

(19)



(11)

**EP 3 225 727 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:  
**12.12.2018 Bulletin 2018/50**

(51) Int Cl.:  
**D04B 1/16 (2006.01)**

(21) Application number: **16163294.8**

(22) Date of filing: **31.03.2016**

(54) **HIGH-STRENGTH FABRIC SYSTEM**

HOCHFESTES STOFFSYSTEM

SYSTÈME DE TISSU À HAUTE RÉSISTANCE

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

(43) Date of publication of application:  
**04.10.2017 Bulletin 2017/40**

(73) Proprietor: **Antoraf S.r.l.**  
**63837 Falerone - Frazione Piane di Falerone, Fermo (IT)**

(72) Inventor: **ANTOGNOZZI, Aurelio**  
**63837 Falerone - Frazione Piane di Falerone (Fermo) (IT)**

(74) Representative: **Petruzziello, Aldo**  
**Racheli S.r.l.**  
**Viale San Michele del Carso, 4**  
**20144 Milano (IT)**

(56) References cited:  
**GB-A- 987 163 GB-A- 2 020 329**  
**JP-B2- 5 785 720**

**EP 3 225 727 B1**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

**[0001]** The present invention relates to a high-strength fabric system.

**[0002]** In particular the present invention relates to a process for obtaining a synthetic or partially synthetic fabric, of extremely compact consistency and having a stiff and rough hand, with improved resistance to horizontal and vertical traction and to perforation, so as to be suitable for creating integral, partial or shaped articles, cloth by the metre which, thanks to the shrinkage undergone, can be used as finished products, semi-manufactured products or as simple parts of finished products intended for the sector of footwear, for example shoe uppers, shoelaces, for the sector of accessories for clothing such as for example belts, bags, hats, watch straps, for the sector of furniture or its accessories, such as rugs including mats for cars.

**[0003]** More particularly the present invention relates to a process for obtaining the aforementioned textile fabric comprising the heat treatment of a knitted fabric obtained by working at least one 100% acrylic yarn of the unshrunk type.

**[0004]** The 100% acrylic yarns currently available on the market are "fixed" acrylic yarns or HB (high bulk) acrylic yarns, the latter generally used in knitting in that they create knitwear having softness and volume, for example outer knitwear or pile fabrics.

**[0005]** The "fixed" acrylic yarn is formed solely by stretched fibres while the HB 100% acrylic yarn is formed by a blend of acrylic fibres where a portion of fibres of the blend were stretched previously while the remaining portion of fibres has not been stretched: the blend is spun and the yarn obtained in this way is then subjected to a heat treatment which generates a shrinkage solely of the stretched fibres, where the degree of swelling of the yarn is mainly a function of the percentage of shrinkage of the portion of stretched fibres.

**[0006]** The 100% acrylic yarns are also used in weaving with a loom, creating fabrics whose consistency is not very suited to obtaining shaped manufactured products of high compactness and stiffness such as to be able to make shoe uppers, belts, bags or other accessories for clothing or furniture such as watch straps or mats for cars.

**[0007]** An increasingly felt need in the textile sector is that of finding materials of great fashion effect, for example with jacquard type effects such as those which can be obtained by knitting, having however a greater compactness and strength, and which represent a valid alternative to the fabrics and/or materials currently available on the market, more particularly in order to produce shoe uppers, belts, bags, hats, shoelaces or other accessories for clothing or furniture such as watch straps or mats for cars.

**[0008]** JP5785720B2 discloses a knitted fabric with tense stiff feeling made by using a blended fiber yarn including rayon fiber with a flat cross-section, said

blended fiber yarn including 20 mass% or more of rayon fiber with a flat cross-section and having a twist coefficient of 3.5 to 5.0.

**[0009]** GB2020329 A discloses a fine jersey cloth resembling a wash leather in character, comprising a 3-cylinder bulk yarn which in turn comprises from 20 to 80 % of shrinkable acrylic stable fibres having a staple length of from 40 to 80 mm and a denier of from 1 to 5 dtex, and from 80 to 20 of cotton and/or wool and or a non-shrinkable fibre, the yarn having before shrinkage a boiling-induced yarn shrinkage of from 10 to 35 %, a spinning alpha of from 70 to 130 and a count of from 20/1 to 150/1.

**[0010]** GB987163 A discloses shaped sheet elements of woven or knitted fabrics of fully synthetic material, the fabric comprises 50-90% of acrylonitrile polymer fibres and 50-10% of fibres which stiffen on heating and are produced from thermoplastic polymers, wherein the stiffening fibres are preferably of polyamides, vinyl chloride and vinylidene chloride polymers, polyolefines, or polyesters.

**[0011]** The object of the present invention is that of overcoming, at least in part, the disadvantages of the prior art by providing alternative textile materials, preferably of extremely compact and stiff consistency, with improved resistance to horizontal and vertical traction and to perforation, such as to be suitable for obtaining cloths by the metre, integral articles, partial articles, shaped manufactured products and the like, for accessories for clothing and/or furniture, such as for example shoe uppers, belts, bags, watch straps, hats, shoelaces, rugs, mats for cars or other accessories for clothing and/or furniture.

