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⑤ **Splice for yarns.**

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The Ashley Book of Knots

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Description

This invention concerns a new kind of splice for yarns, whether they be textile yarns or not.

Splices made between textile yarns by fishermen's knots, weaver's knots or other kinds of knots are known. Splices between yarns are also known which are made with adhesives or with ties by winding the yarn or an outer tape.

Splices are also known which are made by intertwining and entangling the fibres of two yarns by blowing air or by means of electrostatic fields.

For instance, GB-2 066 315 discloses a device in which two yarns are spliced with a jet of air in a turbulence chamber. The splice which can be obtained in this manner is irregular and includes zones having fibres which are not intermingled and which therefore protrude and form tufts.

The known splices entail drawbacks as regards their dynamometric properties and the ability to employ the spliced yarn in usage means downstream and also as regards the general characteristics of the joint.

Splices are also known which are made by untwisting the individual yarns, uniting them and retwisting together the tracts of the yarns to be spliced.

The feature of said joints is the coupling of two yarns by twisting them together after having brought them beforehand to the condition of almost parallel fibres before coupling them.

EP-A-39 609 (in the name of CSIRO) with priority AU3407/80 is known and discloses a device and method to splice two twisted yarns by untwisting portions of each yarn, tearing such portions from the yarn so as to form two tail ends, coupling the tail ends and re-twisting the same so as to form a splice, the yarn being clamped at gripping points spaced apart to define a specific segment of yarn to be untwisted, such specific untwisted segment remaining clamped between such distanced gripping points even after formation of such tail ends, and at least part of such tail ends cooperating with at least two of such distanced gripping points.

GB 661 697 (Abbott) discloses a procedure to form a splice which is generic in itself and which can be performed by hand.

It is not disclosed how such splice can be obtained with a machine.

Furthermore, it is not disclosed how it is intended to apply the twists or to couple the yarns and apply the retwisting, etc.

These splices too entail unsatisfactory mechanical properties since the fibres of the original yarns do not cooperate with each other except to a small extent and in an inadequate way.

This leads to unsatisfactory strengths, inadequate ability to repeat the joints, imperfect end zones and an unsatisfactory strength of the splice in the long term.

Attempts have been made to improve such joints by opening out and ruffling the fibres when the latter are substantially parallel; this has been done with mechanical and/or pneumatic means,

but appreciable results or, at any rate, results of a satisfactory level have not been obtained.

For instance, the known splices made with a jet or jets of air have their fibres bunched together and matted.

Furthermore, the spliced tract is stiffened thereby with a resulting loss of elasticity and even with considerable problems for the usage means downstream, particularly as regards dyeing work and warping operations besides other processes thereafter.

Our present invention proposes a splice for yarns, whether textile yarns or not, which not only has outstanding aesthetic features but also possesses important mechanical, technologic-logical and elastic properties and a long life.

The invention also proposes joints which are not only homogeneous but are also able to meet the requirements of various usage means thereafter.

Indeed it is possible for said splices to be made individually suitable for the particular type of usage means by comprising intermediate and transition lengthwise sections of a type and form selected as desired.

The splice can include tail ends obtained by tearing or extraction or cutting, so that the tail ends themselves can be sheared or chopped, or be reduced or progressive.

The splice also comprises component yarns which tend to shrink lengthwise so that a centripetal reciprocal thrust of one yarn in respect of the other yarn takes place.

According to the invention the various kinds of joint may have a joint diameter which varies between 0.8 and 1.8 times the diameter of the single yarn.

The joint can also have coils with a winding inclination of the coupled yarns of a desired type, for said inclination may be constant, variable or mixed, as desired and depending on the properties required.

The progression of the slope of the winding spirals may also begin at the middle of the joint and move towards the ends thereof.

This enables possible requirements of elasticity and/or strength differentiated outwards from the middle to the periphery of the joint to be met, depending on the needs of the usage means thereafter.

According to the invention a splice made in this way is, in itself, so stable that the tail ends or part thereof can be left substantially free.

According to the invention the remaining tail ends are wound advantageously on the single connected yarns.

It is also possible for at least part of the joint to comprise a mutual penetration of the fibres.

The invention is therefore embodied in a splice for yarns, whether textile or otherwise, which is obtained by coupling tracts of single yarns by means of mechanically winding after having mechanically untwisted beforehand said tracts of single yarns (as is for example known from EP-A-39 609), and is characterized by com-

prising, at least in one tract of the splice, a number of twists of the coupled yarn which is greater than the number of twists included in the single yarns in the same tract, and is also characterised by having a reciprocal centripetal thrust as between the two yarns owing to an induced lengthwise shrinkage.

