(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 537 970 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.12.2012 Bulletin 2012/52

(51) Int Cl.:
D06C 21/00 *(2006.01)*

(21) Application number: **11171330.1**

(22) Date of filing: **24.06.2011**

(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
Designated Extension States:
BA ME

(71) Applicant: **Heimbach GmbH & Co. KG**
52353 Düren (DE)

(72) Inventor: **Rava, Sergio**
22010 Ossuccio (CO) (IT)

(74) Representative: **Albrecht, Ralf**
Paul & Albrecht
Patentanwaltssozietät
Hellersbergstrasse 18
41460 Neuss (DE)

Remarks:
A request for correction of the description and claims 8 and 12 has been filed pursuant to Rule 139 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) Compacting felt for machines for rendering textiles shrinkproof

(57) The present invention relates to a compacting felt (3) for machines for rendering textiles shrinkproof (1), the felt (3) having a base layer (6) at a machine side (M) and a batt fiber layer (10, 11) provided on said base layer (6) at a product side (P), whereas the compacting felt (3) is characterized in that the base layer is formed by a wire link belt (6). This invention also relates to a machine for rendering textiles shrinkproof (1) with a compacting felt (3).

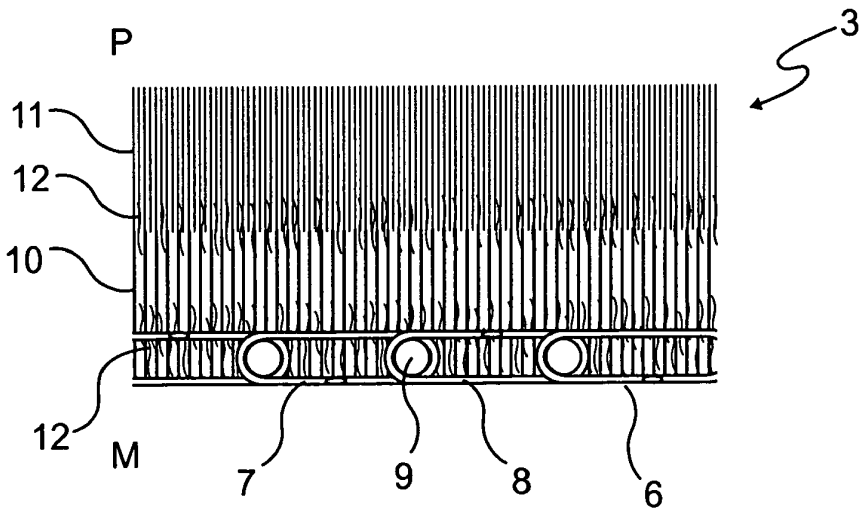

Fig. 2

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Description

[0001] The present invention relates to a compacting felt for machines for rendering textiles shrinkproof, the felt having a base layer at a machine side and a batt fiber layer provided on said base layer at a product side. This invention also relates to a machine for rendering textiles shrinkproof using such a compacting felt.

[0002] Compacting felts of the before mentioned kind are typically used in the manufacturing of textiles to render these materials, such as knitted fabrics, shrinkproof. Materials treated by such methods remain shrinkproof during the first washing process. From US 5,233,733 B, a sheet material shrinking apparatus for that purpose is known. The apparatus has an endless belt which is mounted on rotatable cylinders and disposed against a shrinkage cylinder. The belt comprises an inward and an outward elastomer layer having different elasticity properties.

[0003] Besides these elastomer belts, compacting felts are often used on such machines, as the felt surface is more even and has better compacting capabilities. The compacting felts are usually relatively thick. Typical values range from about 15 to 25 mm in thickness. The felt layer usually consists of organic polymer materials, especially polyamide, polyester or aramid fibers. The physical resistance of compacting felts needs to be very high, as the felts are mounted on machines having several rolls or cylinders with different and in particular very small diameters so that a compacting felt is stretched and compressed alternatingly by the bending process imposed from the wrapping around the several rolls or cylinders due to the thickness of the felt. The stretching and compressing of the felt may lead in particular on its product side surface to a loss of consistency and smoothness with increasing operating time. These wear effects of the product side surface can lead to marking problems on the processed cloth's surface. Besides that, cracks may occur in the compacting felt which limit the service lifetime.

