

(19)



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Office européen des brevets



(11)

EP 0 976 858 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

10.10.2001 Bulletin 2001/41

(51) Int Cl.7: **D03D 23/00**

(21) Application number: **98830440.8**

(22) Date of filing: **21.07.1998**

(54) **Ribbon-like elements for making holding structures for tubular workpieces of elastomer material**

Flachbandelemente zur Herstellung einer Halterungsstruktur für rohrförmige elastomere Werkstücke

Éléments de type ruban pour la fabrication de structures de retenue pour des pièces tubulaires en élastomère

(84) Designated Contracting States:
AT DE ES FR GB IT

(43) Date of publication of application:
02.02.2000 Bulletin 2000/05

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WO-A-93/09281

EP 0 976 858 B1

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Description

[0001] The present invention relates to a ribbon-shaped element for realising structures for the containment of tubular artefacts made of elastomeric material undergoing work processes, comprising the characteristics expressed in the preamble to Claim 1.

[0002] As is well known, flexible tubular artefacts, of the type commonly used to form for instance pressurised hydraulic circuits and the like, normally comprise at least one reinforcing structure made of textile or metallic material embedded in or coated by at least one layer of elastomeric material.

[0003] The tubular artefact, normally obtained from a continuous extrusion process, is appropriately conveyed into vulcanisation station wherein the crude elastomeric material applied to the reinforcing structure reticulates while hardening, thereby forming the final product.

[0004] Before performing the vulcanisation, onto the tubular artefact is helically wound a ribbon-shaped containment structure whose task is to contain and stabilise the crude elastomeric material during the work processes.

[0005] This containment action is particularly important when the tube is in the vulcanisation station, since the crude elastomeric material, being by its nature malleable, presents quite a high degree of softness which increases at the start of the vulcanisation phase because of the heating it undergoes. The ribbon-shaped containment structure applied on the tubular artefact thus prevents the crude elastomeric material from decomposing and jeopardising the structural integrity of the artefact itself.

[0006] In particular, the ribbon-shaped containment structure comprises a series of ribbon-shaped elements coupled to each other consecutively in correspondence with respective ends mutually overlaid and sown together to guarantee the continuity of the ribbon-shaped structure.

[0007] Each ribbon-shaped element in turn comprises a plurality of warp threads enmeshed with at least one woof thread positioned according to alternate transverse first and second sections arranged consecutively, to form a reticular structure.

[0008] The reticular structure generated by the enmeshing of the warp threads with the sections of woof thread normally presents discontinuous surfaces due to a difference in count existing between the warp threads and the woof threads. The warp threads generally present a greater count than the woof thread, for they must directly withstand the traction whereto the ribbon structure is subjected when it is wound around the tubular artefact.

[0009] The count of the warp thread may for instance have a value of the order of 235 dTex, whereas the count of the woof thread can be of 110 dTex.

[0010] A ribbon shaped element similar to the one cit-

ed above is disclosed on the document US 4688598 A.

[0011] The ribbon-shaped elements coupled as stated above by means of appropriate seams effected on the overlaid ends give rise to considerable problems.

[0012] A first problem is given by the fact that the seam makes on the crude elastomeric element an impression which alters the structural characteristics of the tubular artefact, thereby lowering its quality and causing it to be downgraded.

[0013] It should also be considered that each seam determines a localised weakening of the reticular structure of the ribbon-shaped element generating such structural discontinuities that, in correspondence with the seam areas, the containment structure is more prone to breakages and/or tears in the ribbon-shaped elements themselves.

[0014] It should further be noted that the operations whereby a ribbon is joined to the other determine a rise in manufacturing costs, due to the employment of manpower tasked solely with effecting the seams.

[0015] The Applicant has also noted that it is possible to effect the junction of the ribbon-shaped elements by means of ultrasonic welding. Ultrasonic welded ribbon-shaped elements are shown on the documents US 3901749 A and US 5 223 070 A. However state of the art ribbon-shaped elements are not suited to be effectively joined according to the purposes aimed by the invention.

[0016] The object of the present invention is essentially to overcome the drawbacks of the prior art, by means of a ribbon-shaped element so structured as to allow it to be optimally joined with other identical ribbon-shaped elements, through ultrasonic welding, in such a way that the containment structure withstands traction stresses effectively when being wound around the tubular artefact, and at the same time it avoids altering the structure of the crude elastomeric material with any impressions.

[0017] A further aim of the invention is to reduce the manufacturing costs of the tubular artefacts of the kind described, definitively eliminating the sewing operations mandatorily present in the prior art and reducing the manufacturing costs of the ribbon-shaped elements.