These and other objects are achieved by the present invention with a process having the features listed in the appended independent claim 1. Advantageous embodiments of the invention are disclosed by the dependent claims. An object of the present invention relates to a process for obtaining a finished fabric, synthetic or partially synthetic, defined here also as knitted fabric, having at least one stiffened portion with an extremely compact consistency, preferably such as to result in a fabric with low wearability and/or drapability.

**[0012]** "Extremely compact" here is meant to identify a fabric which is rigid and "solid" to horizontal and vertical traction, understood to have little stretch in the directions of width and length (dimensional stability) and resistant to perforation to a much greater extent than other fabrics with the same thickness.

**[0013]** "Knitted fabric" here is meant to identify a product of industrial knitting made by knitting machines of the linear or rectilinear type. The knitted fabric differs from woven fabrics having a warp and a weft because it is made up of curvilinear loops formed by a continuous yarn which weaves sinuously, binding by means of crossings, which are arranged horizontally (wale) and/or vertically (course).

The stiffened portions of the present fabric derive from a

particular heat treatment whereto the knitted fabric made with at least one unshrunk 100% acrylic yarn is subjected.

**[0014]** "Yarn" here is meant to identify the group of textile fibres held together by a twisting to form a thread of length far greater than the fibres and "100% acrylic yarn" here is meant to identify a yarn formed exclusively by acrylic fibres.

"Acrylic fibres" here is meant to identify the acrylic fibres which are produced generally by extrusion of a polymer constituted by at least 85% of acrylonitrile monomer, the possible remaining part to 100 of monomer units being formed by one or more comonomers.

The extrusion of the aforesaid polymer leads to the formation of a continuous multifilament thread which can be colourless or coloured through pigmentation. This staple is crimped in order to undulate it and then torn through traction in order to obtain discontinuous fibres, generally with length of 72/74 mm approximately, and subsequently the fibres can be stretched if intended to form a fixed acrylic yarn, or non-stretched if intended to form a portion of the blend of an HB acrylic yarn.

**[0015]** The present unshrunk 100% acrylic yarn is formed by a blend of acrylic fibres where part of the fibres of the blend, for example 55%, have been previously stretched, while the remaining fibres, for example 45%, have not been stretched. This yarn composed in this way is therefore ready for use in order to be knitted in accordance with the present invention.

**[0016]** The term "different yarns" here is meant to identify all the yarns which are different from the present unshrunk yarn, for example yarns of only natural fibres, yarns of only synthetic fibres other than 100% acrylic, yarns of natural and synthetic fibres in a blend, and the like.

After the heat treatment each stiffened zone of the present knitted fabric exhibits poor or reduced stretch in the directions of width and length.

Generally the stretch in both directions, which the stiffened zones of the present fabric exhibit after the present heat treatment, is less than 5%, even if it is possible to reach values below or equal to 3%, even up to 0%, according to the thickness of the unshrunk 100% acrylic yarn used and the type of knitting.

It is also to be noted that with the same metric count of the yarn there could also be different stretches according to the fineness worked and the pattern or knit stitch of the knitting: therefore according to the degree of final stretch required of the end product a choice will be made of the thickness of the yarn, the type of knitting and the fineness of the working.

"Fineness" here refers to the dimension of the knit stitch which is determined by the number of needles present in a certain length of the machine. The greater the value, the smaller the dimension of the knit.

**[0017]** Moreover each stiffened zone of the aforesaid knitted fabric in accordance with the present invention has a very similar consistency and aesthetic appearance to a felt rather than to a woven fabric such as flannel or

the like which are highly drapable and therefore wearable fabrics thanks to their softness.

Said knitted fabric with one or more stiffened portions can be in the form of cloths by the metre (pieces), integral articles, partial articles (parts of end products) or shaped manufactured products deriving therefrom.

Since the object of the present invention is that of reducing as far as possible the stretch of a knitted fabric, the present fabric is made by knitting a single unshrunk 100% acrylic yarn so as to obtain advantageously a fabric substantially without stretch in both directions.

Thanks to its stiffness and dimensional stability, the present knitted fabric is found to be particularly suitable for obtaining shoe uppers, belts, bags, watch straps, hats, shoelaces, mats for cars or other garments or accessories for clothing and/or furniture. In fact the above-mentioned properties are the end result of the use of acrylic fibre in one of its "non-usual" states and not currently available commercially.

In practice, without wanting to be bound to any particular theory, it can be presumed that the extreme compactness, the stiff and rough hand, the improved resistance to horizontal and vertical traction and to perforation, are due to the stiffening undergone by the area of knitted fabric containing the unshrunk 100% acrylic yarn defined above, when said yarn is subjected to heat, while the other types of conventional yarns, for example those of wool, do not undergo this stiffening.

"Hand" here is meant to identify the touch sensation given by a fabric. Generally the sensation which the hand notices when touching the fabric can be softness, warmth, stiffness, compactness, hairiness, slip, deriving from a hand which is, for example, soft, crinkled, full-bodied, smooth, heavy, grainy, pliant, dry, hard, fine, swollen, rough, undulated, smooth.