Let us now look at the invention with the help of the figures, which have been attached merely as an illustrative example.

The figures show the following:

- Fig. 1 shows a splice according to the invention;
- Fig. 2a shows a first variant of the splice of Fig. 1;
- Fig. 2b shows another variant of the splice of Fig. 1;
- Fig. 3 shows two conditions of the spliced yarns respectively;
- Fig. 4 shows the constraining effect of the fly fibres;
- Fig. 5 shows a variant of the splice of Fig. 1 with cut or torn tail ends which are free;
- Fig. 6 shows a variant of the splice of Fig. 1 with cut or torn tail ends which are wound up fully;
- Figs. 7 and 8 show two possible arrangements of the yarns in the splice.

In the figures the same parts or parts having the same functions bear the same reference numbers.

A splice 22 as in Fig. 5 with the tail ends 120 and/or 121 free (cut or torn, as in the example shown, or opened out) is stable enough and can be employed without any worries for given operations thereafter.

If steps are taken to wind (Fig. 6) the tail ends 120 and/or 121 respectively onto the yarns 21 and 20, a still stronger joint is obtained.

Said winding of the tails 120 and 121 is performed with the same device as that which arranges to make the splice 22, or with other suitable means.

In the splice of the invention the end points 124 of the fly fibres 24 (Fig. 4) can be anchored in and with other fibres, thereby creating better anchorage and intertwining of the individual yarns 20 - 21 both as between the two individual yarns and also as between one coil and another of the same yarn by passing the fibres over the intermediate coil of the other yarn.

This anchorage is further improved by a preferential orientation given to the fly fibres 24 themselves.

Said orientation is advantageously, but not necessarily, directed towards the end 23 of the splice 22 from the middle of the splice.

When progressive untwisted tail ends are present (Figs. 1, 2 and 4), the tail ends 120 - 121 are advantageously wound tightly onto the other single yarn, 21 and 20 respectively, so that the last coils wound become protected by the protrusion of the face 25 of the single yarn onto which

they are wound.

Fig. 4 shows this condition for instructional purposes, together with the bond created by the fly fibres 24.

In said Fig. 4 can be seen the face 25 of the coils of yarn 21 deeply furrowed by the coils of the tail end 120, so that said coils of the tail end 120 are contained within the outer edge 25 of the yarn 21.

According to the invention it is possible to have different kinds of splices with different properties. Figs. 1, 2, 7 and 8 show some types of splices.

The splice of Fig. 1 is made without any thickening and compressive action; moreover, the tail ends 120 - 121 are pulled open, that is, progressive, and their end zone is wound progressively on the anchored yarn 21 - 20.

Under such conditions the joint 22 consists essentially of three zones, respectively a middle zone 26 with an almost constant development of the coils, a transition zone 27 wherein the coils change their slope progressively while the diameter of the joint is progressively lessened, and a zone 23 for the binding of the tails wherein the slope of the coils varies more quickly than in the zone 26.

This kind of splice may have in the zone 26 a maximum diameter varying between 1.25 and 1.8 times the diameter of the single yarn; in the zone 23 instead the maximum diameter may vary between 0.8 and 1.10 times the diameter of the single yarn.

The splices of Figs. 2 show a compressive and thickening effect produced during their formation.

In the case of Fig. 2a (the fly fibres 24 are purposely not shown for reasons of clarity) there are still three zones, but zone 26 will take up a proportionately greater length.

This kind of joint may have a maximum diameter about 1.05 to 1.25 times the diameter of the single yarn in zone 26, whereas in zone 23 the diameter will be between 0.8 and 1.25 times the diameter of the single yarn.

Instead, Fig. 2b shows the case wherein the tail ends are about as long as the splice itself (as an example we have assumed the case of fibres spread out evenly in the tail ends).

In such a case the joint 22 still has a zone 27 for the splicing of the tail ends, but zone 26 is substantially lacking, whereas the transition zone 27 in practice covers the zone 23 as well.

It can be seen in said figure that in practice a splice is made in that case with a reciprocal progressive development in both directions.

Such a type of splice has a diameter between 0.8 and 1.25 times the average diameter of the single yarn, and said diameter may vary substantially within said limits along the axis of the joint.

By varying the length of the tail ends and varying the operating conditions while the joint is made, it is possible to obtain different splices, which may be a combination of the joint of Fig. 2a and the joint of Fig. 2b, or a combination of said

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two joints and the joint of Fig. 1.

