fabric produced by the third stitch structure;

Figure 6 is a schematic stitch diagram of a fourth stitch structure; and

Figure 7 is a schematic view of a brassiere having desired areas of reinforcement.

[0009] Referring initially to Figure 1 there is shown a reinforcement yarn 10 suitable for use in the production of reinforced fabrics according to the present invention. The yarn 10 is a composite yarn having a core which is formed from a highly stretch resistive yarn 11 such as an arimid yarn or glass fibres or metal yam or a polyester, polyamide, polypropylene or other synthetic monofilament. The arimid yarn may for example be KEVLAR (RTM). The yarn 11 is formed preferably by spinning staple fibres or extruding filaments so as to produce a yarn that can be formed into stitches or loops so as to enable it to be converted into fabric using either knitting or weaving techniques. Typically the weight of yarn 11 is about 130 dtex.

[0010] The stretch resistive yarn 11 is coated with a weldable material 12 which, prior to being welded, is of sufficient flexibility to enable the yarn 11 to be knitted or woven. Preferably, the weldable material 12 is in the form of covering yarns 14 wrapped about the stretch resistive yarn 11. Preferably at least two yarns 14 are wrapped about the yarn 11 in opposite directions so as not to impart any bias on the composite yarn 10. The relative sizes of yarns 11 and 14 are preferably chosen such that the outer surface of yarn 11 is completely covered by the weldable material 12.

[0011] Preferably the yarns 14 are formed from a low melt plastics such as a polyamide. Typically the weight of yarn 14 is about 75 dtex. A suitable yarn is one sold under the brand name GRILON (RTM).

[0012] The reinforcement yarn is incorporated into a ground fabric using conventional pattern techniques so as to create reinforcement areas of predetermined size and shape in a predetermined location within the fabric. By suitable choice of the weight of reinforcement yarn and/or how it is incorporated into the ground fabric structure it is possible to control the degree of reinforcement in those areas.

[0013] For example, if the fabric has a ground weft knitted fabric formed by knitting of ground yarns, the reinforcement yarn may be incorporated as plain knitted stitches, as tuck stitches, as floats or as laid in yarn. The

reinforcement yarns may be incorporated into the same courses as the ground yarns or may be incorporated into courses intermediate the courses of ground yarns. By suitable choice of these different ways of incorporating the reinforcement yarn into the ground fabric it is possible to engineer the desired reinforcement characteristics for each reinforcement area.

[0014] For example, as illustrated in Figure 3a, the reinforcement yarn 10 may be knit on every course C and every wale W.

[0015] With such a structure, each stitch of reinforcement yarn 10 is in contact with neighbouring stitches of reinforcement yarn 10.

[0016] Accordingly, after the fabric has been exposed to welding conditions, for example by being elevated in temperature to a temperature at which the weldable material melts, the contacting stitches weld to one another thereby creating a reinforcement area 50 formed of a welded mass with stitches of stretch resistive yarn 11 embedded within the welded weldable material 14a.

[0017] Preferably the fabric is exposed to welding conditions by being elevated in temperature to a temperature at which the weldable material 14 will soften and melt, the viscosity of the weldable material 14 in its melted state being such that the weldable material partially flows throughout the fabric structure. After cooling to ambient temperatures, the welded mass 14a forms a more rigid structure, replicating the function of a rigid insert such as a reinforcement bone or plastic insert. In other words, the weldable material 14 forms a cohesive mass.

[0018] When the weldable material 14 is GRILON (RTM), for example, the fabric is exposed to welding conditions by being elevated in temperature to a temperature in the range of 80°C to 150°C.

[0019] The fabric structure in the reinforced area 50 is thereby locked and rigid due to the welded mass 14a of the weldable material 14. The stretch resistive yarn 11 embedded within the welded mass 14a of the weldable material 14 helps to prevent stretch of the welded mass and so serves to prevent breakup of the welded mass.