[0004] A compacting felt of the before mentioned type is recited in EP 1 941 092 B1, comprising a synthetic polymeric resin base layer which is woven or knitted with synthetic polymeric resin yarns to a machine-side of the compacting felt. A second elastic base layer is woven with elastic yarns adjacent to a product forming side of the compacting felt, whereas a first and second batt layer are provided on each of the machine and the product forming side of the compacting felt, respectively. Both batt layers are fixed to the polymeric base layer of the machine-side and the elastic base layer of the product forming side by a needling process.

[0005] A disadvantage of such a compacting felt may be seen in that its build-up is quite complicated due to the use of two different base layers, which are however required for a sufficient stability. Another disadvantage is caused by that the machine side is also provided with a batt layer to protect the machine side base layer from direct contact with the rolls or cylinders of the machine. However, this additional batt fiber layer increases the distance of the base layers from the machine roll or cylinder around which the compacting felt is wound. Because the base layers represent the joint layer to which the product-side batt fibers are connected, a larger distance of the joint layer from the machine roll or cylinder reduces the stretching and compacting of the respective product-side batt layer.

[0006] Another compacting felt is known from US 6,479,414 B1. The compacting felt recited therein has a multilayer build-up having at least one ground textile, a felt layer stitched thereon and an elastic knit fabric attached to the surface region of the felt layer. It may however be found disadvantageous that the elastic knit fabric may limit the elastic behaviour of the felt layer, i.e. the compression and extension ratio caused by winding over the textile machine rolls or cylinders. This limitation reduces the textile compacting efficiency of such a felt.

[0007] It is an object of the present invention to allocate a compacting felt of the before-mentioned type which has on the one hand a relatively long service lifetime and on the other hand a product side with good compacting capabilities.

[0008] This object has been solved with a compacting felt for machines for rendering textiles shrinkproof, the felt having a base layer at a machine side and a batt fiber layer provided on said base layer at a product side, whereas the compacting felt is characterized in that the base layer is formed by a wire link belt.

[0009] The research work which has led to the present invention has revealed that by using a wire link belt as the base layer, a compacting felt can be constructed which may withstand bending and stretching imposed on the felt in a textile compacting machine. Further, a wire link belt has a high physical resistance so that on the machine side of the compacting felt, no additional protection layer is required. As set out above, the wire link belt represents the joint layer for the batt fiber layer provided thereon. Because the base layer of the inventive compacting felt can be in direct contact with the rolls or cylinders of the compacting machine, the batt layer has a higher compacting efficiency.

[0010] The thickness of the wire link belt and the batt fiber layer may vary in wide ranges. Typically, a suitable wire link belt has a thickness ranging from 0.8 to 5 mm, in particular between 1.0 and 4.0 mm, especially from 1.5 to 2.5 mm. The density of the wire link belt can range from 1100 to 1500 g/m^2, in particular from 1200 to 1400 g/cm^2.

[0011] Regarding the batt fiber layer, its overall thickness may range for example from 6 to 40 mm, especially from 8 to 30 mm.

[0012] The wire link belt to be used for the inventive compacting felt preferably comprises a multiplicity of partly overlapping loops that define connecting channels through which at least one pintle wire is inserted respectively for interlocking the loops with each other. Such a

wire link belt has a high dimensional stability combined with a high bending flexibility, so that it can be wound around rolls or cylinders with relatively small diameters without being damaged.

[0013] According to a preferred embodiment of the inventive compacting felt, the loops are formed by helically wound wires. The loops may be composed of monofilament wires being alternatingly left and right wound around parallel spaced pintle wires. The width of the helices in the machine direction, i.e. the longitudinal extension of the felt can be for example from 3 to 7 mm measured at the outside of the helices, just to give an example. A smaller helix diameter improves the flexibility of the wire link belt regarding the possible bending angles over rolls or cylinders with smaller diameters. This leads to a more intense spreading of the fibers of the batt fiber layers.

[0014] Alternatively, the wire link belt can be formed by partly overlapping single ring elements, whereas pintle wires extend through the overlapping areas between adjacent ring elements. Such a wire link belt is for example described in EP 0.763 623 A1, which disclosure is incorporated herewith by reference.