Fig. 3 shows two final conditions of the single yarns with the splice made (middle tract 26), the splice having undergone compression and thickening (position B) and not having undergone that auxiliary action (position A) respectively.

Fig. 3 shows the bonding effect created by such auxiliary compressive and thickening action, which broadens the band of support and mutual cooperation between the two yarns 20 - 21.

Figs. 7 and 8 are examples of two further kinds of joints having different characteristics which could be produced on the joints of Figs. 1 and 2a.

The tails 120 - 121 are shown but bear no relation to specific cases and are merely illustrative.

In Fig. 7 the farther the coils are located from the middle of the splice towards the ends thereof, the more they tend progressively to take up a disposition at right angles to the axis of the single yarn.

Instead, in Fig. 8 the coils are oriented more at right angles, to the axis of the splice near the middle of the splice and then change progressively until they reach the edge of the splice with an accentuated slope.

We have described the invention here according to preferred embodiments shown as examples, but variants, integrations and additions can be embodied by a person skilled in this field, with the use also of mechanical equivalents, without departing thereby from the scope of the idea of the solution as set out in the appended claims.

Claims

1. Splice for yarns, whether textile or otherwise, which is obtained by coupling tract of single yarns by means of mechanically winding after having mechanically untwisted beforehand said tracts of single yarns and is characterized by comprising, at least in one tract of the splice (22), a number of twists of the coupled yarn which is greater than the number of twists included in the single yarns (221 - 220) in the same tract, and is also characterized by having a reciprocal centripetal thrust as between the two yarns (221 - 220) owing to an induced lengthwise shrinkage.

2. Splice for yarns, whether textile or otherwise, as in Claim 1, characterized by the fact that in at least one tract of the splice (22) the single yarns (220 - 221) have a band of support and mutual cooperation of a desired width (Fig. 3).

3. Splice for yarns, whether textile or otherwise, as in Claim 1 or 2, characterized by the fact that at least one tract (26) of the splice (22) comprises coils of single yarns (220 - 221) having a substantially constant slope.

4. Splice for yarns, whether textile or otherwise, as in Claim 1 or 2, characterized by the fact that

at least one tract (27) of the splice (22) comprises coils of the single yarns (220 - 221) having a variable slope.

5. Splice for yarns, whether textile or otherwise, as in Claims 1 or 2 and 4, characterized by the fact that the tract (27) of the splice (22) having coils with a variable slope is contained between the middle zone (26) and the end zone (23) of the splice (Figs. 1 and 2a).

6. Splice for yarns, whether textile or otherwise, as in Claims 1 or 2 and 4, characterized by the fact that the tract (27) of the splice (22) having coils with a variable slope comprises the whole splice (Fig. 2b).

7. Splice for yarns, whether textile or otherwise, as in Claims 1 or 2 and 4, characterized by the facts that the tract (27) of the splice (22) having coils with a variable slope comprises at least part of the splice, and that the slope varies substantially according to the same law in the opposed parts in respect of the middle of said splice (Figs. 7 and 8).

8. Splice for yarns, whether textile or otherwise, as in Claim 1 and in one or another of the Claims thereafter, characterized by the fact that the tail ends (120 - 121) are free (Fig. 5).

9. Splice for yarns, whether textile or otherwise, as in Claim 1 or in one or another of the Claims thereafter up to Claim 7 inclusive, characterized by the fact that the tail ends (120 - 121) are wound onto the single spliced yarn (21 - 20).

10. Splice for yarns, whether textile or otherwise, as in Claim 1 or in one or another of the Claims thereafter, characterized by the fact that the tail ends (120 - 121) are chopped (Figs. 5 and 6).

11. Splice for yarns, whether textile or otherwise, as in Claim 1 or in one or another of the Claims thereafter up to Claim 9 inclusive, characterized by the fact that the tail ends (120 - 121) diminish (Figs. 1 and 2).

12. Splice for yarns, whether textile or otherwise, as in Claim 11, characterized by the fact that the end part of the tail ends (120 - 121) is wound in a position protected by the face (25) of the single yarns (21 - 20) - (Fig. 4).

13. Splice for yarns, whether textile or otherwise, as in Claim 1, and in one or another of the Claims thereafter up to Claim 12 inclusive, characterized by the fact that the splice (22) has an average intermediate diameter (zone 26) between 1.25 and 1.8 times the diameter of the single yarns (20 - 21) - (Fig. 1).

14. Splice for yarns, whether textile or otherwise, as in Claim 1, and in one or another of the Claims thereafter, characterized by the fact that the dia-

meter in the zone (23) where the tail ends (120 – 121) are spliced may vary from 0.8 to 1.25 times the diameter of the single yarns (20 – 21) – (Figs. 1 – 2a).