[0018] These aims and others besides, which shall become more readily apparent in the course of the present description, are reached by a ribbon-shaped elements for realising structures for the containment of tubular artefacts made of elastomeric material undergoing work processes, comprising the characteristics expressed in the characterising part of Claim 1.

[0019] Additional features and advantages shall become more readily apparent from the detailed description of at least one preferred, but not exclusive, embodiment of a ribbon-shaped element for realising structures for the containment of tubular artefacts made of elastomeric material undergoing work processes, according to the present invention. The description shall be made hereafter with reference to the accompanying

drawings, provided purely by way of non-limiting indication, whose sole figure shows a structural diagram of a ribbon-shaped element according to the invention.

[0020] With reference to the aforementioned figure, the number 1 indicates in its entirety a ribbon-shaped element for realising structures for the containment of tubular artefacts made of elastomeric material.

[0021] The ribbon-shaped element 1 comprises a plurality of warp threads 2 made of synthetic material interwoven with at least one woof thread 3 made of synthetic material to form therewith a reticular structure 4. The woof thread 3 is usually arranged according to consecutive woofs 3a, each formed by a first section 5 and a second section 6 extending transversely to the warp threads 2 according to alternating directions.

[0022] More specifically, the warp threads 2 are arranged according to a density essentially equal to the density according to which the first 5 and second 6 sections are arranged. The density of the warp threads 2 ranges preferably between 30 and 40 threads/cm given that, if warp threads 2 were used with a lesser density than the minimum value indicated above, the ribbon-shaped element would have poor resistance, and hence be quite fragile with respect to static and/or dynamic loads. On the other hand, should the maximum recommended limit be exceeded, one would have a ribbon-shaped element 1 able to withstand static and/or dynamic loads, but also presenting excess material impacting on manufacturing costs as well as the flexibility and handiness of the ribbon-shaped element for purposes of its winding onto the tubular artefact undergoing work processes.

[0023] The warp threads 2 also present the same count as the woof thread 3, thereby rendering the reticular structure 4 of the ribbon-shaped element 1 compact and uniform. In particular, the count of the warp threads 2, like that of the woof thread 3, preferably ranges from 100 to 250 dTex and it is advisable to use, both as warp and as woof threads, heavy duty 6.6 nylon threads, with breaking limit preferably no lower than 7g/Tex.

[0024] The uniformity of the reticular structure 4 of the ribbon-shaped element 1 confers thereto the possibility of being welded effectively to another identical ribbon-shaped element through ultrasonic welding.

[0025] Ultrasonic welding can be performed positioning one end of a first ribbon-shaped element 1 to overlay one end of a second ribbon-shaped element 1. The two ends are pressed against each other with a pre-set pressure and are simultaneously exposed to ultrasonic waves produced by known apparatuses such as sonotrodes.

[0026] During the exposure of the ribbon-shaped elements 1 to the action of the ultrasounds, as an effect of the mechanical vibrations generated thereby, such a quantity of heat develops due to mechanical friction as to induce localised fusion and the consequent welding of the surfaces of the ribbon-shaped element 1 in mutual contact.

[0027] The ribbon-shaped element 1 according to the present invention attains the proposed aims.

[0028] The structure of the ribbon-shaped elements described above, thanks to the equality in the density and count of the warp and of the woof, entails considerable advantages. A homogeneous and uniform structure such as the one obtainable according to the invention allows to optimise the union of the ribbon-shaped elements by means of ultrasound welding. In particular, the ribbon-shaped element realised according to the invention presents essentially smooth surfaces, free of discontinuities deriving from the enmeshing of warp and woof threads having different counts. This circumstance allows to increase the contact area between the mutual junction surfaces of the ribbon-shaped elements, and to exploit the potential of ultrasonic welding to the utmost.

[0029] It should further be considered that the ability to couple the ribbon-shaped elements by means of ultrasonic welds determines a considerable decrease in the manufacturing costs closely linked to the use of manpower tasked solely with effecting the seams.

[0030] The coupling according to the preceding description completely eliminates the structural alterations generated by the seams, obtaining a tough coupling, effectively resistant to stresses, even when the overlay area between the ribbons presents an extremely reduced width. This allows considerably to reduce woof density and, above all, warp density, thereby lightening the ribbon-shaped elements, reducing their manufacturing costs and increasing their handiness and flexibility, thus facilitating their winding around the tubular artefacts, unlike prior art ribbons which were over-dimensioned to withstand the localised weakening due to the structural alterations that the seams entailed.

[0031] It should also be noted that, having eliminated the junction seams between a ribbon-shaped element and the other and having minimised the width of the overlapping areas therebetween, the containment structures thus composed leave no impressions on the crude elastomeric material.

