US 20210079570A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2021/0079570 A1

Saiz (43) Pub. Date: Mar. 18, 2021

(54) **FABRIC HAVING A SHEET OF REINFORCEMENT THREADS, AND AWNING COMPRISING SAID FABRIC**

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(21) Appl. No.: **16/969,354**

(22) PCT Filed: **Feb. 21, 2019**

(86) PCT No.: **PCT/FR2019/050405**

§ 371 (c)(1),
(2) Date: **Aug. 12, 2020**

(30) **Foreign Application Priority Data**

Feb. 23, 2018 (FR) 1851595

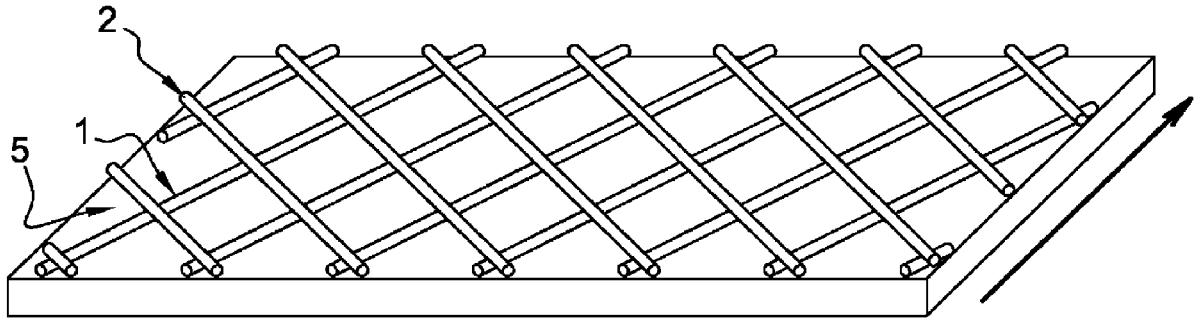
Publication Classification

(51) **Int. Cl.**
D04B 21/16 (2006.01)
E04F 10/02 (2006.01)

(52) **U.S. Cl.**
CPC ***D04B 21/165*** (2013.01); ***E04F 10/02*** (2013.01); *D10B 2505/18* (2013.01); *D10B 2403/0122* (2013.01); *D10B 2403/02412* (2013.01); *D10B 2403/0112* (2013.01)

(57) **ABSTRACT**

A fabric includes two parallel selvages, and can be wound onto itself in at least one winding direction running parallel or perpendicular to said parallel selvages. The fabric is to be kept taut and includes a support layer that has a front face and a rear face. The fabric includes at least two sheets, i.e. a first sheet and a second sheet, one of which is arranged on top of the other and which consist of reinforcement threads, said sheets being arranged on the rear face, and the reinforcement threads extending at angles of 5 to 85° relative to the winding direction, with said angles being symmetrical in relation to the winding direction.