It is to be noted that, after the aforesaid heat treatment, the present knitted fabric can also be subjected to a chemical treatment of waterproofing if necessary for the end use (for example uppers) without thereby departing from the scope of the present invention.

As already mentioned, the knitted fabrics in accordance with the present invention can be made also by knitting one or more unshrunk 100% acrylic yarns as defined above, with one or more yarns for knitting which are different from the present unshrunk 100% acrylic yarn, for example of natural and/or synthetic fibres. The resulting fabrics will exhibit very stiff and compact areas for the unshrunk 100% acrylic yarn in accordance with the invention, and less stiff and less compact areas for the other types of yarn which are usual for knitting operations.

When the abovementioned finished textile fabric, having at least one stiffened portion of extremely compact consistency, is presented in the form of cloth by the metre it is possible to obtain integral, partial or shaped articles which can be used as finished products, semi-manufactured products or as simple parts of finished product intended for the sector of footwear, for example shoe uppers, shoelaces, for the sector of accessories for clothing

such as for example belts, bags, watch straps, hats, jewellery, for the sector of furniture or its accessories, such as rugs including mats for cars.

"Cloth by the metre" is meant here to identify a flat fabric with large surface with respect to its thickness, suitable for being shapable by cutting.

It is to be noted that the stiffness of the stiffened zones obtained by the present process is such as not to require, in the obtaining of the fabric, a second support yarn, hidden and not forming the curvilinear weaves of wale and/or course (a laid-in yarn), in order to give stability to transverse traction.

Going into detail, the process for obtaining a knitted fabric, synthetic or partially synthetic, in the form of cloth by the metre (piece), integral article, parts of end manufactured products, which has at least one stiffened portion of extremely compact consistency and appearance similar to felt, preferably of such a consistency as not to be substantially wearable and/or drapable, and preferably with a stretch in both directions less than 5%, more preferably less than or equal to 3% even up to 0%, said process comprising the following steps:

- (A) preparing, in a predefined metric count, an unshrunk 100% acrylic yarn as defined above from acrylic fibres, preferably coloured and not undyed,
- (B) knitting one or more of said yarns prepared in step (A) to obtain said knitted fabric directly shaped on the rectilinear machine, in the form of cloth by the metre (piece), integral article, parts of end products, said yarns prepared in said step (A) being fed into the machine in such a way as to form curvilinear loops forming the structure of said knitted fabric;
- (C) subjecting to heat treatment said knitted fabric obtained from the aforementioned step (B), preferably in humid heat conditions, more preferably passing said knitted fabric of step (B) through a first continuous ironing machine with heated smooth rollers and then through a second ironing machine with press cover, so as to obtain said knitted fabric wherein at least said stiffened portion has little stretch in the directions of width and length, preferably a stretch in both directions less than or equal to 5%, more preferably less than or equal to 3% even up to 0%;
- (C') subjecting the knitted fabric obtained from step (C) to cooling.

**[0018]** In step (B) said 100% acrylic yarns prepared in step (A) can be knitted in a knitting machine, also together with one or more different yarns as defined above. The different yarns are fed separate in the machine to create zones of different materials.

**[0019]** It is to be noted that when a knitted fabric obtained by working the aforementioned unshrunk 100% acrylic yarn with other yarns of different composition is subjected to heat treatment an extremely compact textile fabric is obtained, having at least one first stiffened por-

tion with a stiff and rough hand for the percentage of acrylic yarn, and a second portion having a soft hand in the percentage of the other yarns. Said fabric is therefore particularly suitable for creating wearable garments such as caps, characterised in that they have both rigid parts (e.g. visor) and soft parts such as the head or vice versa (this produces a cap with a composition not exclusively 100% acrylic).

**[0020]** In practice the extension of the stiffened portion of the fabric obtained after the present process is proportional to the extension of the knitted fabric containing said unshrunk 100% acrylic yarn.

**[0021]** The metric count of the unshrunk 100% acrylic yarn in accordance with the invention can be any count normally used in the knitting sector: the knitwear can in fact be created with any count depending on the result that is to be obtained. In fact the greater the thickness of the yarn, the greater the thickness of the fabric.

**[0022]** "Metric count" here is meant to identify the number of metres for making up the weight of 1000g (Nm) and represents the bulkiness or thickness of the yarn.

**[0023]** An example of the metric count of the present unshrunk acrylic yarn suitable for industrial knitting can be 1/18000 but can also be produced in a different count, for example with a metric count of 1/500 (i.e. to reach 1kg in weight 500 metres of yarn are needed) or 1/700, or 1/30000 (i.e. to reach 1kg in weight 30000 metres of yarn are needed), or 1/40000: the metric count of the yarn to be knitted will therefore influence the fineness at which the yarns can be worked.

**[0024]** Knitting of the present unshrunk 100% acrylic yarn can be performed with the density of the stitches (number of wales and courses per centimetre) to be chosen on the basis of the compactness which is to be achieved in the knitted fabric.