[0020] As seen in Figure 3a, the reinforcement area 50 formed by knitting on every course and wale is continuous in both the weft and wale directions and so forms a totally rigid area of reinforcement.

[0021] It is envisaged that within the reinforced area formed by plain stitches, it is possible to incorporate at selected locations, tuck stitches which introduce holes within the reinforced area. Such holes may be desirable to enable passage of air and so provided air/moisture passageways.

[0022] As illustrated in Figures 4a, 4b the reinforcement yarn 10 may be incorporated as a miss-knit stitch formation. As illustrated in Figure 4a, the reinforcement yarn 10 is knitted on each course (for a selected number of courses) as knit 2 — miss-knit 3. This produces after exposure of the fabric to welding conditions, reinforcement areas 60 in the form of wale wise extending regions/strips of welded weldable material 14. The miss-knit structure produces floats of reinforcement yarn 10 which weld to the stitches of the ground yarns which they cross. This provides resistance to stretch in the course wise direction but provides flexibility in the wale wise direction.

[0023] The miss-knit stitch formation adopted for the reinforcement yarn 10 may provide some flexibility in the course wise direction also. For example as illustrated in Figures 5a, 5b alternate courses are knit with a different miss-knit stitch structure so as to avoid continuous knitted wales formed of the reinforcement yarn 10. For example, in Figure 5a, a first course is knit using a knit 2 — miss-knit 3 notation and the second course is knit using a miss-knit 2 - knit 3 notation. This is repeated on successive courses and so produces small areas of reinforcement 70 separated in both the course and wale wise directions.

[0024] As schematically illustrated in Figure 6, courses C_R knitted using the reinforcement yarn 10 may be separated by courses C_g knitted from ground yarn of the fabric. This will produce lines of reinforcement which are flexibly connected by the intermediate courses C_g of the knitted ground yarn.

[0025] It will be appreciated that the reinforcement yarn may be incorporated by any conventional knit structure into a ground fabric knitted using ground yarns such as polyamide or polyester in order to provide desired areas of reinforcement 50.

[0026] Desired areas of reinforcement 50 are shown, for example, in the brassiere shown in Figure 7 wherein the areas of reinforcement 50 extend around, and between, the breast pockets 51. The fabric structure of the areas of reinforcement 50 may be the same throughout or be different in order to provide different degrees of reinforcement at desired locations.

[0027] It will also be appreciated that the fabric may be knit using weft or warp knitting techniques and alternatively may also be woven.

[0028] It is envisaged that the fabric of the present invention is preferably laid upon a former of predetermined shape whilst being elevated to the temperature at which the weldable material is melted to form the welded mass. In this way, the welded mass is moulded into the predetermined shape so as to provide the area of reinforcement with a desired shape.

Claims

1. A method of producing a reinforced fabric including producing by a knitting or weaving process a ground fabric using ground yarns and incorporating into the ground fabric during the knitting or weaving process reinforcement yarns in a predetermined pattern to form predetermined areas of reinforcement, the reinforcement yarn being a stretch resistive yarn coat-

ed with a weldable material, and subsequently exposing the fabric to a weldable condition in order to cause said weldable material to weld to itself and to ground yarns with which it is in contact.

2. A method according to claim 1 wherein said reinforcement yarn is knitted to define a plain knit construction in selected ones of said predetermined areas.

3. A method according to claim 1 or 2 wherein said reinforcement yarn is knitted to define a misknit-knit construction in selected ones of said predetermined areas.

4. A reinforced fabric comprising a knitted or woven ground fabric incorporating a predetermined pattern of reinforcement yarns which define integral areas of reinforcement, the reinforcement yarns being stretch resistive yarns coated with a welded weldable material.

5. A reinforced fabric according to claims 4 wherein said stretch resistive yarn comprises an arimid yarn.

6. A reinforced fabric according to claim 4 wherein said stretch resistive yarn comprises glass fibres.

7. A reinforced fabric according to claim 4 wherein said stretch resistive yarn is one of the group consisting of polyester, polyamide, polypropylene or other synthetic monofilament.