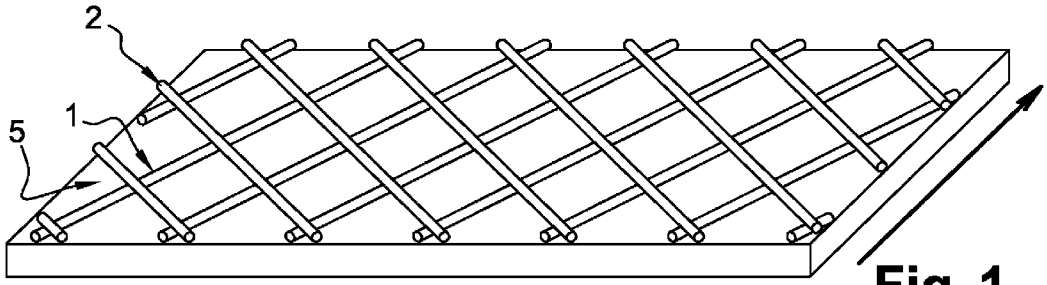


Fig. 1

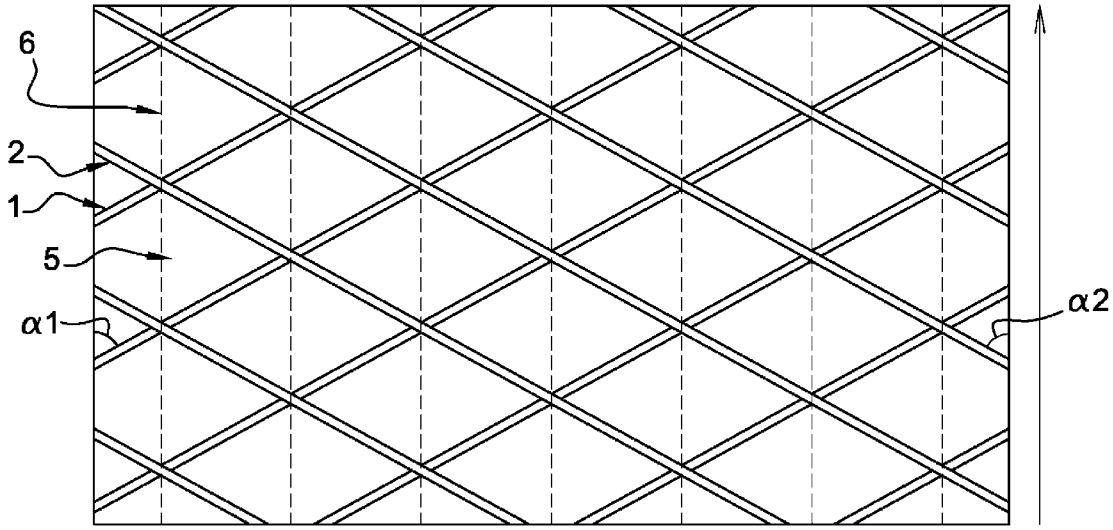


Fig. 2

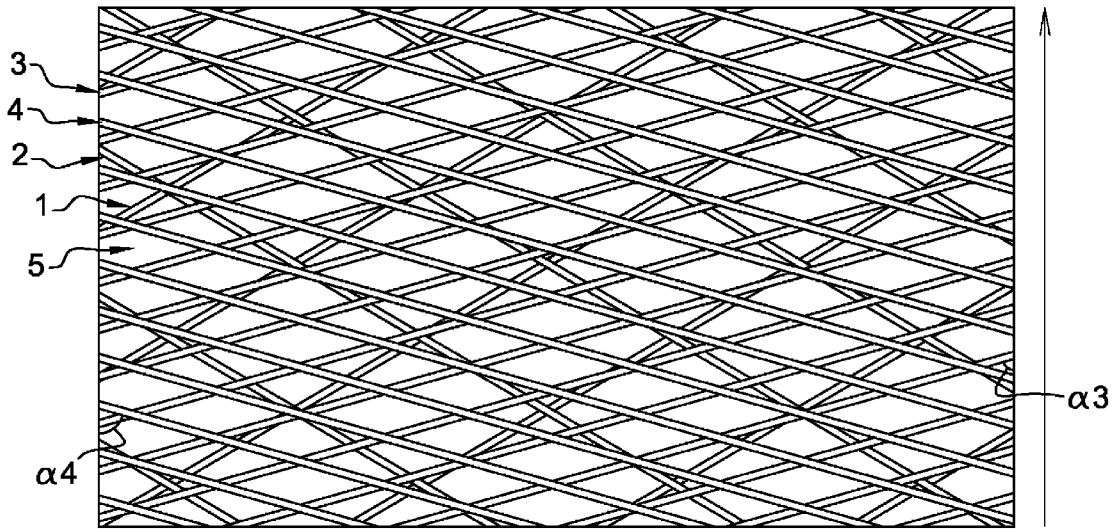


Fig. 3

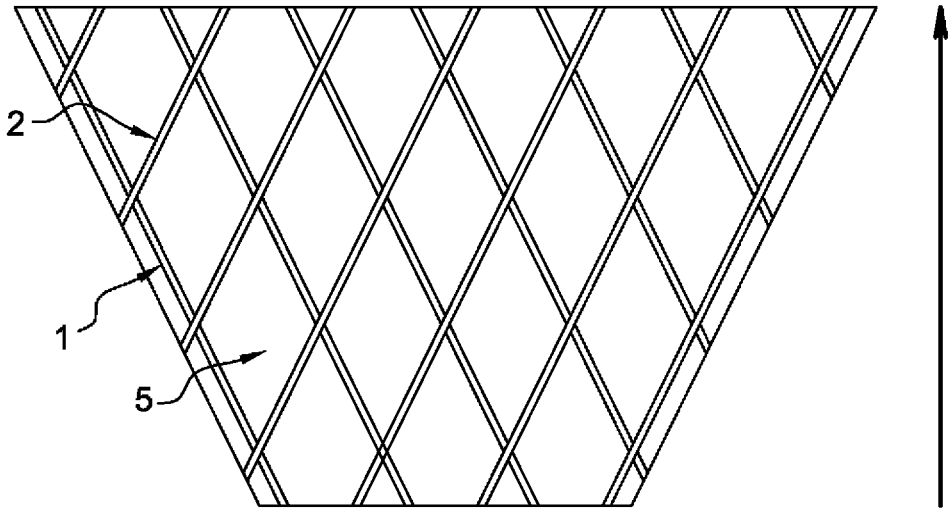


Fig. 4

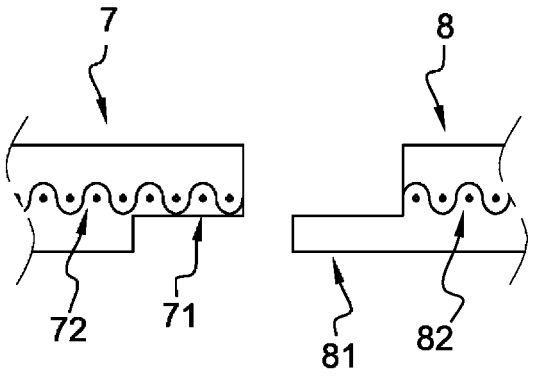


Fig. 5a

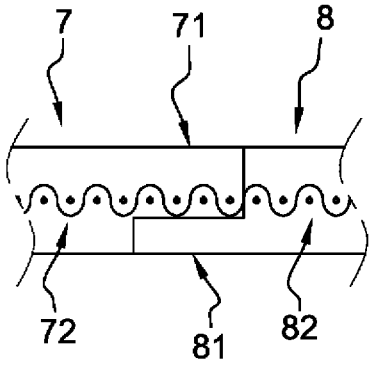


Fig. 5b

FABRIC HAVING A SHEET OF REINFORCEMENT THREADS, AND AWNING COMPRISING SAID FABRIC

FIELD OF THE INVENTION

[0001] The present invention relates to a fabric which is to be kept taut and which can be wound onto itself. In particular, the present invention relates to the field of fabrics which are to be deployed on demand, to protect a zone from the sun's rays, for example. For mechanical and aesthetic reasons, these fabrics are preferentially kept taut. More precisely, the present invention is of specific interest in fabrics produced for awnings.

BACKGROUND

[0002] The devices which are generally designated by the term "awnings" are devices which are intended to be raised on a facade or wall and which enable a shaded area to be produced by means of a taut fabric. These devices form a shelter which in particular enables individuals to protect themselves from the sun's direct rays.

[0003] More specifically, an awning presents a fabric which is deployed on demand and which can be wound on itself in order to protect the fabric if the weather conditions such as wind, rain, snow or hail demand it. To do so, the fabric is wound around a rotating axis which is connected to the facade on which the awning is raised and a load profile is installed mobile in relation to the facade to enable the fabric to be deployed or retracted if necessary.

[0004] Generally, it is known to deploy and tighten a fabric by means of a mobile load profile in sideways movement remaining parallel in relation to the facade. These profiles are also supported by arms which may be articulated or telescopic in particular, and which enable the load profile to be maintained at a predetermined height.

[0005] The two free ends of the fabric are then connected respectively to the rotating axis, on the one hand, and to the load profile, on the other hand.

[0006] However, the awnings which currently exist are equipped with a fabric which has a tendency to weaken in its central part. This weakening translates to a visible bend in the fabric. This phenomenon increases the wider and longer the fabric is.

[0007] This is detrimental as the fabric is not perfectly taut, which hinders the operation to unwind it and generates unsightly folds when the fabric is deployed again. These unsightly folds lead inter alia to additional thicknesses when the fabric is wound which may lead to rubbing phenomena which cause wear to the fabric. In particular, this phenomenon may lead to a loss of sealing of the fabric, which makes it unsuitable for its use.