**[0025]** Moreover the present unshrunk 100% acrylic yarn can be worked with any fineness so as to reproduce all the types of the knitted textile working of the art, always giving rise to a fabric with stiffened zones after the heat treatment.

**[0026]** As already mentioned, the heat treatment of step (C) applied to the knitted fabric, obtained with the yarn described above in accordance with the present invention, can be compared to a shrinkage treatment in that operating at a temperature of around 100-120°C, using a thermal fluid selected from steam, hot air or boiling water, preferably steam.

**[0027]** After the treatment of step (C), the knitted fabric is cooled, preferably through aspiration in that it allows also the residual moisture to be removed and also the shrinkage step to be accelerated, making the fabric reach the definitive dimensional stability.

**[0028]** It is to be noted that the present heat treatment (C) in hot-humid conditions is preferably performed by means of the use of ironing machines which supply both heat and humidity, passing said knitted fabric of step (B) through the smooth and heated rollers of a first continuous ironing machine, which helps to keep open the pores

between the meshes during the shrinkage, and then through a second ironing machine with press cover, also capable of supplying heat and humidity to the fabric, in such a way as to complete the shrinkage and at the same time impart a dimensional stability to the fabric as defined above.

**[0029]** It is to be noted that the fabric deriving from the aforesaid heat treatment can be comparable aesthetically to a "felted" fabric in that it has become more compact, heavier and of greater thickness with respect to the knitted fabric before the heat treatment, in addition to having thickened its mass, thus becoming less permeable to air similarly to boiled wool or felted wool. However this invention was found to be unexpected in that the felting is a typical phenomenon of wool while the synthetic fibres including acrylic fibres are notoriously not subject to the phenomenon of felting.

**[0030]** Therefore, in the present invention, the particular nature of the yarn given by the material used and by its working together with the effect of the heat treatment of the knitted fabric, have allowed the fabric which is the object of the present invention to reach a high consistency and a compactness such as to be able to be shaped not only on the machine but also by cutting, without having to be lined with an adhesive material to avoid the fraying of the edges, operation which instead has to be carried out for conventional knitted fabrics.

**[0031]** It is to be noted in fact that conventional knitted fabrics are not shaped by cutting since they are very suitable for being reduced or increased directly on the machine but not for being cut.

**[0032]** The process of production of the present fabric is also found to be more advantageous with respect to the processes of loom weaving in that in the latter a high outlay of time is required for the preparation of the loom and a minimum production quantity (production minimums) is necessary for operating the looms which always operate with a very high number of reels, while with the present process even one single piece can be produced advantageously and fast whose shape is obtained directly on the machine using a single reel of yarn.

**[0033]** Further features of the invention can be made clearer by referring to some of its embodiments purely by way of a non-limiting example, illustrated in the accompanying drawings, in which:

Figure 1 illustrates two samples of parts of knitwear, before and after the heat treatment of step (C);  
 Figure 2 illustrates a two-colour knitted cap, both worn by a mannequin and not worn, which has not been subjected to the heat treatment of step (C);  
 Figure 3 illustrates the two-colour knitted cap of Figure 2 after having undergone the heat treatment of step (C), both worn by a mannequin and not worn.

**[0034]** Referring to Figure 1 the sample on the left, denoted by reference numeral 1, is what is obtained by knitting one or more "unusual" yarns in that they are not

shrunk in accordance with the present invention.

**[0035]** The illustrated sample 1 is knitted with fabric stitch, with fineness 7, using a 1/18,000 Nm 100% acrylic yarn. This is not a conventional knitting product since the yarn has not been subjected to shrinkage (retraction) before knitting and therefore is to be considered as the precursor of the product which can be obtained through the method of the present invention.

**[0036]** As can be seen from the photo, this sample 1 has undulations which are an indication of its deformability, despite the fact it has been fabric stitched. More particularly, if said sample 1 is subjected to traction in a transverse direction, it tends to stretch, similarly to known knitted fabrics, even if in a more marked manner.

**[0037]** It is for this reason that unshrunk yarns of acrylic fibres have never been used to produce knitwear.

**[0038]** The sample on the right, denoted by reference numeral 2, is that which is obtained by subjecting the sample 1 to step (C) of heat treatment and to subsequent cooling (C'). As can be seen from Figure 1, this sample 2 does not have undulations, has narrower meshes, and if said sample 2 is subjected to traction in the transverse direction it does not stretch, similarly to felts which are however typically in natural fibres.

**[0039]** As mentioned above, the knitted fabric obtained from the process in accordance with the present invention is found to be, where stiffened, very compact and solid, resistant to horizontal/vertical traction and to perforation in a much more marked manner than any other similar fabric, which can also be detected with instruments. Moreover it is stable, insulating, with raw edge, does not fray, solid and resistant at the sewing points, and exhibits a possibility of colours with high fastness to light, to washing and to rubbing, having moreover a particular stability to washing by hand and in a machine.

**[0040]** Referring to Figures 2-3, a hat is illustrated before (Fig. 2) and after the heat treatment (C) (Fig. 3). This hat has been made using, in the same machine for knitting, an unshrunk 100% acrylic yarn as defined above to make the soft black cap and a wool yarn to make the white band placed around the black cap.