15. Splice for yarns, whether textile or otherwise, as in Claim 1 and in one or another of the Claims thereafter up to Claim 12 inclusive, characterized by the fact that the splice (22) has an average intermediate diameter (zone 26) between 1.05 and 1.25 times the diameter of the single yarns (20 – 21) – (Fig. 2a).

16. Splice for yarns, whether textile or otherwise, as in Claim 1 and in one or another of the Claims thereafter up to Claim 12 inclusive, characterized by having an average intermediate diameter (zone 27) between 0.8 and 1.10 times the diameter of the single yarns (20 – 21) – (Fig. 2b).

17. Splice for yarns, whether textile or otherwise, as in Claim 1 and in one or another of the Claims thereafter, characterized by the fact that the fly fibres (24) protruding from at least the middle tract (26) of the splice (22) are mainly free.

18. Splice for yarns, whether textile or otherwise, as in Claim 1 and in one or another of the Claims thereafter up to Claim 16 inclusive, characterized by the fact that the greater part of the fly fibres (24) possess characteristics of slithering towards at least one end of the splice and of anchoring themselves to the fibres of the single yarns (20 – 21) – (Fig. 4).

Patentansprüche

1. Verbindung von Textil- und Nichttextilfäden, die durch Doublieren der Abschnitte der Einzelfäden durch mechanische Wicklung nach vorheriger mechanischer Detorsion der genannten Abschnitte der Einzelfäden erhalten wird, dadurch gekennzeichnet, daß sie mindestens in einem Abschnitt der Verbindung (22) eine größere Anzahl Drehungen, die in dem selben Abschnitt in den Einzelfäden (221 – 220) vorhanden sind, und einen gegenseitigen Zentripetalschub eines Fadens gegen den anderen (221 – 220), der von einer erzwungenen longitudinalen Kontraktion verursacht ist, aufweist.

2. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1, dadurch gekennzeichnet, daß mindestens in einem Abschnitt der Verbindung (22) die Einzelfäden (220 – 221) ein gegenseitiges Stütz- und Mitwirkungsband der gewollten Breite aufweisen (Fig. 3).

3. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß mindestens ein Abschnitt (26) der Verbindung (22) die Windungen der Einzelfäden (220 – 221) mit einer wesentlich konstanten Neigung aufweist.

4. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß mindestens ein Abschnitt (27) der Verbindung (22) die Windungen der Einzelfäden (220 – 221) mit veränderlicher Neigung aufweist.

5. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Abschnitt (27) der Verbindung (22) mit Windungen mit veränderlicher Neigung zwischen der Mittelzone (26) und der Endzone (23) der Verbindung eingeschlossen ist (Fig. 1 und 2a).

6. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder 2 und 4, dadurch gekennzeichnet, daß der Abschnitt (27) der Verbindung (22) mit Windungen mit veränderlicher Neigung die ganze Verbindung einschließt (Fig. 2b).

7. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder 2 und 4, dadurch gekennzeichnet, daß der Abschnitt (27) der Verbindung (22) mit Windungen mit veränderlicher Neigung mindestens einen Teil der Verbindung enthält und die Neigung sich in den entgegengesetzten Teilen gegenüber der Mittellinie der genannten Verbindung wesentlich nach demselben Gesetz ändert (Fig. 7 und 8).

8. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder irgendeinem der folgenden Ansprüche, dadurch gekennzeichnet, daß die Schwänzchen (120 – 121) frei sind (Fig. 5).

9. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder irgendeinem der folgenden Ansprüche bis 7, dadurch gekennzeichnet, daß die Schwänzchen (120 – 121) auf den verbundenen Einzelfäden (21 – 20) aufgewickelt sind.

10. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder dem einen oder dem anderen der folgenden Ansprüche, dadurch gekennzeichnet, daß die Schwänzchen (120 – 121) verstümmelt sind (Fig. 5 – 6).

11. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 oder dem einen oder dem anderen der folgenden Ansprüche bis 9, dadurch gekennzeichnet, daß die Schwänzchen (120 – 121) abnehmen (Fig. 1 und 2).

12. Verbindung von Textil- und Nichttextilfäden nach Anspruch 11, dadurch gekennzeichnet, daß der Endteil der Schwänzchen (120 – 121) in vor der Rückseite (25) der einzelnen Fäden (21 – 20) geschützter Lage gewickelt ist (Fig. 4).

13. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche bis 12, dadurch gekennzeichnet, daß sie einen durchschnittlichen Zwischendurchmesser (Zone 26) aufweist, der zwischen 1,25 und 1,8 mal den Durchmesser der

Einzelfäden (20 – 21) eingeschlossen ist (Fig. 1).

14. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche, dadurch gekennzeichnet, daß sich in der Bindungszone (23) der Schwänzchen (120 – 121) der Durchmesser von 0,8 bis 1,25 mal den Durchmesser der Einzelfäden (20 – 21) ändern kann (Fig. 1 – 2a).

15. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche bis 12, dadurch gekennzeichnet, daß sie einen durchschnittlichen Zwischendurchmesser (Zone 26) aufweist, der zwischen 1,05 und 1,25 mal den Durchmesser der Einzelfäden (20 – 21) eingeschlossen ist (Fig. 2a).

16. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche bis 12, dadurch gekennzeichnet, daß sie einen durchschnittlichen Zwischendurchmesser (Zone 27) aufweist, der zwischen 0,8 und 1,10 mal den Durchmesser der Einzelfäden (20 – 21) eingeschlossen ist (Fig. 2b).

17. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche, dadurch gekennzeichnet, daß die mindestens von zentralen Abschnitt (26) der Verbindung (22) vorstehenden fliegenden Fasern (24) überwiegend frei sind.

18. Verbindung von Textil- und Nichttextilfäden nach Anspruch 1 und dem einen oder dem anderen der folgenden Ansprüche bis 16, dadurch gekennzeichnet, daß die meisten fliegenden Fasern (24) Mitnahmeeigenschaften gegen mindestens ein Ende der Verbindung und der Ankupplung mit den Fasern der einzelnen Fäden (20 – 21) aufweisen (Fig. 4).

Revendications

1. Epissure pour fils, qu'ils soient textiles ou autres, que l'on obtient en accouplant des tronçons de fils individuels au moyen d'un enroulement mécanique après avoir détordu mécaniquement au préalable ces tronçons de fil individuel, caractérisée par le fait qu'elle comprend, au moins dans un tronçon de l'épissure (22), un nombre de torsions du fil accouplé qui est plus grand que le nombre de torsions inclus dans les fils individuels (221 – 220) dans le même tronçon, et par le fait qu'elle produit une poussée centripète réciproque entre le deux fils (221 – 220), par suite d'une contraction longitudinale provoquée.

2. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1, caractérisée par le fait que dans au moins un tronçon de l'épissure (22), les fils individuels (220, 221) ont une bande

de soutien et de coopération mutuelle d'une largeur désirée (figure 3).

5 3. Epissure pour fils, qu'ils soient textiles ou autres, selon l'une des revendications 1 et 2, caractérisée par le fait qu'au moins un tronçon (26) de l'épissure (22) comprend des spires de fils individuels (220 – 221) ayant une pente pratiquement constante.

10 4. Epissure pour fils, qu'ils soient textiles ou autres, selon les revendications 1 et 2, caractérisée par le fait qu'au moins un tronçon (27) de l'épissure (22) comprend des spires de fils individuels (220 – 221) ayant une pente variable.

15 5. Epissure pur fils, qu'ils soient textiles ou autres, selon les revendications 1, 2 et 4, caractérisée par le fait que le tronçon (27) de l'épissure (22) ayant des spires à pente variable est contenu entre la zone centrale (26) et la zone terminale (23) de l'épissure (figures 1 et 2a).

20 6. Epissure pour fils, qu'ils soient textiles ou autres, selon le revendications 1, 2 et 4, caractérisée par le fait que le tronçon (27) de l'épissure (22) ayant des spires à pente variable comprend toute l'épissure (figure 2b).

25 7. Epissure pour fils, qu'ils soient textiles ou autres, selon les revendications 1, 2 et 4, caractérisée par le fait que le tronçon (27) de l'épissure (22) ayant des spires à pente variable comprend au moins une partie de l'épissure et que la pente varie pratiquement selon la même loi dans les parties opposées, relativement au centre de l'épissure (figures 7 et 8).

30 8. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes, caractérisée par le fait que les extrémités de queue (120 – 121) sont libres (figure 5).

35 9. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 ou l'une ou l'autre des revendications suivantes jusqu'à la revendication 7 incluse, caractérisée par le fait que les extrémités de queue (120 – 121) sont enroulées sur le fil épissé individuel (21 – 20).

40 10. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 ou l'une ou l'autre des revendications suivantes, caractérisée par le fait que les extrémités, de queue (120 – 121) sont hachées (figures 5 et 6).