[0008] There is therefore a need to obtain a fabric which may wind itself without generating any folds around an awning winding axis.

[0009] To meet this need, the Applicant has developed a fabric comprising a support layer and at least two reinforcement thread layers.

[0010] Fabrics comprising reinforcement thread layers are known. For example, American U.S. Pat. No. 4,518,640 discloses a multi-axial reinforcement composed by superimposing reinforcement thread layers which are held together by a knitting stitch or a chain stitch. This multi-axial reinforcement is rigid so as to reinforce mechanical parts for example, therefore, it cannot be wound on itself.

[0011] In addition, application PCT WO 02/090644 discloses a coated fabric. This fabric comprises a multi-axial fabric core comprising thread layers reinforced with metal, notably steel, to prevent the fabric from lacerating after coating with a blade such as a knife. This fabric core is coated with a thermoplastic such as PVC. This core does not present any dimensional hold as such, this is obtained after coating. In other words, before coating, the fabric core does not present resistance to extension in different directions without the component threads or the layer(s) separating.

SUMMARY OF THE DISCLOSURE

[0012] The invention relates to a fabric which comprises two parallel selvages, can be wound onto itself in at least one winding direction running parallel or perpendicular to said parallel selvages, is to be kept taut, comprising a support layer, with said support layer having a front face and a rear face, characterized in that the fabric comprises at least two sheets, one of which is arranged on top of the other, i.e. a first sheet and a second sheet, and which consist of reinforcement threads, said sheets being arranged on said rear face, the reinforcement threads extending at angles of 5° to 85° relative to the winding direction, said angles being symmetrical in relation to the winding direction.

[0013] The invention also relates to an awning comprising a fabric as described hereinbefore.

[0014] One benefit of the invention is that the fabric can wind on itself without generating any folds.

[0015] One benefit of the invention, when the fabric is taut, is the significant reduction in the bend in the fabric in relation to a fabric which does not contain reinforcement threads.

[0016] Another benefit of the invention is that, when used in an awning, the constraints due to winding the fabric are distributed over the whole fabric, which facilitates its winding and its deployment.

[0017] One additional benefit of the invention is the regularity of winding, there is therefore less wear, which leads to better conservation of the fabric's aesthetic quality.

[0018] The fabric according to the invention comprises a support layer. In practice, conveniently, this support layer may be a fabric, a non-woven fabric, a grille or a film. The support according to the invention presents a dimensional resistance. In particular, the support as such can be wound on itself even in the absence of reinforcement threads. In fact, the reinforcement thread sheets are integrated so as to increase the resistance to extension of the support in the favored directions. In other words, in the present invention, the reinforcement thread sheets are used to limit the support bend phenomenon and to distribute the forces applied to it when it is wound, with the support therefore presenting intrinsic dimensional resistance.

[0019] In addition, the fabric according to the invention presents a front face and a rear face. Throughout the description, the front face corresponds to the face of the support which is not covered by the reinforcement thread sheets and the rear face corresponds to the face of the support which is covered by the reinforcement thread sheets. In the specific case where the fabric is incorporated into an awning, the front face is intended to be positioned towards the sky and the rear face towards the ground. Therefore, the people who

are sheltering under the awning have the reinforcement threads in view on the rear face.

[0020] Typically, the fabric according to the invention comprises two parallel selvages and can be wound onto itself in at least one winding direction running parallel or perpendicular to said parallel selvages. In the specific case where the fabric is incorporated into an awning, the winding direction of the fabric is directed towards the facade or the wall.

[0021] In other words, in the specific case where the fabric is incorporated into an awning, the winding direction corresponds to the direction perpendicular to the winding axis. Of course, in the case where the fabric is rectangular in form, this winding axis is both perpendicular to two parallel selvages and parallel to two other parallel selvages. Typically, on exit from production, the manufactured fabric is rectangular in form and wound on itself in a direction running parallel to the two selvages which represent the lengths of the rectangular and perpendicular to the two selvages which represent the widths of the rectangle.

[0022] In accordance with the invention, the fabric comprises at least two sheets, one of which is arranged on top of the other, a first sheet and a second sheet, consisting of reinforcement threads, with said sheets being positioned on said rear face.