[0015] The wire link belt can comprise or consist of polymeric or metallic materials or mixtures of them, for example. Preferably, the loops of the wire link belt are composed of monofilament wires of a synthetic polymer, which is in particular chosen from the group comprising polyesters, polyphenylenesulfide (PPS), polyamide or copolymers or blends thereof. In case the wire link belt contains polymeric materials, the wire link belt or the compacting felt, i.e. the wire link belt with the batt fiber layer, is pretreated by a thermosetting step prior to its use. This ensures the dimensional stability of the compacting felt.

[0016] According to a further preferred embodiment, the machine side of the felt is formed mostly by the wire link belt. In other words, according to this embodiment, the machine side of the wire link belt is not covered by an additional fiber layer. This has the advantage that the wire link belt as the joint layer of the compacting felt gets into direct contact with the rolls or cylinders of the textile compacting machine. As a result of this, the batt fiber layer undergoes stretching and compressing movements at a higher degree so that the compacting step of the textiles to be processed is more effective.

[0017] This embodiment does explicitly not exclude that some fibers may protrude the machine side of the wire link belt. This can occur, for example, if fibers from the product side batt fiber layer are penetrated through the wire link belt by a needling process to fix the batt fiber layer to the wire link belt.

[0018] According to a further embodiment of this invention, the machine side of wire link belt is provided with a surface treatment, especially to improve the grip to rolls or cylinders of a compacting machine, on which the felt is used. The surface treatment is in particular a silicone impregnation, for example by a coating with silicone E50 white and a solvent. This coating mixture can be applied as 40 to 50 wt. -% silicone E50 white and 60 to 50 wt . -% of a suitable solvent. The application can be carried out in any suitable way, like dip coating, spray coating, brushing or the like.

[0019] The batt fiber layer may comprise or consist of synthetic polymer fibers, especially staple fibers, whereas polyester, polyamide and/or aramid staple fibers are preferred.

[0020] According to a further preferred embodiment of this invention, the batt fiber layer comprises at least two superimposed batt fiber layers, being in particular made from different materials. This is advantageous because the two or more superimposed batt fiber layers may fulfill different functions in the compacting felt. For example, the inner batt fiber layer adjacent to the wire link belt may comprise or consist of polyester and/or polyamide staple fibers. Such a layer has excellent elastic properties with respect to the stretching and compacting movements of the compacting felt. Furthermore, these materials are cost-effective. The superimposed batt fiber layers typically cover each other completely.

[0021] If a mixture of polyester and polyamide staple fibers is used, the ratio between polyester and polyamide fibers may preferably range from 30 : 70 to 70 : 30 wt. -%, in particular from 40 : 60 to 60 : 40 wt. -%, preferably about 50 : 50 wt. -%.

[0022] It is further preferred that the outer batt fiber layer comprises or consists of aramid staple fibers. The provision of such a batt fiber layer may increase the production lifetime of the inventive compacting felt and further allows to provide a very smooth product side in order to avoid marking problems on the textiles to be processed with the inventive compacting felt. Besides that, the aramid fibers increase the resistance of the outer batt fiber layer to heat and hydrolysis.

[0023] The batt fiber layer or, if more than one batt fiber layer is present, at least the product side batt fiber layer may be provided with a surface treatment. Such a surface treatment may include but is not limited to an anti-adhesion coating, like a silcone- or PTFE-impregnation, a grinding of the surface, or combinations thereof. Such a surface treatment may further increase the service lifetime of the compacting felt as well as its surface smoothness. On the other hand, grinding the surface increases the capability of the belt to catch the fibers of the fabrics to be compacted and thus improve the shrinking characteristics. This may be explained by that the grinding cuts off the top of the fibers of the outer batt fiber layer so that these fibers are less linked to the top part. When the belt is turned over the rolls, these fibers may open up at a higher degree.

[0024] It is further preferred according to this invention that the inner batt fiber layer extends at least partly into the wire link belt. This is advantageous because the coherence between the wire link belt and the inner batt fiber layer is increased. Further, the dead volume inside the windings of the wire link belt is at least partly filled with the inner batt fiber layer so that less air is transported by

a rotating wire link belt. This helps to increase the running stability of the inventive compacting felt and also reduces the airflow which is caused by air being transported in the dead volume of the wire link belt.

[0025] In such an embodiment, the inner batt fiber layer may protrude at the product side of the wire link belt by at least 4.0 mm, in particular by at least 6.0 mm. The inner batt fiber layer may have a total thickness of at least 6.0 mm, in particular at least 8.0 mm. Inner batt fiber layers of such thicknesses are advantageous because they contribute to the overall thickness of the compacting felt calculated from the surface of the wire link belt which increases the overall compacting capabilities of the compacting felt of this invention.