**[0041]** From the comparison of Figure 2 with Figure 3 it is clear that the heat treatment (C) and the cooling (C') confer to the black portion of the cap (relating to the head) such rigidity and compactness as to transform the cap (Fig. 2) into a rigid beret, leaving instead unchanged the hand and the consistency of the white band in wool.

**[0042]** As mentioned above, one or more unshrunk 100% acrylic yarns as defined above can be used in association and/or in combination with one or more yarns of different composition, even not acrylic, wherein the acrylic yarn as defined above is used in the construction of a first element of a shaped article and different yarns, for example wool, are used in the construction of other elements belonging to the shaped article, as in the case of the hat illustrated in Figures 2-3. It is to be understood that the heat treatment of step (C) and cooling of step (C') can also be performed on a portion of knitted fabric

without thereby departing from the present invention.

**[0043]** The present invention is not limited to the particular embodiments described previously and illustrated in the accompanying drawings, but instead numerous detail changes may be made thereto within the reach of the person skilled in the art, without thereby departing from the scope of the same invention, as defined in the appended claims.

## Claims

1. Process for obtaining a synthetic or partially synthetic knitted fabric having at least one stiffened rigid portion with a rough hand, poor stretch and aesthetic appearance similar to felt, said fabric being directly shaped on a rectilinear knitting machine in the form of a piece of cloth by the metre, integral articles, parts of end products or shaped products deriving therefrom, said process comprising the following steps:

(A) preparing, in a predefined metric count, a not shrunk 100% acrylic yarn consisting of acrylic fibres, wherein said yarn has not been subjected to shrinkage or retraction before knitting,  
 (B) knitting one or more of said not shrunk 100% acrylic yarns as prepared in step (A) to obtain said knitted fabric (1) said yarns being fed into the rectilinear knitting machine in such a way as to form curvilinear loops of the structure of said knitted fabric;  
 (C) subjecting to heat treatment said knitted fabric (1) obtained from the aforementioned step (B), preferably in humid heat conditions, so as to obtain said at least one stiffened portion which has a stretch in the directions of width and length less than 5%, preferably less than or equal to 3% even up to 0% ;  
 (C') subjecting the knitted fabric obtained from step (C) to cooling.

2. Process according to claim 1, wherein the heat treatment of step (C) is performed by passing said knitted fabric of step (B) through a first continuous ironing machine with heated smooth rollers and then through a second ironing machine with press cover, so as to obtain said knitted fabric.
3. Process according to claim 1, wherein the heat treatment of step (C) is performed at a temperature of around 100-120°C, using a thermal fluid selected from steam, hot air or boiling water, preferably steam.
4. Process according to any one of the preceding claims, wherein the fabric (2) in the form of a piece of cloth by the metre, obtained from the heat treat-

ment of step (C) and from the cooling of step (C') is then subjected to one or more cutting operations (D) to obtain shaped products or parts of shaped manufactured products for accessories for clothing and/or furniture, such as for example shoe uppers, shoelaces, belts, bags, watch straps, hats or other accessories for clothing and/or furniture such as for example rugs, mats for cars.

5. Process according to any one of the preceding claims, wherein the cooling of step (C') is performed by means of aspiration.
6. Process according to any one of the preceding claims, wherein the 100% acrylic yarn prepared in step (A) has a metric count of 1/18,000 Nm.
7. Process according to any one of the preceding claims, wherein the extension of the stiffened portion of the knitted fabric (2) obtained after step (C') is proportional to the extension of the knitted fabric containing said 100% acrylic yarn made up solely of unshrunk fibres.
8. Process according to any one of the preceding claims, wherein in step (B) one or more yarns different from said not shrunk 100% acrylic yarn are fed separate in the rectilinear knitting machine to create zones of different materials.
9. Process according to any one of the preceding claims, wherein the 100% acrylic yarn prepared in step (A) is coloured and not undyed.

## Patentansprüche

1. Verfahren zur Herstellung eines synthetischen oder teilweise synthetischen gewirkten Stoffs, der mindestens einen gesteiften starren Teil mit einer rauen Seite, geringer Dehnbarkeit und einem ästhetisches Aussehen ähnlich dem von Filz aufweist, wobei der Stoff direkt auf einer geradlinigen Strickmaschine in Form eines Stück Tuchs als Meterware, als integrale Artikel, Teile von Endprodukten oder davon abgeleitete geformte Produkte geformt wird, wobei das Verfahren die folgenden Schritte umfasst:

(A) Herstellen in einer vorher festgelegten metrischen Nummer eines nicht geschrumpften, 100 % Acrylgarns, das aus Akrylfasern besteht, wobei das Garn vor Stricken keinem Schrumpfen oder Zusammenziehen unterzogen wurde.  
 (B) Stricken von einem oder mehreren der nicht geschrumpften 100 % Acrylgarne wie in Schritt (A) hergestellt, um gewirkten Stoff (1) zu erhalten, wobei die Garne in die geradlinige Strickmaschi-