[0023] To connect the reinforcement threads and the support layer, the sheets consisting of reinforcement threads are advantageously sewn or glued onto the support layer. Said sheets may be connected individually or globally.

[0024] In other words, when the fabric is manufactured, the sewing or gluing may be carried out in two ways. In one case, the sheets are connected to the support layer after the positioning of each sheet, i.e. said second sheet is positioned after said first sheet has been connected to said support layer. In the second case, the two sheets are positioned on said support layer before the joint sewing or gluing step.

[0025] The reinforcement threads may be contiguous or non-contiguous. Contiguous means the case where a reinforcement thread has at least one physical contact point with at least one other reinforcement thread.

[0026] In the case where all of the reinforcement threads of the same sheet are contiguous, the amount of reinforcement threads is higher when the reinforcement threads are not all contiguous. As a consequence, when the fabric is wound, the constraints are distributed over the whole fabric, which reduces the force applied to each of the reinforcement threads. However, in this case, the weight of the fabric is higher than in the case where the reinforcement threads are not all contiguous.

[0027] The weight of the fabric according to the invention may be optimized according to the position and count of the reinforcement threads. In fact, the higher the reinforcement thread count, the fewer threads are necessary to provide the technical effect. Therefore, the more the reinforcement threads present a higher count, the more the distance between two reinforcement threads may be increased for the same reduction in bend and the same distribution of the forces applied during winding.

[0028] Typically, the reinforcement threads have a count of between 50 dtex and 1,200 dtex, conveniently between 150 dtex and 900 dtex and even more advantageously between 250 dtex and 550 dtex. The skilled artisan will be able to associate the gap and the count of the reinforcement threads to achieve the required properties.

[0029] Conveniently, a single sheet consists of distant or separated groups of contiguous reinforcement threads. In other words, the sheets may consist of distinct groups of reinforcement threads, with each group comprising for example two or three reinforcement threads and are separated from each other. This is advantageous as when the fabric is wound, the forces applied locally are distributed on the threads of the same group and the weight of the fabric is reduced in relation to the case where all of the reinforcement threads are contiguous. In addition, this characteristic enables the number of reinforcement thread deposit operations to be limited.

[0030] In fact, the overall weight of the fabric increases with the number of reinforcement threads. Therefore, the use of sheets wherein the reinforcement threads are not all contiguous enables the overall weight of the fabric to be reduced.

[0031] Therefore, conveniently, the reinforcement threads of a sheet are not all contiguous.

[0032] In the case where the groups of reinforcement threads are used, the weight may be reduced further. In fact, for the same reinforcement efficacy, threads with lower mass may be used when they are positioned by group and said groups may be spaced out from each other.

[0033] Therefore, conveniently, the reinforcement threads have a count between 280 dtex and 550 dtex.

[0034] To maximize sealing to fluids, notably rain water and condensation, but also to generate a perfectly shaded zone, i.e. to prevent the sun's rays from passing through the fabric, the fabric according to the invention is advantageously coated on said front face and/or on said rear face.

[0035] Preferably, the material used to coat the fabric is a polyurethane, an acrylic or a PVCN as plastisol, for example.

[0036] The coating layer is advantageously deposited on the fabric after said reinforcement threads are positioned. This is advantageous as in the case where the reinforcement threads are sewn holes are generated in the support layer and the coating layer enables these holes to be filled in. A coating on the rear face also enables the reinforcement threads to be blocked on the support, and to improve the tension of the support when the reinforcement threads are taut.

[0037] In a specific embodiment, the fabric is coated on the rear face after the reinforcement thread sheets are positioned, then coated a second time on at least one of the rear and front faces as described hereinbefore. The first coating enables good coating of the reinforcement thread sheets. In this specific embodiment, the first coating is carried out advantageously with polyurethane.

[0038] In accordance with the invention, said reinforcement threads form angles of between 5° and 85° with said winding direction, said angles being symmetrical to said winding direction.

[0039] These reinforcement threads enable the constraints of the fabric to be distributed across the whole fabric. Typically, when a fabric is taut the constraints applied to the fabric generate a bend towards the center of gravity of the taut fabric. Therefore, in the specific case of a rectangular-form fabric, the constraints are substantially applied to the diagonals of the rectangle and the center of the rectangle has a tendency to collapse. The angle of the reinforcement threads with the optimum winding direction depends on the form and dimensions of the fabric. The fact that the angles of the two sheets are symmetrical in relation to the winding

direction enables the constraints to be distributed homogeneously over the whole fabric and so significantly reduce the bend in the fabric.