[0026] Regarding the outer batt fiber layer, the thickness may vary in wide ranges as well, whereas a thickness of at least 6.0 mm, in particular at least 8.0 mm is preferred.

[0027] For both inner and outer batt fiber layers the thickness is in principal not limited but is typically 20.0 mm or less.

[0028] In a further preferred embodiment of this invention, the inner batt fiber layer has a density of 3800 - 4200 g/ m^2, in particular of 3900 - 4100 g/ m^2. The inner batt fiber layer is typically produced from several batt layers by needling, which may have a pre-needled weight of 100 to 130 g/m^2.

[0029] The fibers of the inner batt fiber layer may have a fiber fineness of 6 to 17 dtex for example. The fiber length may vary from 60 to 120 mm and the thickness from 6 to 10 mm, for example.

[0030] The outer batt fiber layer preferably has a density of 2800 - 3200 g/ m^2, in particular of 2900 - 3100 g/ m^2. The outer batt fiber layer is typically produced from several batt layers by needling, which may have a pre-needled weight of 100 to 130 g/m^2.

[0031] The fibers of the outer batt fiber layer may have a fiber fineness of 4 to 7 dtex for example. The fiber length may vary from 50 to 100 mm, especially from 70 to 80 mm and the thickness from 6 to 8 mm, for example.

[0032] These densities and other characteristics of the inner and outer batt fiber layers are especially preferred, because the compacting felts with such batt fiber layers combine long service lifetime with good compacting capabilities and smooth product side surfaces which lead to high quality shrinkproof textiles. Furthermore, the high density of the batt fiber layers prevents that the characteristics of the compacting felt significantly changes over its lifecycle. This ensures a continuously relatively unchanged product quality. The final weight of the inventive felt may especially range from 8.000 to 8.500 g/m^2.

[0033] Although the batt fiber layer may be fixed to the wire link belt by any possible means, it is preferred that the batt fiber layer is needled to the wire link belt. In case that two batt fiber layers are superimposed, the inner and outer batt fiber layer may be needled to the wire link belt. It is however preferred that the inner batt fiber layer is needled to the wire link belt, whereas the outer batt fiber layer is needled to the inner batt fiber layer. If more than two batt fiber layers are present, it is preferred that each layer is needled to its adjacent layers with the exception of the inner batt fiber layer, which is needled to the wire link belt. This fixation method is preferred because it leads to a stronger coherence between the wire link belt and the batt fiber layer, in particular with the inner batt fiber layer as well as between the several batt fiber layers.

[0034] The present invention further relates to a machine for rendering textiles shrinkproof which is characterized in that a compacting felt according to this invention is used.

[0035] In the following, this invention is described in more detail by means of the examples shown in the figures. They show in

Figure 1 a schematic presentation of a textile compacting machine,

Figure 2 a sectional view of the inventive compacting felt and

Figure 3 a schematic picture of the layer build-up of an inventive compacting felt in top-view.

[0036] In figure 1, a schematic picture of a machine 1 for rendering textiles 2 shrinkproof is shown. The machine 1 comprises calenders A, B, each consisting of a compacting felt 3 which is wound around a cylinder arrangement comprising three small cylinders 4 and a larger diameter cylinder 5.

[0037] During operation, the textile 2 is fed into the machine 1 in a direction as indicated by an arrow. The compacting felt 3 of the first calender A is rotated as indicated by an arrow. The small diameter of the cylinder 4 urges the compacting felt 3 to extend at its surface. The maximum extension is reached at the point E. The textile 2 is taken over by the compacting felt 3 and led over the surface of the heated cylinder 5 while passing a point of compression C, in which the compacting felt 3 is bent into the opposite direction, thus compressing its surface and compacting the textile 2. In the following, the same procedure takes place in the second calender B, in which the textile 2 is compressed from its other surface so that a shrinkproof textile 2 is yielded.

[0038] Figure 2 shows a cross-sectional view of the inventive compacting felt 3. The compacting felt 3 has a base layer at a machine side in the form of a wire link belt 6, which comprises a multiplicity of partly overlapping helically wound monofilament polyester wires 7, 8. Adjacent overlapping wires 7, 8 define connecting channels through which a polyester pintle wire 9 is inserted for interlocking the helically wound wires 7, 8. The width of the helices in the machine direction, i.e. the longitudinal extension of the felt is 5.2 mm measured at the outside and 2.9 mm measured on the inner side of the helices.