- ne so eingespeist werden, dass sie krummlinige Schlingen der Struktur des gewirkten Stoffs bilden;
- (C) Unterziehen des gewirkten Stoffs (1), der aus dem vorstehend erwähnten Schritt (B) erhalten wurde, einer Wärmebehandlung, vorzugsweise unter feuchten Wärmebedingungen, um den mindestens einen gesteiften Teil zu erhalten, der eine Dehnbarkeit in Breiten- und Längsrichtung von weniger als 5 %, vorzugsweise weniger oder gleich 3 % oder sogar bis zu 0 % aufweist;
- (C') Unterziehen des aus Schritt (C) erhaltenen gewirkten Stoffs einer Kühlung.
2. Verfahren nach Anspruch 1, wobei die Wärmebehandlung von Schritt (C) durchgeführt wird, indem man den gewirkten Stoff von Schritt (B) durch eine erste kontinuierliche Bügelmaschine mit aufgeheizten glatten Rollen führt und dann durch eine zweite Bügelmaschine mit Pressabdeckung, um den gewirkten Stoff zu erhalten.
  3. Verfahren nach Anspruch 1, wobei die Wärmebehandlung von Schritt (C) bei einer Temperatur von ungefähr 100 - 120 °C unter Anwendung eines thermischen Fluids ausgeführt wird, das aus Dampf, Warmluft oder kochendem Wasser, vorzugsweise Dampf, ausgewählt wird.
  4. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Stoff (2) in der Form eines Stück Tuchs, das aus der Wärmebehandlung von Schritt (C) und der Kühlung von Schritt (C') als Meterware erhalten wurde, dann einem oder mehreren Schneidvorgängen (D) unterzogen wurde, um geformte Produkte oder Teile von geformten gefertigten Produkten für Zubehöre für Kleidung und/oder Möbel zu erhalten, wie zum Beispiel Schuhoberleder, Schuhriemen, Gürtel, Handtaschen, Uhrbänder, Hüte oder anderes Zubehör für Kleidung und/oder Möbel wie zum Beispiel Läufer, Matten für Autos zu erhalten.
  5. Verfahren nach einem der vorhergehenden Ansprüche, wobei das Kühlen von Schritt (C') mittels Aspiration durchgeführt wird.
  6. Verfahren nach einem der vorhergehenden Ansprüche, wobei das 100 % Akrylgarn, das in Schritt (A) hergestellt wurde, eine metrische Nummer von 1/18,000 Nm aufweist.
  7. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Verlängerung des gesteiften Teils des gewirkten Stoffs (2), der nach Schritt (C') erhalten wurde, proportional der Verlängerung des gewirkten Stoffs ist, der 100 % Akrylgarn enthält, das ausschließlich aus nicht geschrumpften Fasern besteht.
  8. Verfahren nach einem der vorhergehenden Ansprüche, wobei in Schritt (B) ein oder mehrere Garne, die von dem nicht geschrumpften 100 % Akrylgarn verschieden sind, getrennt in die geradlinige Strickmaschine eingespeist werden, um Zonen von verschiedenen Materialien zu bilden.
  9. Verfahren nach einem der vorhergehenden Ansprüche, wobei das 100 % Akrylgarn, das in Schritt (A) hergestellt wird, farbig und nicht ungefärbt ist.
- Revendications**
1. Processus permettant d'obtenir un article tricoté synthétique ou partiellement synthétique comportant au moins une partie rigide raidie avec une main ferme, une faible élasticité et une apparence esthétique similaire à du feutre, ledit tissu étant directement mis en forme sur une machine à tricoter rectiligne sous la forme d'une pièce de tissu au mètre, d'articles intégraux, de parties de produits d'extrémité ou de produits mis en forme dérivants de ceux-ci, ledit processus comprenant les étapes suivantes consistant à :
    - (A) préparer, dans un nombre métrique prédéfini, un fil 100 % acrylique non diminué constitué de fibres acryliques, dans lequel ledit fil n'a pas été assujéti à une diminution ou à une rétraction avant le tricotage,
    - (B) tricoter au moins un dudit fils 100 % acrylique non diminué tel que préparé dans l'étape (A) pour obtenir ledit article tricoté (1), lesdits fils étant alimentés dans la machine à tricoter rectiligne de façon à former des boucles curvilignes de la structure dudit article tricoté ;
    - (C) assujettir à un traitement thermique ledit article tricoté (1) obtenu lors de l'étape précédente (B), de préférence dans des conditions de chaleur humide, de façon à obtenir ladite au moins une partie raidie qui présente une extension dans les directions de largeur et de longueur inférieure à 5 %, de préférence inférieure ou égale à 3 % et allant même jusqu'à 0 % ;
    - (C') assujettir l'article tricoté obtenu lors de l'étape (C) à un refroidissement.
  2. Processus selon la revendication 1, dans lequel le traitement thermique de l'étape (C) est effectué au moyen du passage dudit article tricoté de l'étape (B) à travers une première machine à repasser en continu équipée de rouleaux lisses chauffés et ensuite à travers une seconde machine à repasser équipée d'un carter de protection, de façon à obtenir ledit article tricoté.
  3. Processus selon la revendication 1, dans lequel le

traitement thermique de l'étape (C) est effectué à une température d'environ 100 à 120 °C, au moyen d'un fluide thermique choisi parmi la vapeur, l'air chaud ou l'eau en ébullition, de préférence la vapeur.

