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(12) # EUROPEAN PATENT APPLICATION

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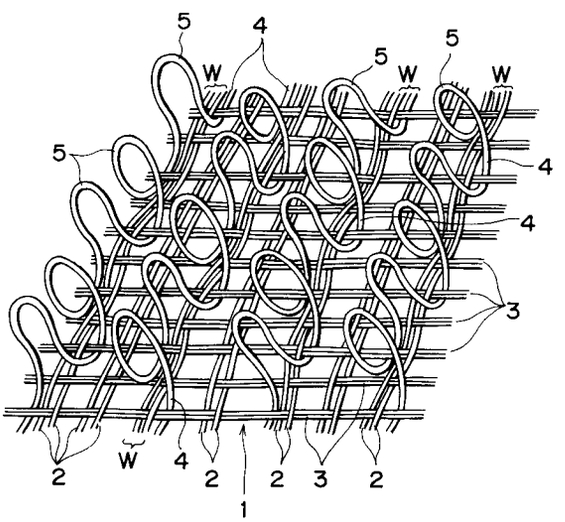
(54) **Male engaging member of surface fastener having a high density of hooks.**

(57) A male engaging member for a surface fastener with hooks in high density comprises a woven or knit foundation structure (1) woven or knit of warp and weft yarns (2, 3), and monofilaments (4) having hooks formed by weaving or knitting the monofilaments (4) into the woven or knit foundation structure (1) so as to have loops (5) and by cutting the loops (5). Each monofilement (4) is woven or knit into the woven or knit foundation structure in such a manner that the monofilament (4) skips every other weft yarn (3) to form the loops (5).

FIG. 1



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BACKGROUND OF THE INVENTION

1. Field of the Invention:

This invention relates to a surface fastener composed of a male engaging member with a number of hooks on one face, and a female engaging member with a number of loops on one face, and more particularly to a flexible surface fastener in which the density of said hooks of said male engaging member is higher than usual.

2. Description of the Related Art:

Surface fasteners have been used for a very wide variety of fields from daily goods to industrial materials. As a basic structure of surface fasteners, hooks or mushroom-shaped projections on the male engaging member engage at random with loops on the female or companion engaging member. The male engaging member is made from a loop or double-weave or -knit structure, or from molded structure of synthetic resin material, depending on the flexibility and engaging strength required for surface fasteners.

The male engaging member made from a loop structure or double-weave or -knit structure is used for a pillow cover, a stomach band, a diaper, etc., which requires a high degree of flexibility. This male engaging member is exemplified by Japanese Patent Publications Nos. SHO 35-522 and SHO 47-36663.

FIGS. 3 and 4 are fragmentary perspective views of male engaging members having the same structure as those disclosed in the above-identified publications, showing the male engaging members before the loops have been cut to form hooks. FIG. 3 shows a woven fabric structure in which synthetic resin monofilaments of 320 deniers for prospective hooks are woven into a woven foundation cloth, and FIG. 4 shows a woven fabric structure in which synthetic resin monofilaments of 360 deniers for prospective hooks are woven into a woven foundation cloth.

In FIGS. 3 and 4, since the cloth is woven on a needle weaving machine, a double yarn is used for a weft yarn 3 of the foundation woven cloth 1, while an ordinary twisted yarn is used for a warp yarn. As is apparent from these diagrams, the structure of the foundation woven cloth 1 is a plain weave. In the example shown in FIG. 3, each monofilament 4 extends in a first inter-warp space between adjacent warp yarns alternately under and over three weft yarns 3 and then is shifted to the next or second inter-warp space, striding over two warp yarns 2 in a loop posture, whereupon the monofilament 4 extends in the second inter-warp space alternately under and over another three weft yarns and then is shifted back to the original or first inter-warp space, striding over the two warp yarns 2 in a loop posture, and the foregoing is repeated to form a woven cloth for the male engaging member. In the example shown in FIG. 4, the monofilament 4 extends in the first inter-warp space alternately under and over seven weft yarns 3 and then is shifted to the second inter-warp space, striding over two warp yarns 2 in a loop posture, whereupon the monofilament 4 extends in the second inter-warp space alternately under and over another seven weft yarns 2 and then is shifted back to the original or first inter-warp space in a loop posture, and the foregoing is repeated to form a woven cloth for the male engaging member.