[0040] The form of the support, and therefore the fabric, may be varied. Typically, said support is rectangular or trapezoidal in form.

[0041] In a specific embodiment, the fabric is rectangular in form.

[0042] In the case where the fabric is rectangular in form, the fabric is wound according to a winding direction parallel to the widths of the rectangle, and therefore perpendicular to the lengths of said rectangle. In this specific embodiment, the Applicant has noted that it was advantageous to position the reinforcement threads so that a reinforcement thread or group of reinforcement threads be positioned according to the two diagonals of said rectangle.

[0043] In a specific embodiment, the fabric further comprises two additional sheets of reinforcement threads, i.e. a third sheet and a fourth sheet, with said reinforcement threads extending at angles (α_3 α_4) between 5° and 85° with said winding direction, said angles being symmetrical in relation to the winding direction. This specific embodiment is advantageous as it enables the constraints applied to the reinforcement threads during winding of the fabric according to the invention to be distributed according to the progress in the winding process. In fact, in the case where the fabric is rectangular in form, the lengths present the same dimension during the winding process whereas the widths reduce. Therefore, the diagonal of the rectangle of the fabric still to be wound presents an angle which evolves in a linear fashion with the winding of the fabric. The optimum angle for the theoretical positioning of the reinforcement threads also evolves.

[0044] In another specific embodiment, the fabric is trapezoidal in form. In this case, the winding direction is perpendicular to said parallel selvages, which form a small and large base of the trapezium, and, for practical reasons, the winding axis is located on the side of the largest selvage between said two parallel selvages, in other words on the side of the large base of the trapezium. In this specific embodiment, the Applicant noted that it was advantageous to position the reinforcement threads so that one part is parallel to one of the sides of the trapezium linking the bases and another part is parallel to the other side of the trapezium linking the bases. In fact, in the case where the trapezoidal form fabric is incorporated into an awning the sides of the trapezium which link the bases have a tendency to collapse as they are not perfectly taut, therefore the reinforcement threads enable the bend to be reduced at the edge of the fabric.

[0045] Conveniently, the reinforcement thread sheets present a different reinforcement thread density between sheets. This is advantageous as, in the case where the fabric is incorporated into an awning, the effort to be provided to wind the fabric on itself depends on the progress of the winding process. Therefore, the density of the reinforcement threads on each sheet may be adapted according to the constraints applied to the fabric.

[0046] Therefore, conveniently, said sheets comprise, independently, between 2 and 8 reinforcement threads per cm.

[0047] The invention also relates to an awning comprising at least one fabric as described hereinbefore.

[0048] In the case where the awning comprises at least two fabrics as described hereinbefore, said fabrics are advantageously assembled at the rabbets by soldering the calandering. This is advantageous as no additional thickness is generated at the fabric assembly zone, it is in fact known that additional thicknesses generate tensions on the fabric at the edge of the assembly zones, which causes folds and may generate the problems quoted above.

BRIEF DESCRIPTION OF THE FIGURES

[0049] The way to practice the invention, and also the benefits which followed there from, will emerge clearly from the depiction of the following embodiments, with the support of the attached figures wherein:

[0050] FIG. **1** is a perspective view of a fabric according to one aspect of the invention;

[0051] FIGS. **2** to **4** are top views of the fabrics according to three specific cases of the invention;

[0052] FIGS. **5***a* and **5***b* are transverse cross-sections of the assembly zone of two fabrics according to the invention presenting a rabbet, shown respectively before and after assembly.

[0053] Of course, the dimensions and the proportions of the elements shown in FIGS. **1** to **5***b* may have been exaggerated in relation to reality, and have only been given in order to facilitate understanding of the invention. In FIGS. **1** to **4**, the arrow indicates the winding direction of the fabric according to the invention.

DETAILED DESCRIPTION

[0054] As shown in FIG. **1**, the fabric according to one aspect of the invention comprises a support **5**, a sheet comprising reinforcement threads **1** and a second sheet comprising reinforcement threads **2**.