45 11. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 ou l'une ou l'autre des revendications suivantes jusqu'à la revendication 9 incluse, caractérisée par le fait que les extrémités de queue (120 – 121) diminuent (figures 1 et 2).

50 12. Epissure pour fils, qu'ils soient textiles ou

autres, selon la revendication 11, caractérisée par le fait que la partie terminale des extrémités de queue (120 – 121) est enroulée dans une position protégée par la face (25) des fils individuels (21 – 20) (figure 4). 5

13. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes jusqu'à la revendication 12 incluse, caractérisée par le fait que l'épissure (22) a un diamètre intermédiaire moyen (zone 26) de 1,25 à 1,8 fois le diamètre des fils individuels (20 – 21) (figure 1). 10

14. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes, caractérisée par le fait que le diamètre dans la zone (23) où les extrémités de queue (120 – 121) sont épissées peut varier de 0,8 à 1,25 fois le diamètre des fils individuels (20 – 21) (figures 1, 2a). 15
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15. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes jusqu'à la revendication 12 incluse, caractérisée par le fait que l'épissure (22) a un diamètre intermédiaire moyen (zone 26) de 1,05 à 1,25 fois le diamètre des fils individuels (20 – 21) (figure 2a). 25
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16. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes jusqu'à la revendication 12 incluse, caractérisée par le fait qu'elle a un diamètre intermédiaire moyen (zone 27) de 0,8 à 1,10 fois le diamètre des fils individuels (20 – 21) (figure 2b). 35
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17. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes, caractérisée par le fait que les fibres volantes (24) dépassant au moins du tronçon central (26) de l'épissure (22) sont principalement libres. 45

18. Epissure pour fils, qu'ils soient textiles ou autres, selon la revendication 1 et l'une ou l'autre des revendications suivantes jusqu'à la revendication 16 incluse, caractérisée par le fait que la majeure partie des fibres volantes (24) possèdent les caractéristiques de glisser vers au moins une extrémité de l'épissure et de s'ancrer aux fibres des fils individuels (20 – 21) (figure 4). 50
55