The foundation woven cloth 1 is treated with a synthetic resin process in such a manner that the base portions of the loops are secured to the foundation woven cloth 1, and then the loops are cut in the usual manner to form hooks.

The size of the monofilament to be used for hooks of the male engaging member manufactured from this conventional kind of woven cloth shown in FIGS. 3 and 4 is usually 320 to 500 deniers. The monofilament is woven into the foundation woven cloth, and extends alternately under and over three or more weft yarns. And the base portions of each loop is gripped by a number of weft yarns in an attempt to prevent hooks from being removed from the foundation woven cloth.

The larger the size of hooks, the bigger the yarns must necessarily be, which are used for the foundation woven cloth supporting the hooks. The higher the rigidity of hooks, the more the foundation woven cloth will become rigid; as a result, the foundation woven cloth would have insufficient flexibility. As surface fasteners have been increasingly used in underwear-like clothing in recent years, much more flexibility is required for the male engaging member.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a surface fastener which has an improved degree of flexibility and can secure adequate engaging force.

According to the invention, there is provided a male engaging member for a surface fastener with hooks in high density, comprising: a woven or knit foundation structure woven or knit of warp and weft yarns; monofilaments having hooks formed by weaving or knitting the monofilaments into the woven or knit foundation structure so as to have loops and by cutting the loops; and each of the monofilements being woven or knit into the woven or knit foundation structure in such a manner that the monofilament skips across every other weft yarn to

form the loops. Preferably, the monofilaments have a size of 80 to 300 deniers.

The loop of the monofilament woven or knit into the woven or knit foundation cloth is formed as the monofilament is interlaced under a single weft, then skips over the next weft yarn and is then interlaced under the next to next weft yarn. Usually, the loop of the monofilement strides over a warp yarn. According to this woven structure, the loops of the monofilament are formed for every other weft yarn. The resulting male engaging member has loops necessarily in an increased density, compared to the conventional male engaging member in which the loops of the monofilament are formed for every fourth weft yarns, even if the warp and weft yarns as well as the monofilaments are identical in size with the corresponding yarns of the conventional male engaging member.

With the male engaging member having the foregoing woven or knit structure, if the size of monofilaments exceeds 300 deniers as coventional, the hooks stand too closely to each other so that the number of hooks to be caught by loops of the companion or female engaging member, i.e. the hook engaging rate is reduced, thus lowering the engaging force of the entire surface fastener to an impractical level. Consequently, in this invention, the monofilaments whose size is 80 to 300 deniers are used. Using monofilaments of such small size, the engaging force between a single hook and a companion loop is small while the hook engaging rate becomes higher than conventional, and as a result, an adequate degree of engaging force for the entire surface fastener can be secured. Further, the woven structure of this invention is excellent also in flexibility, compared to the conventional woven structure; specifically, when it is applied to a kind of clothing tending to contact the skin, e.g. a pillow cover, a stomach band and a diaper, it is possible to guarantee a very soft touch without impairing the texture of a cloth.

Furthermore, since the hooks tend to be bent when the male engaging member is separated from the female engaging member, they can be disengaged neatly from the companion loops without large resistance, thereby minimizing chances of accidental removal and/or damage of the loops.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view showing a woven fabric structure for a surface fastener's male engaging member before the loops are cut, embodying this invention;

FIG. 2 is a fragmentary, enlarged cross-sectional view of the woven fabric structure of FIG. 1;

FIG. 3 is a fragmentary perspective view showing the structure for a conventional male engaging member; and

FIG. 4 is a fragmentary perspective view showing the structure for another conventional male engaging member.

DETAILED DESCRIPTION

The principles of this invention are particularly useful when embodied in a male engaging member of a surface fastener such as shown in FIG. 1.

FIG. 1 shows a fragmentary perspective view showing a woven fabric structure of the surface fastener's male engaging member before hooks are formed. In FIG. 1, reference numeral 1 designates a woven foundation cloth; 2, warp yarns; 3, weft yarns; and 4, monofilaments from which hooks are to be formed. A surface fastener is used to fasten surfaces and is composed of the male engaging member with a number of hooks projecting from one face, and a female engaging member with a number of loops projecting from one face. The female engaging member is not pertinent to this invention and, as conventional, a pile woven or knit cloth of multifilaments or an ordinary knit pile cloth is used; so its description is omitted here. Parts or elements corresponding to those of the conventional male members shown in FIGS. 3 and 4 are designated by like reference numerals.