[0055] The sheet comprising reinforcement threads **1** is positioned on the support layer **5** and the sheet comprising reinforcement threads **2** is positioned on the sheet comprising reinforcement threads **1**. The reinforcement threads are positioned flat. In other words, the reinforcement threads **1** define the plan of the first sheet and the reinforcement threads **2** define the plan of the second sheet. It results that the fabric depicted in FIG. **1** comprises three distinct and parallel plans, a first plan represented by the support layer, a second plan represented by the first sheet comprising reinforcement threads **1** and a third plan represented by the second sheet comprising reinforcement threads **2**.

[0056] Therefore, the reinforcement threads **1** and **2** do not present any shrinkage. The effect of this is that as soon as a constraint is applied to them, the reinforcement threads are already in a straight line and transmit their traction immediately.

[0057] FIG. **2** is a top view of the fabric according to FIG. **1** in which the sewing threads **6** have been shown.

[0058] The reinforcement threads **1** form an angle α_1 with the winding direction of the fabric, this angle α_1 is between 5° and 85°. The reinforcement threads **2** form an angle α_2 which is symmetrical to angle α_1 in relation to the winding direction. The fact that the angles α_1 and α_2 are symmetrical enables the constraints to be applied homogeneously to the fabric when it is taut or in the winding phase.

[0059] The sewing threads **6** enable the sheets comprising reinforcement threads to be connected to the support layer.

As shown in FIG. **2**, the sewing threads were sewn after the second sheet comprising reinforcement threads **2** was positioned.

[0060] As already stated, the sheets comprising reinforcement threads may be glued and not sewn, or be sewn one by one.

[0061] The specific embodiment depicted in FIG. **3** presents four sheets of reinforcement threads. In the same way as previously, the reinforcement threads **1** and the reinforcement threads **2** form respectively an angle α_1 and an angle α_2 with the winding direction of the fabric. A third and a fourth sheet comprising respectively reinforcement threads **3** and reinforcement threads **4** are positioned above the second sheet of reinforcement threads. The reinforcement threads **3** form an angle α_3 with the winding direction and the reinforcement threads **4** form an angle α_4 with the winding direction, with the angles α_3 and α_4 symmetrical in relation to the winding direction.

[0062] In the same way as in the embodiment illustrated in FIGS. **1** and **2**, the different sheets are in distinct and parallel plans.

[0063] The interest of the reinforcement threads **3** and **4** is to be able to optimize the distribution of the efforts applied to the reinforcement threads. To do so, the reinforcement threads **3** form an angle α_3 which is larger than the angle α_1. In a similar way, and due to the fact that the angles α_1 and α_2 on the one hand and the angles α_3 and α_4 on the other are symmetrical with each other, angle α_4 is larger than angle α_2.

[0064] During the fabric winding phase, the fraction located between the load bar and the winding axis, and which is taut reduces. Thereby, the forces applied to the fabric change direction as the fabric is wound. Therefore, the constraints applied evolve as the fabric is wound and the efficacy of the reinforcement threads **1** and **2** reduces. Greater demands are therefore placed on the reinforcement threads **3** and **4** and the constraint applied to the reinforcement threads **1** and **2** is reduced, which enables the effort to be distributed throughout the winding process.

[0065] The specific embodiment depicted in FIG. **4** shows the case where the fabric is trapezoidal in form. In this case, the winding direction is perpendicular to the two parallel selvages of the fabric which form the small base and the large base of the trapezium.

[0066] The other characteristics of the fabric, i.e. the symmetry of the reinforcement thread angles, and the layout on distinct plans of the reinforcement thread sheets and the support layer, are similar.

[0067] Preferably, and as shown in FIG. **4**, the reinforcement threads are tilted to be parallel to the sides of the trapezium which link the bases. This enables tension to be maintained on the lateral zones of the trapezium when the tension is applied by the load bar, which is shorter than the large base of the trapezium.

[0068] When the fabric is not wide enough to be used on its own, it is possible to assemble several fabrics. To do so, conveniently, the fabrics are assembled by rabbet, as shown in FIGS. **5***a* and **5***b* so as not to generate any additional thickness at the assembly zone.