8. A reinforced fabric according to claims 4, 5, 6 or 7 wherein said stretch resistive yarn is a yarn spun from staple fibres.

9. A reinforced fabric according to any of claims 4 to 8 wherein said weldable material in a low melt plastic.

10. A reinforced fabric according to claim 9 wherein said reinforcement yarn, prior to welding, comprises said stretch resistive yarn wrapped in covering yarns formed from said low melt plastics.

11. A reinforced fabric according to claim 10 wherein said stretch resistive yarn is wrapped by at least two of said covering yarns wrapped in opposite directions about the stretch resistive yam.

12. A garment incorporating fabric according to any of claims 4 to 11.

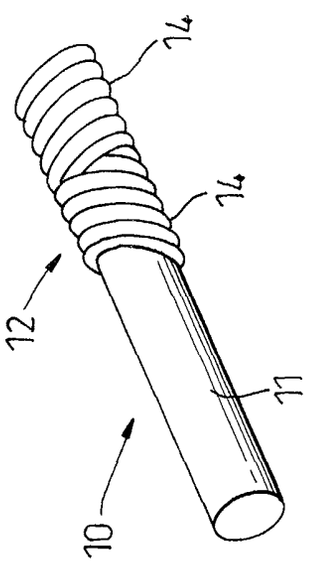

Fig. 1

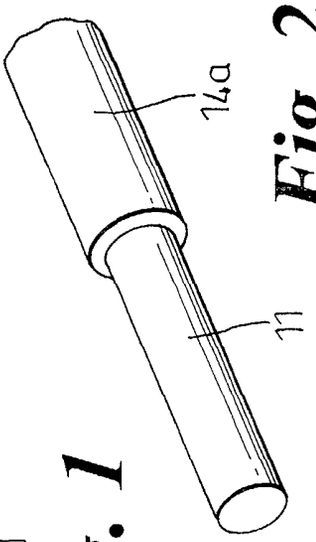

Fig. 2

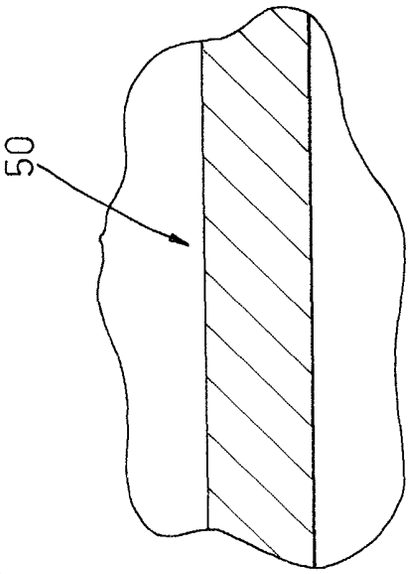

Fig. 3b

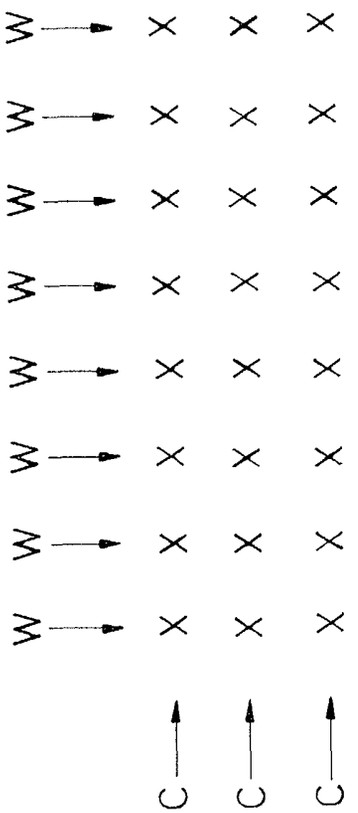

Fig. 3a

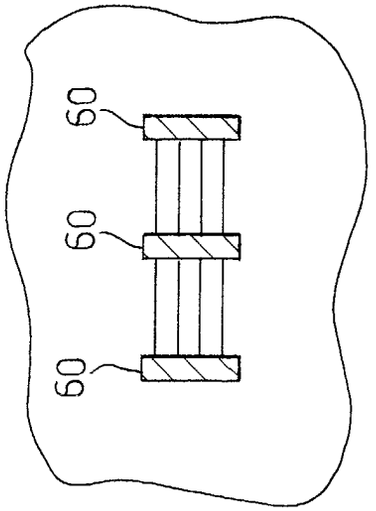

Fig. 4b

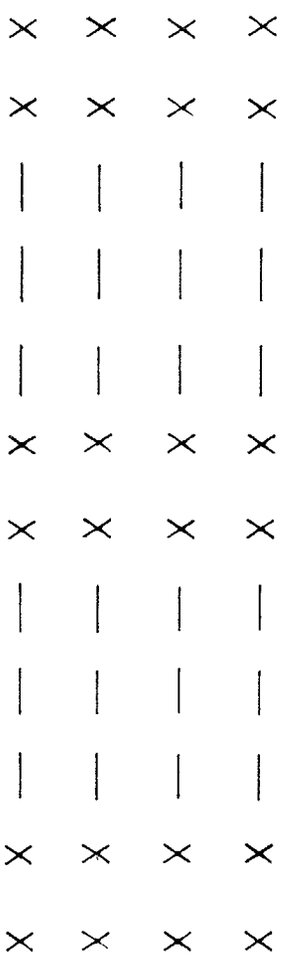

Fig. 4a

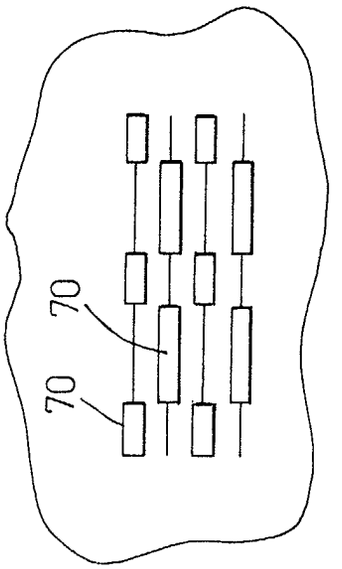

Fig. 5b

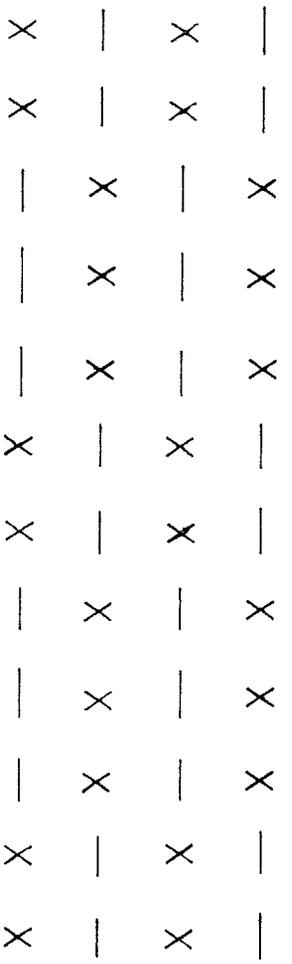

Fig. 5a

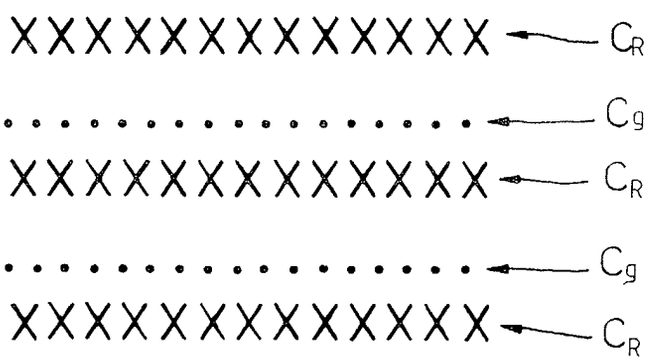

Fig. 6

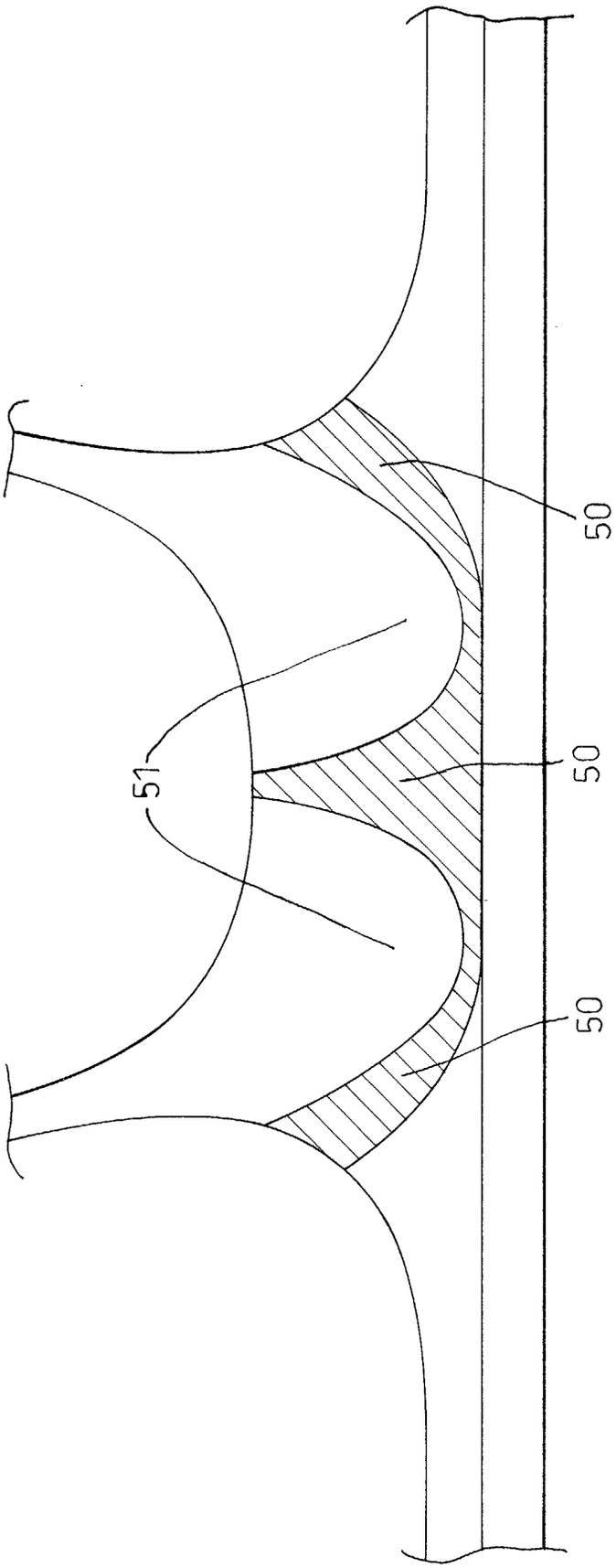

Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 1102

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 383 953 A (TEIJIN) 29 August 1990 (1990-08-29) * page 1, line 2 - line 9 *	1	D03D15/00 D04B1/12
A	US 6 155 084 A (ANDREWS) 5 December 2000 (2000-12-05) * abstract *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

D03D
D04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 May 2002	Boutelegier, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 25 1102

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-05-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 383953 A	29-08-1990	DE 68919825 D1	19-01-1995
		DE 68919825 T2	06-07-1995
		EP 0383953 A1	29-08-1990
		WO 9002831 A1	22-03-1990
		JP 7049614 B	31-05-1995
		KR 9209284 B1	15-10-1992
		US 5118569 A	02-06-1992
US 6155084 A	05-12-2000	US 5965223 A	12-10-1999

EPO FORM P0459

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