In the male engaging member of this embodiment, the woven foundation cloth 1 is a plain-weave structure composed of weft yarns 3 and warp yarns 2 as conventional. Multifilaments of 100 deniers are used as the weft yarns 3, and multifilaments of 140 deniers are used as the warp yarns 2. On the other hand, it is required that monofilaments which is to be woven into the woven foundation cloth 1 for forming hooks has a size of 80 to 300 deniers. Thus they are remarkably small in diameter, compared with 320 to 500 deniers of the conventional hook-forming monofilaments.

Given that the size of the hook-forming monofilaments 4 is within the range of 80 to 300 deniers, adepuate flexibility for surface fasteners is secured. If the male engaging member had the same hook density as that of the conventional male engaging member, an adequate degree of engaging strength of hooks could not have been obtained so that the resulting male engaging member would be unfit for use. Assuming that the male engaging member has a large hook density and the size of the monofilaments 4 exceeds 300 deniers, the hooks cannot come into the loops of the companion or female engaging member, thus lowering the rate of engagement with the loops sharply. On the contrary, assuming that the size of the monofilaments 4 is reduced and the hook density is increased, the hook engaging rate of the male engaging member with respect to the companion or

female engaging member would increase markedly so that an adequate degree of engaging strength can be secured for the entire male engaging member, thus making the male engaging member fit for use.

As a result of further research and development, the hook density of the male engaging member obtained according to this invention is preferably within the range of 100 to 200 per square centimeters. This figure is very large, compared with 20 to 75 per square centimeters of the conventional one.

In order to obtain the male engaging member of this invention, it is inevitable to reconstruct the conventional male engaging member. The specific structure in which the monofilaments are woven according to the embodiment is shown in FIG. 1.

In FIG. 1, the woven foundation cloth 1 is a plain-weave structure, as conventional, woven of 140-denier multifilaments as warp yarns 2 and 100-denier multifilaments as weft yarns, each of the weft yarns is composed of a pair of the multifilaments. Monofilaments 4 from which hooks are to be formed are woven into the woven foundation cloth 1 along every other warp yarn group row w, each being composed of an adjacent pair of the warp yarns 2. In this woven structure, as is apparent from FIG. 1, loops 5 of the monofilaments 4 are formed as the individual monofilament 4 extends across and under a single weft yarn 3 and skips over the next weft yarn 3 in a loop posture and then extends across and under the next weft yarn 3, and so on. At that time, each loop 5 of the monofilament 4 strides over a single warp yarn group row w. Thus the loops 5 of the monofilaments 4 are formed for every other weft yarn 3; the resulting male engaging member has loops 5 necessarily in an increased density, compared to the conventional male engaging member in which the loops 5 of the monofilament 4 are formed for every fourth weft yarns 3, even if the warp and weft yarns 2, 3 as well as the monofilaments 4 are identical in size with the corresponding yarns of the conventional male engaging member.

With the male engaging member of this invention, if the size of monofilaments exceeds 300 deniers as conventional, the hooks stand too closely to each other, so that the number of hooks to be caught by loops of the companion or female engaging member, i.e. the hook engaging rate is reduced, thus lowering the engaging force of the entire surface fastener to an impractical level. Consequently, in this invention, the monofilaments whose size is 80 to 300 deniers are used. Using monofilaments of such small size, the engaging force between a single hook and a companion loop is small while the hook engaging rate becomes higher than conventional, and as a result, an adequate degree of engaging force for the entire surface fastener can be secured. Further, the woven structure of this invention also has an excellent flexibility, compared to the conventional woven structure; specifically, when it is applied to a kind of clothing tending to contact the skin, e.g. a pillow cover, a stomach band and a diaper, it is possible to guarantee a very soft touch without impairing the texture of a cloth.

As the resulting woven cloth is thermally set on a weaving machine by the usual method, the loops will be set to keep their shapes as shown in FIG. 2. Subsequently as the woven cloth is treated with synthetic resin, the base portions of the loops 5 will be secured to the woven foundation cloth 1, whereupon the individual loops 5 are cut to form hooks, thus obtaining a desired male engaging member for the surface fastener.