60

65

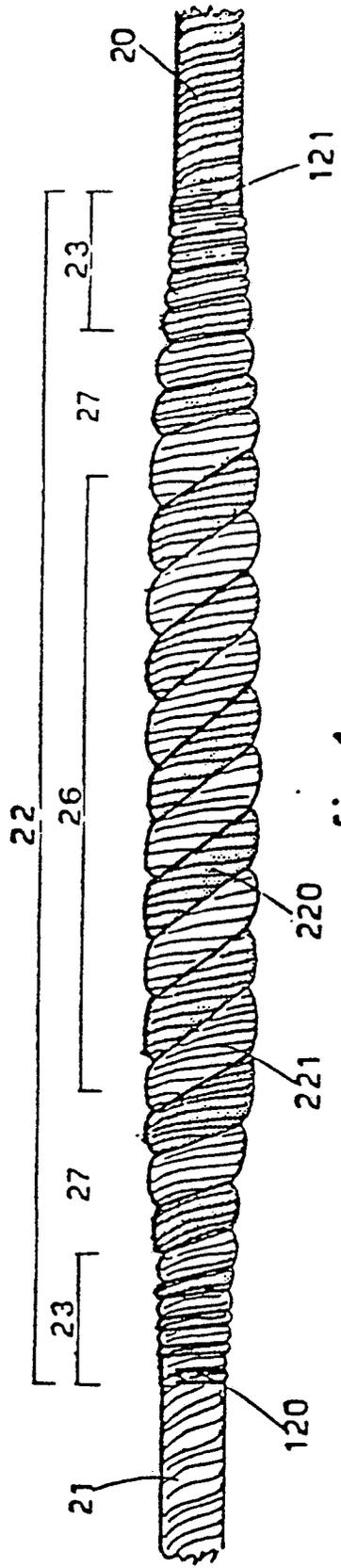


fig.1

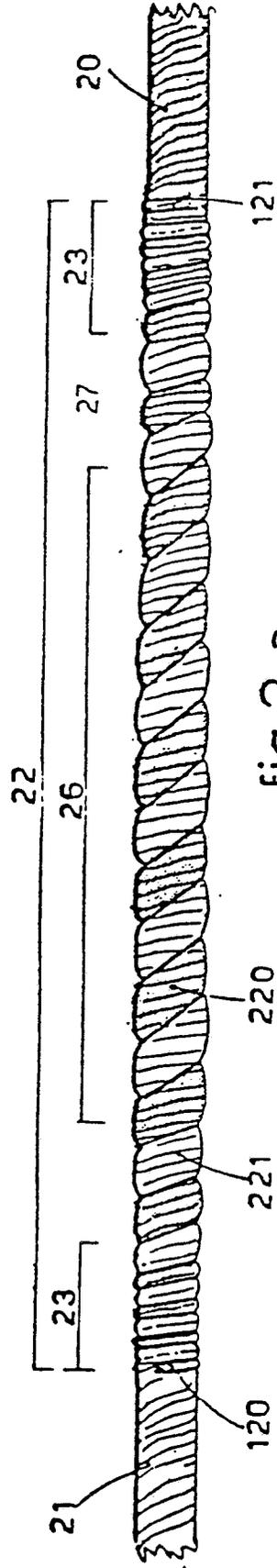


fig.2 a

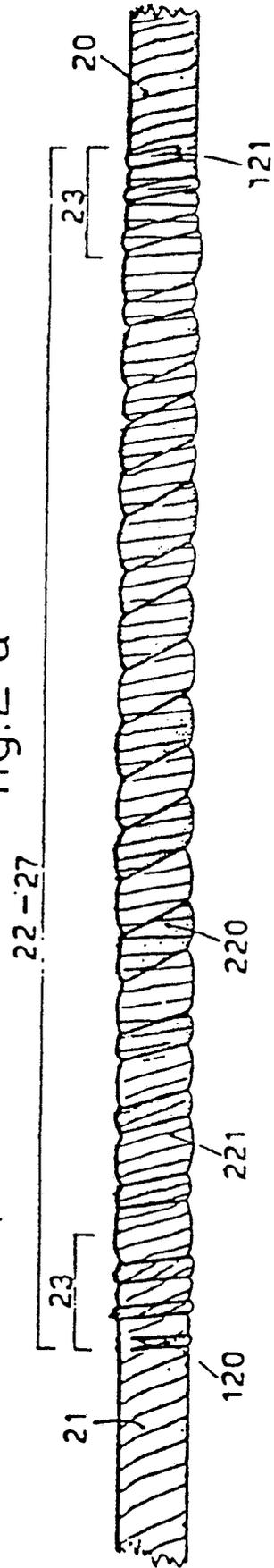


fig.2 b

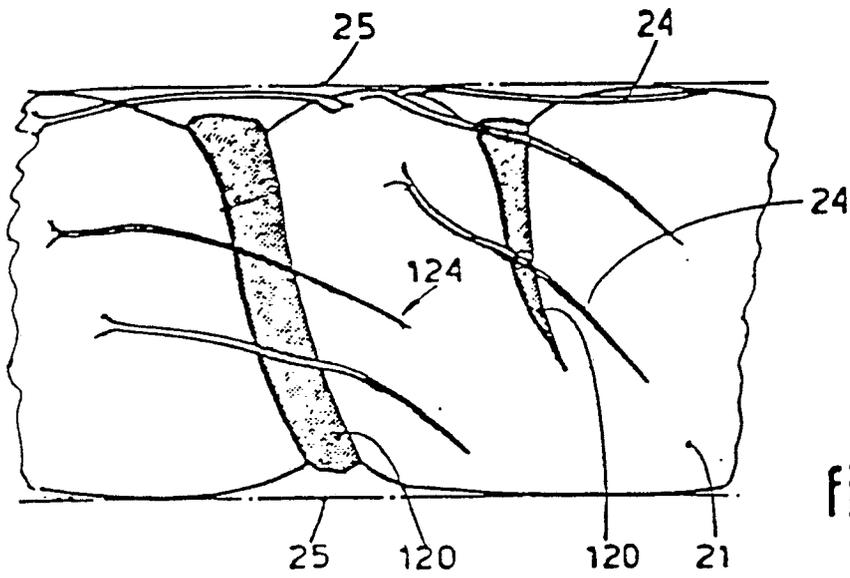


fig. 4