- 5
4. Processus selon l'une quelconque des revendications précédentes, dans lequel le tissu (2) sous la forme d'une pièce de tissu au mètre, obtenu à partir du traitement thermique de l'étape (C) et à partir du refroidissement de l'étape (C') est ensuite assujéti à au moins une opération de découpe (D) pour obtenir des produits ou parties façonnés de produits fabriqués et mis en forme pour des accessoires destinés à l'habillement et/ou l'immobilier, tels que par exemple des dessus de chaussures, des lacets de chaussures, des ceintures, des sacs, des bracelets de montre, des chapeaux ou d'autres accessoires destinés à l'habillement et/ou l'immobilier, tels que par exemple des tapis, des matelas pour voitures.
- 10
- 15
- 20
5. Processus selon l'une quelconque des revendications précédentes, dans lequel le refroidissement de l'étape (C') est effectué au moyen d'une aspiration.
- 25
6. Processus selon l'une quelconque des revendications précédentes, dans lequel le fil 100 % acrylique préparé dans l'étape (A) présente un numéro métrique de 1/18 000 Nm.
- 30
7. Processus selon l'une quelconque des revendications précédentes, dans lequel l'extension de la partie raidie de l'article tricoté (2) obtenu après l'étape (C') est proportionnelle à l'extension de l'article tricoté contenant le fil 100 % acrylique constitué seulement de fibres non diminuées.
- 35
- 40
8. Processus selon l'une quelconque des revendications précédentes, dans lequel dans l'étape (B) au moins un fil différent dudit fil 100 % acrylique non diminué est alimenté séparément dans la machine à tricoter rectiligne pour créer des zones de matériaux différents.
- 45
9. Processus selon l'une quelconque des revendications précédentes, dans lequel le fil 100 % acrylique préparé dans l'étape (A) est coloré et pas non teint.