In this embodiment, a woven cloth is used as the male engaging member. This invention should by no means be limited to the illustrated example; for example, a knit cloth may be used and the woven or knit foundation cloth may have a fabric structure other than the plain-weave structure. Further, the monofilaments may be woven or knit into the foundation cloth in such manner that loops of each monofilament do not skip over any warp yarn group row but are arranged along the same warp yarn group row.

As is apparent from the foregoing description, in this invention, since the monofilaments for hooks are reduced in diameter and the hook density is increased to improve the hook engaging rate, it is possible to secure adequate engaging force and flexibility so that the texture of clothing is free from any damage when the clothing is of the type tending to contact with the skin. Further, because of their flexibility, the hooks are prevented from accidental disengagement from the loops of the companion or female engaging member, thus minimizing chances of accidental removal and/or damage of the loops.

Claims

1. A male engaging member for a surface fastener with hooks in high density, comprising:

(a) a woven or knit foundation structure (1) woven or knit of warp and weft yarns (2, 3);

(b) monofilaments (4) having hooks formed by weaving or knitting said monofilaments (4) into said woven or knit foundation structure (1) so as to have loops (5) and by cutting said loops (5); and

(c) each of said monofilements (4) being woven or knit into said woven or knit foundation structure in such a manner that the monofilament (4) skips every other weft

yarn (3) to form said loops (5).

2. A male engaging member for a surface fastener with hooks in high density according to claim 1, wherein said monofilaments (4) have a size of 80 to 300 deniers.

3. A male engaging member for a surface fastener with hooks in high density according to claim 1 or 2, wherein said monofilaments (4) have a density of 100 to 200 per square centimeters.