Claims

1. Ribbon-shaped element for realising structures for the containment of tubular artefacts made of elastomeric material undergoing work processes, comprising:
 - a plurality of warp threads (2) made of synthetic material;
 - at least one woof thread (3) made of synthetic material and presenting first sections (5) and second sections (6) alternatively consecutive and arranged transversely with respect to the warp threads (2) engaging the latter to form an interwoven structure,

characterised in that:

the warp threads (2) present the same count as said at least one woof thread (3), the count of the warp threads (2) and of said at least one woof thread (3) ranges between 100 and 250 dTex;

the warp threads (2) are arranged according to a density that is equal to the density according to which the first (5) and second (6) sections of said at least one warp thread (3) are distributed; the density of the warp threads (2) ranges between 30 and 40 threads per cm; said warp threads (2) and said at least one woof thread (3) are made of heavy-duty 6.6 nylon with breaking limit exceeding 7g/dTex; said ribbon-shaped element is suitable to be coupled with an identical ribbon-shaped element (1) by means of ultrasonic welding effected on respective overlaid ends

2. Ribbon-shaped containment structure realised from a plurality of ribbon-shaped elements according to claim 1 consecutively coupled by means of ultrasonic welding effected on respective mutually overlaid ends.

Patentansprüche

1. Bandförmiges Element zur Herstellung von Strukturen zur Aufnahme von rohrförmigen Werkstücken aus Elastomer, umfassend:

- eine Vielzahl von Kettfäden (2) aus Kunststoff;
- mindestens einen Schussfaden (3) aus Kunststoff, der erste Abschnitte (5) und zweite Abschnitte (6) aufweist, die wechselweise nacheinanderfolgend und quer zu den Kettfäden (2) angeordnet sind, indem sie diese letzteren zur Bildung einer geflochtenen Struktur ergreifen,

dadurch gekennzeichnet, dass:

- die Kettfäden (2) dieselbe Feinheit mindestens eines Schussfadens (3) aufweisen, wobei die Feinheit der Kettfäden (2) und des mindestens einen Schussfadens (3) zwischen 100 und 250 dTex liegt;
- die Kettfäden (2) gemäß einer Dichte gleich der Dichte angeordnet sind, gemäß welcher der erste (5) und der zweite Abschnitt (6) des mindestens einen Schussfadens (3) verteilt sind;
- die Dichte der Kettfäden (2) zwischen 30 und 50 Fäden pro cm liegt;
- die Kettfäden (2) und mindestens der eine Schussfaden (3) aus Nylon 6.6 mit hoher Festigkeit mit einer Reißgrenze größer als 7 g/

dTex sind;

- das bandförmige Element geeignet ist, mit einem identischen, bandförmigen Element (1) durch Ultraschallschweißen verbunden zu werden, das an den entsprechenden überlappenden Enden durchgeführt wird.

2. Bandförmige Aufnahmestruktur, hergestellt durch eine Vielzahl von bandförmigen Elementen nach Anspruch 1, die nacheinander durch Ultraschallschweißungen verbunden werden, die an den entsprechenden überlappenden Enden durchgeführt werden.

Revendications

1. Élément de type ruban pour la fabrication de structures de retenue pour des pièces tubulaires en élastomère, comprenant:

- une pluralité de fils de chaîne (2) de matière synthétique;
- au moins un fil de trame (3) réalisé en matière synthétique et présentant des premiers morceaux (5) et des deuxièmes morceaux (6) qui se succèdent alternativement et sont disposés transversaux par rapport aux fils de chaîne (2), engageant ces derniers de manière à former une structure entrelacée, **caractérisé en ce que:**

- les fils de chaîne (2) présentent le même titre que ledit au moins un fil de trame (3);
- le titre des fils de chaîne (2) et dudit au moins un fil de trame (3) se situe entre 100 et 250 dTex;
- les fils de chaîne (2) sont arrangés suivant une densité qui est égale à la densité suivant laquelle sont distribués les premiers (5) et deuxièmes (6) morceaux dudit au moins un fil de trame (3);
- la densité des fils de chaîne (2) se situe entre 30 et 40 fils par cm;
- lesdits fils de chaîne (2) et ledit au moins un fil de trame (3) sont réalisés en nylon 6.6 de grande résistance ayant une limite de rupture supérieure à 7 g/dTex;
- ledit élément de type ruban est apte à être accouplé à un élément de type ruban identique (1), par soudage par ultra-sons effectué, sur des extrémités respectives superposées.

2. Structure de retenue de type ruban réalisée à partir d'une pluralité d'éléments de type ruban suivant la revendication 1 accouplés d'une façon consécutive par soudage par ultra-sons effectué sur des extrémités respectives réciproquement superposées.