[0069] The interest in not generating any additional thicknesses at the assembly zone is that it prevents folds from forming. In fact, as previously stated, it is known that the additional thicknesses generate tensions on the fabric at the edge of the assembly zones, which causes folds and may generate the problems quoted above.

[0070] In the embodiment as shown in FIGS. **5***a* and **5***b*, two fabrics **7** and **8** are assembled. The fabrics **7** and **8** show on at least one of their selvages an protruding part **71**, **81** over part of its thickness, on the side of the rear face or the side of the front face (FIG. **5** *a*). In practice, placing the protruding parts **71**, **81** one on top of the other enables continuity to be provided between the fabrics **7** and **8** (FIG. **5***b*). In other words, the protruding part **71** is complementary to the protruding part **81** in the thickness of fabrics **7** and **8**.

[0071] Conveniently, the protruding part **71** of the fabric **7** comprises the fabric core **72** of the fabric **7** and the protruding part **81** of the fabric **8** does not comprise the fabric core **82** of the fabric **8**. Therefore, conveniently, the protruding part **71** presents a thickness equal to approximately ⅔ of the thickness of the fabric **7** and the protruding part **81** presents a thickness equal to approximately ⅓ of the thickness of the fabric **8**.

[0072] The two fabrics **7** and **8** are assembled by placing their protruding parts **71**, **81** one on top of the other so as to coincide with the rear faces and the front faces of the fabrics **7** and **8** (FIG. **5** *b*). In practice, once the protruding parts **71**, **81** are placed one on top of the other, the two fabrics **7** and **8** are soldered therebetween.

[0073] In practice, the protruding parts **71**, **81** of the fabrics **7** and **8** may be obtained in different ways.

[0074] In a specific embodiment, the protruding parts **71**, **81** are obtained by not depositing a layer present on the rest of the surface of the sheet. In other words, during the fabric core coating phase, several elementary layers are deposited successively. One or more of these elementary layers may be absent in the characteristic strip zones. To do so, masks may be added to the coating machine to prevent the liquid PVC from some of these elementary layers from being deposited in this zone, to therefore produce a strip for which the coating layer is less thick in relation to the rest of the surface.

[0075] In another specific embodiment, the protruding parts **71**, **81** are obtained by trimming a portion of the coating layer present on the surface of the sheet. This operation enables a portion of the coating layer to be eliminated mechanically from one or more strips.

[0076] In practice, in the two preceding embodiments, the portion of cloth of the fabric **8** which is not coated on one of these faces is removed by cutting.

1. A fabric comprising two parallel selvages, which can be wound onto itself in at least one winding direction running parallel or perpendicular to said parallel selvages, to be kept taut and comprising a support layer, said support layer has a front face and a rear face, wherein the fabric includes at least a first sheet and a second sheet, one of which is arranged on top of the other and which consist of reinforcement threads, said sheets being arranged on the rear face, the reinforcement threads extending at angles of 5° to 85° relative to the winding direction, said angles being symmetrical in relation to the winding direction.

2. The fabric according to claim **1**, wherein the support layer is a fabric, a non-woven fabric, a grille or a film.

3. The fabric according to claim **1**, wherein said sheets comprising reinforcement threads are sewn or glued to said support layer.

4. The fabric according to claim **1**, wherein the reinforcement threads of a sheet are not all contiguous.

5. The fabric according to claim **1**, wherein the reinforcement threads have a count between 50 dtex and 1,200 dtex.

6. The fabric according to claim **1**, wherein the fabric is coated on said front face and/or on said rear face.

7. The fabric according to claim **1**, further comprising two additional sheets of reinforcement threads including a third sheet and a fourth sheet, with said reinforcement threads extending at angles between 5° and 85° with said winding direction, said angles being symmetrical in relation to the winding direction.

8. The fabric according to claim **1**, wherein the reinforcement thread sheets present a different reinforcement thread density between sheets.

9. The fabric according to claim **1**, wherein said sheets comprise, independently, between 2 and 8 reinforcement threads per cm.

10. The fabric according to claim **1**, wherein said support layer is rectangular or trapezoidal in form.

11. An awning comprising at least one fabric according to claim **1**.

12. An awning comprising at least two fabrics according to claim **1**, wherein said fabrics are assembled by soldering then by calandering or by rabbet.

* * * * *