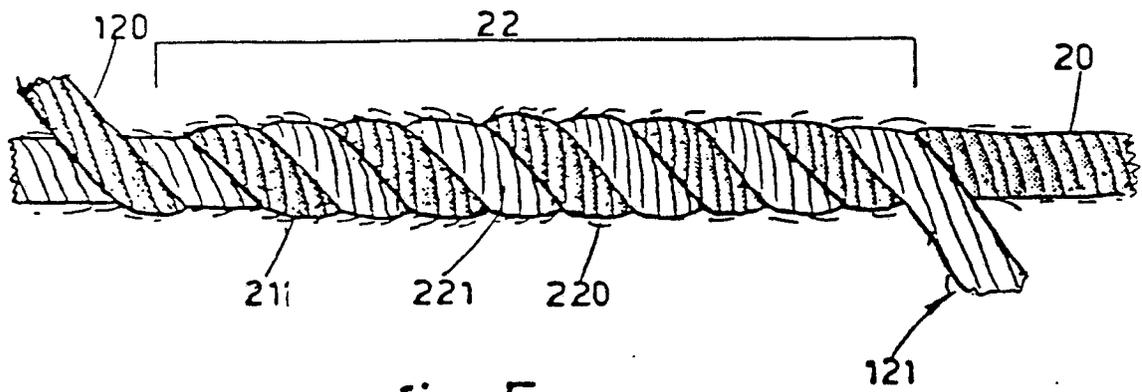


fig. 5

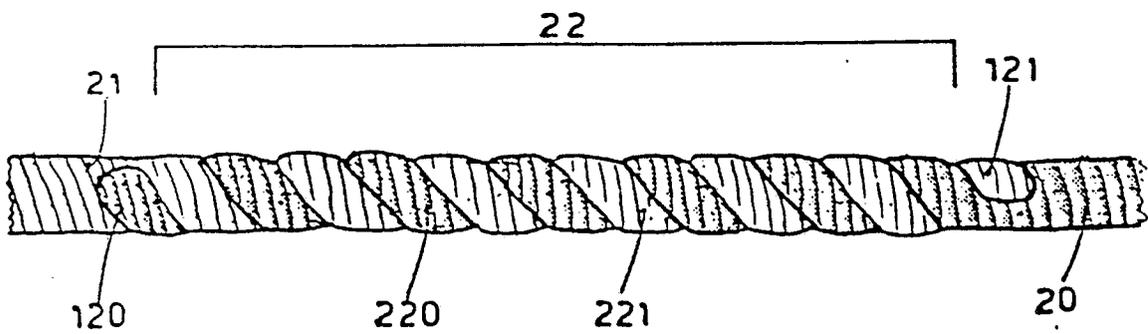


fig. 6

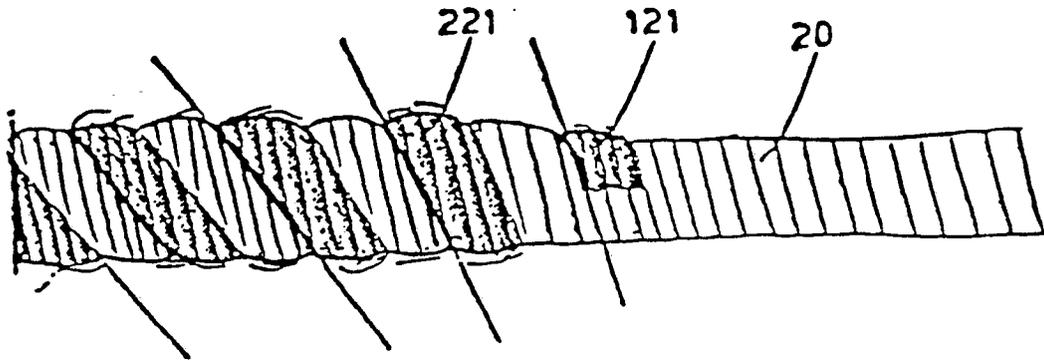


fig.7

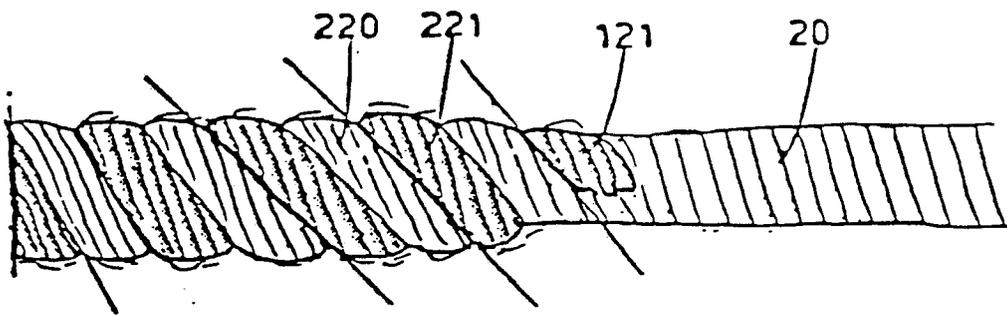


fig.8

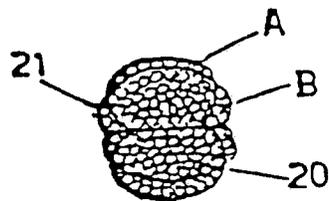


fig.3