50

55



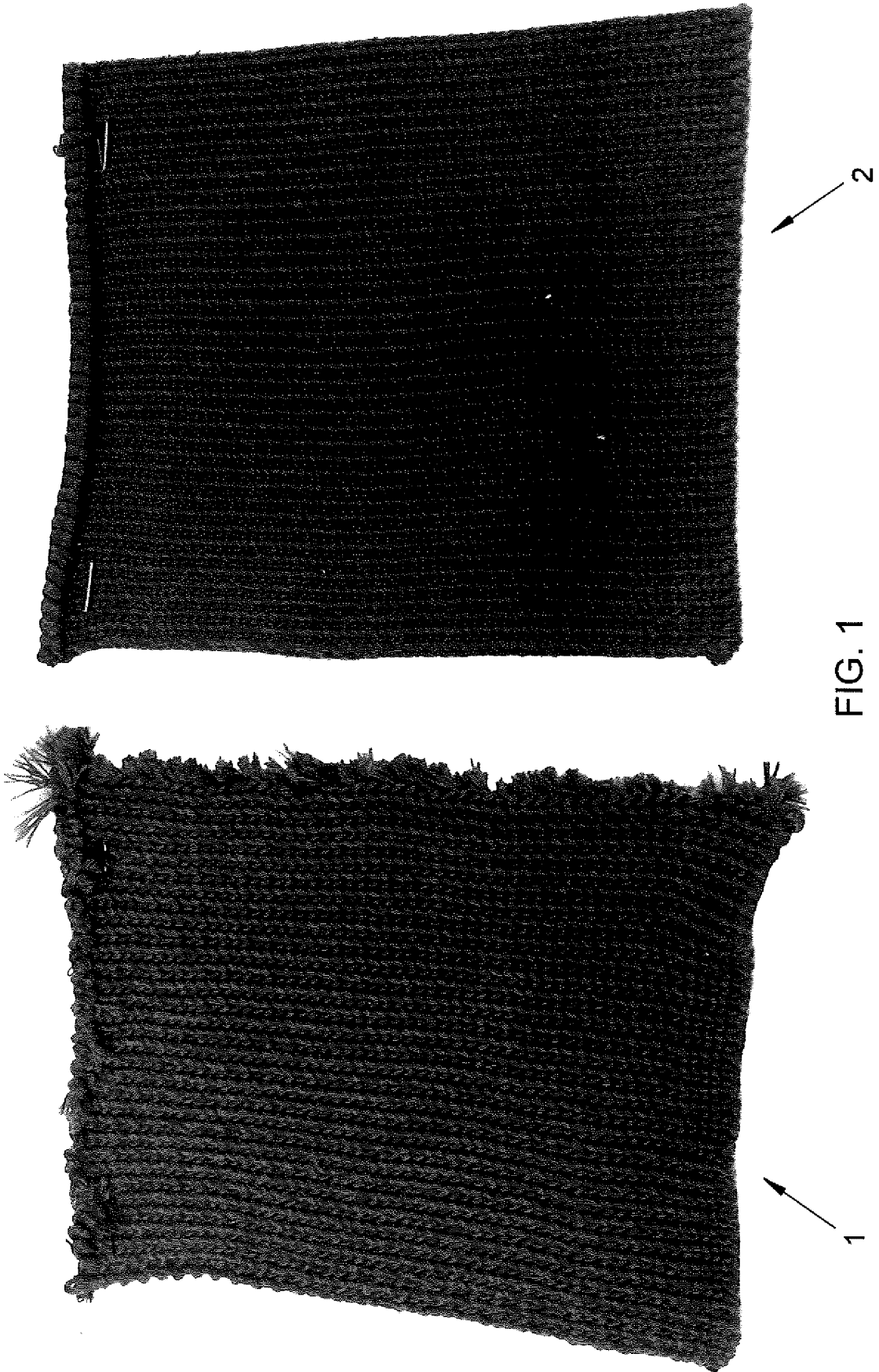




FIG. 2

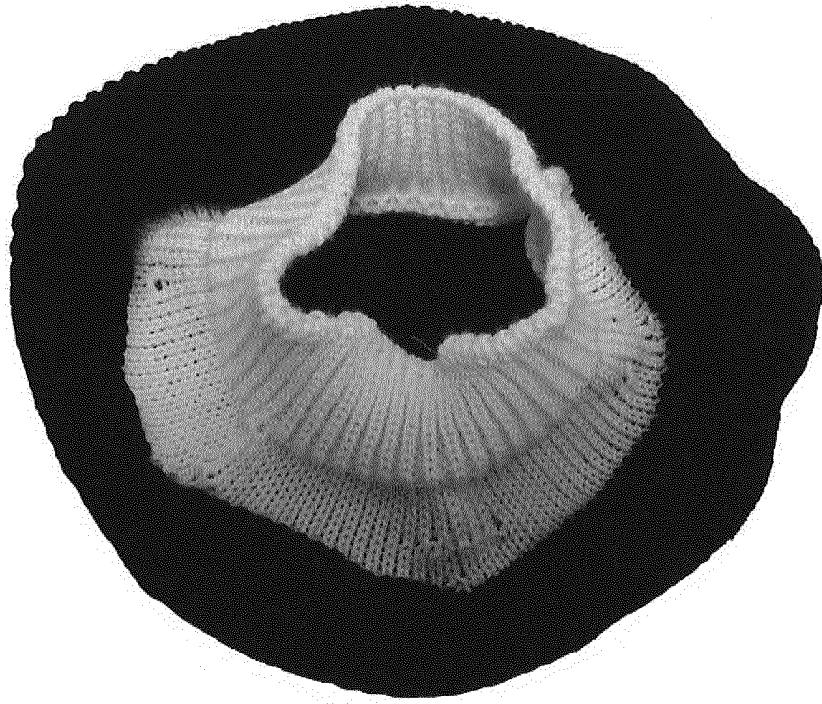
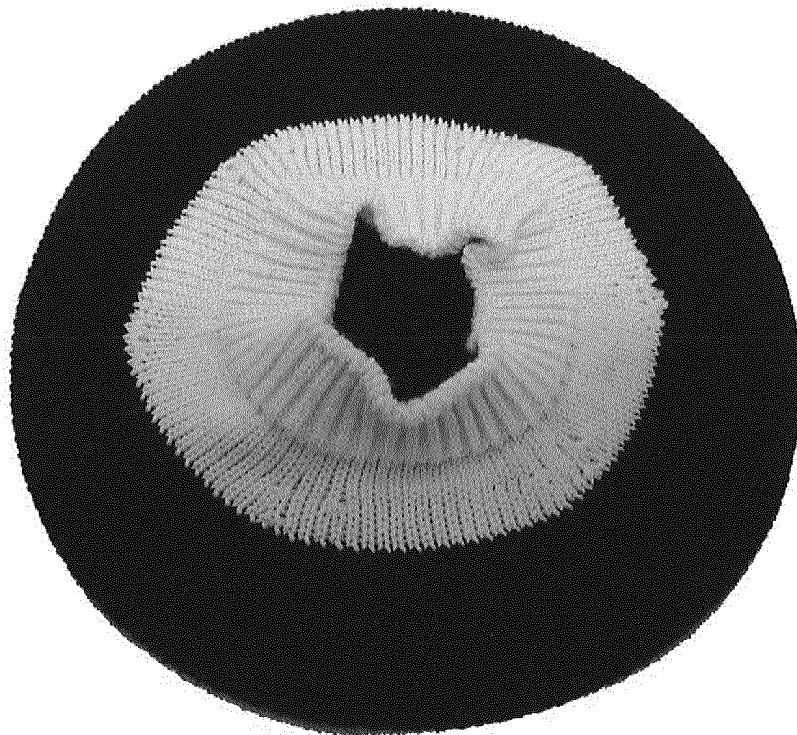




FIG. 3



**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- JP 5785720 B [0008]
- GB 2020329 A [0009]
- GB 987163 A [0010]