FIG. 1

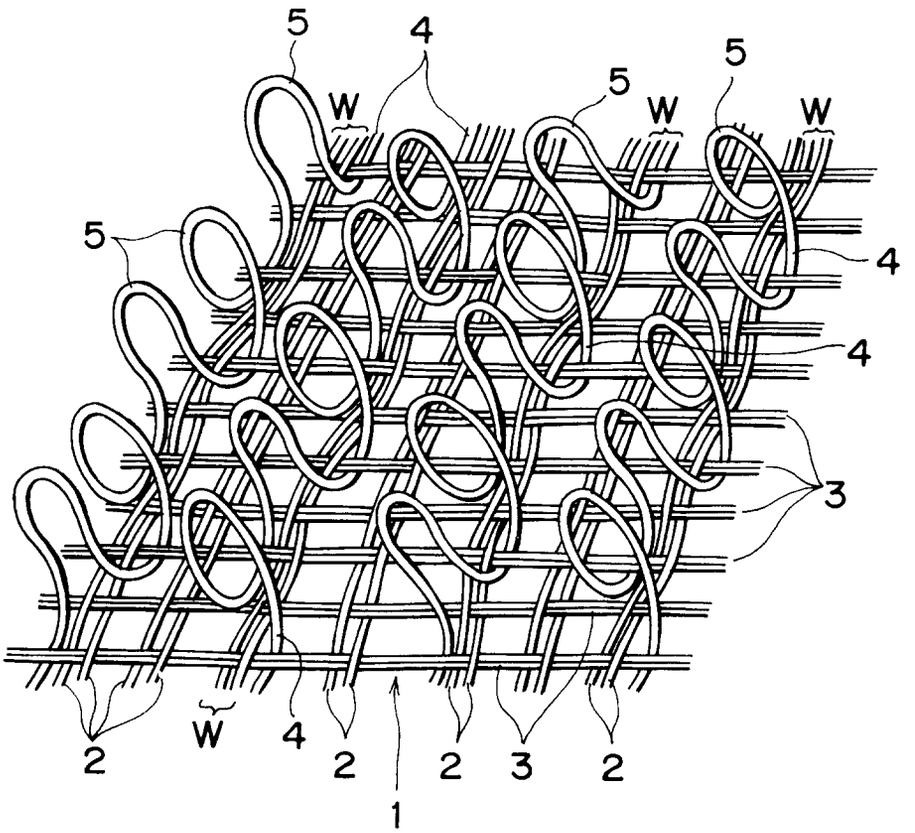


FIG. 2

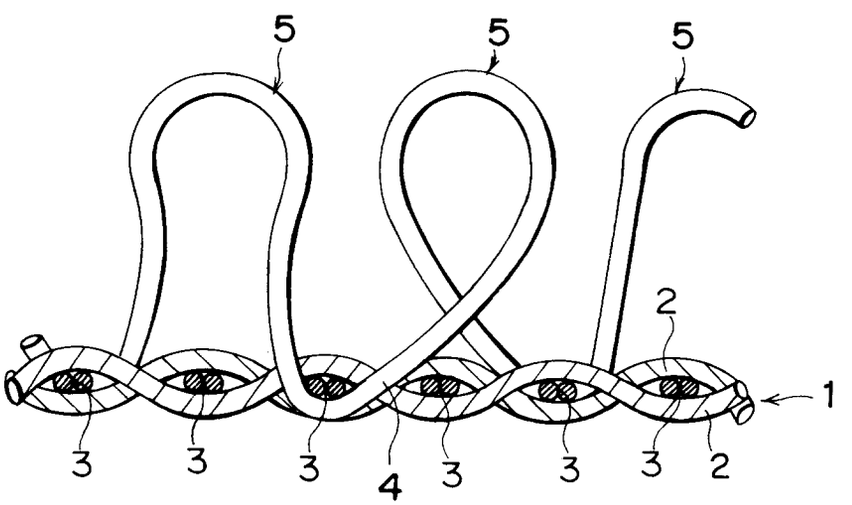


FIG. 3

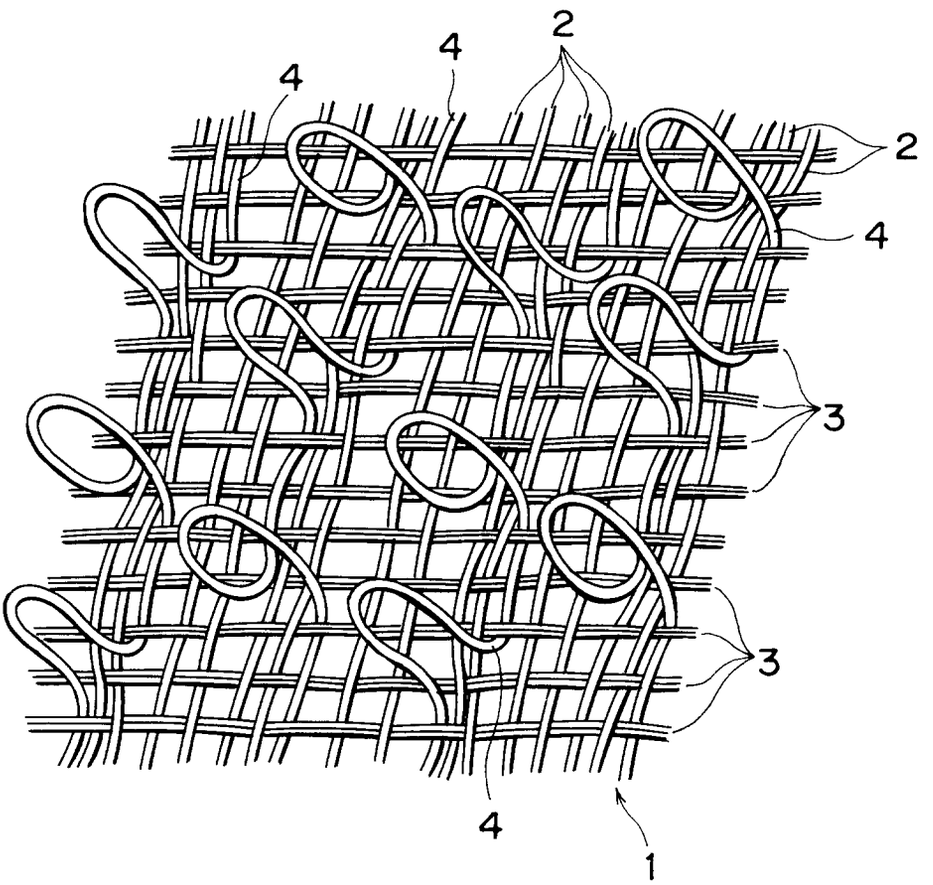
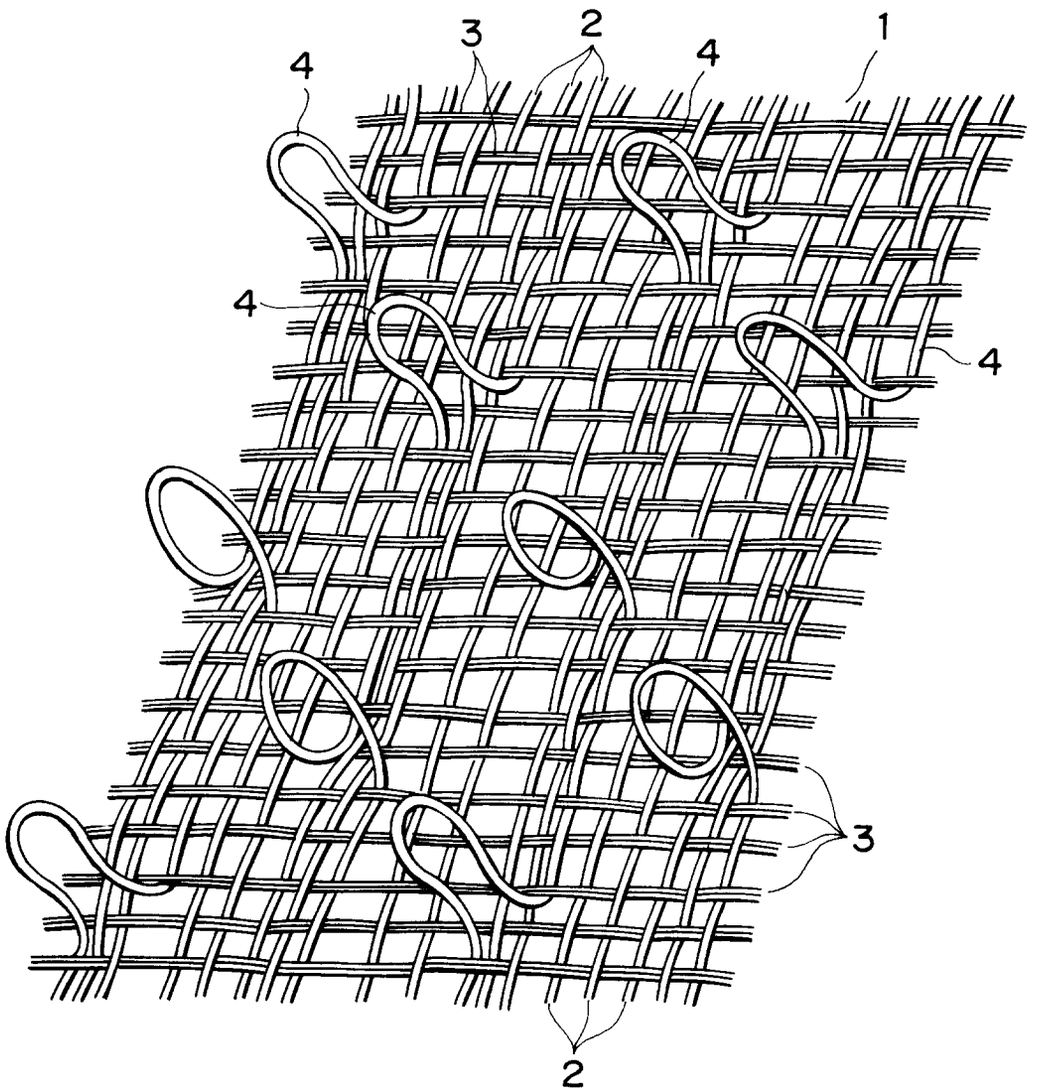


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 93 12 0526

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.5)
X	DE-U-86 18 159 (TEXTILER HAFTVERSCHLUSS) * page 6, line 92 - page 7, line 3; claims 1,4,9-12; figure 2 *	1-3	A44B18/00
X	EP-A-0 217 549 (ACTIEF N.V.) * column 5, line 26 - line 41 * * column 7, line 1 - line 20; claims 1-3,5,6,8,9,15; figure 5 *	1-3	
A	EP-A-0 223 024 (YOSHIDA KOGYO K.K.) * column 2, line 39 - column 3, line 4; claims 1,3; figures 1,3 *	1-3	
A	EP-A-0 233 364 (YOSHIDA KOGYO K.K.) * column 2, line 26 - line 31; figure 1 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 April 1994	Fairbanks, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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