[0039] The wire link belt 6 is provided on its product side P with two superimposed batt fiber layers 10, 11,

from which the inner batt fiber layer 10 adjacent to the wire link belt 6 consists of polyester staple fibres and wherein the outer batt fiber layer 11 consists of aramid staple fibers. The inner batt fiber layer 10 extends into the wire link belt 6 and protrudes at the product side P by 8.0 mm. The thickness of the outer batt fiber layer 11 is 8.0 mm and the thickness of the wire link belt 6 is 2.0 mm, so that the overall thickness of the compacting felt is about 18 mm.

[0040] Each of the inner and outer batt fiber layers 10, 11 are produced from several batt layers by needling. In both cases, the pre-needled weight of the fiber batts ranges from 100 to 130 g/m^2. The inner and outer batt fiber layers 10, 11 are produced individually.

[0041] The inner batt fiber layer 10 is then needled into the wire link belt 6 so that connecting fibers 12 are transferred at least partly into the wire link belt 6. The outer batt fiber layer 11 is needled to the inner batt fiber layer 10 whereas connecting fibers 12 are transferred partly from the outer batt fiber layer 11 into the inner batt fiber layer 10.

[0042] Figure 3 shows a schematic top view of the compacting felt 3 from the product side P displaying the layer arrangement with the outer batt fiber layer 11 covering the inner batt fiber layer 10 which is positioned on top of the wire link belt 6.

Claims

1. A compacting felt (3) for machines for rendering textiles shrinkproof (1), the felt (3) having a base layer (6) at a machine side (M) and a batt fiber layer (10, 11) provided on said base layer (6) at a product side (P), **characterized in that** the base layer is formed by a wire link belt (6).

2. The compacting felt according to claim 1, **characterized in that** the wire link belt (6) comprises a multiplicity of partly overlapping loops that define connecting channels through which at least one pintle wire (9) is inserted respectively for interlocking the loops with each other.

3. The compacting felt according to claim 1 or 2, **characterized in that** the loops are formed by helically wound wires (7, 8) and/ or that the loops are composed of monofilament wires (7, 8) being alternatingly left and right wound around parallel spaced pintle wires (9).

4. The compacting felt according to one of the preceding claims, **characterized in that** the loops are composed of monofilament wires (7, 8) of a synthetic polymer, which is in particular chosen from the group comprising polyesters, polyphenylenesulfide (PPS), polyamide or copolymers or blends thereof.

5. The compacting felt according to one of the preceding claims, **characterized in that** the machine side (M) of the felt (3) is formed mostly by the wire link belt (6).

6. The compacting felt according to one of the preceding claims, **characterized in that** the machine side (M) of wire link belt is provided with a surface treatment, in particular with a silicone impregnation.

7. The compacting felt according to one of the preceding claims, **characterized in that** the batt fiber layer (10, 11) comprises at least two superimposed batt fiber layers (10, 11), being in particular made from different materials.

8. The compacting felt according to claim 7, **characterized in that** the inner batt fiber layer (10) adjacent to the wire link belt (6) comprises or consists of polyester and/ or polyamide staple fibers whereas the inner batt fiber layer has in particular a density of 3800 - 4200 g/ m^2, especially of 3900 - 4100 g/ m^2.

9. The compacting felt according to claim 7 or 8, **characterized in that** the inner batt fiber layer (10) extends at least partly into the wire link belt (6).

10. The compacting felt according to claim 9, **characterized in that** the inner batt fiber layer (10) protrudes at the product side (P) of the wire link belt (6) by at least 4.0 mm, in particular by at least 6.0 mm.

11. The compacting felt according to one of the claims 7 to 10, **characterized in that** the inner batt fiber layer (10) has a thickness of at least 6.0 mm, in particular at least 8.0 mm, and/ or the outer batt fiber layer (11) has a thickness of at least 6.0 mm, in particular at least 8.0 mm.

12. The compacting felt according to one of the claims 7 to 11, **characterized in that** the outer batt fiber layer (11) comprises or consists of aramid staple fibers, whereas the outer batt fiber layer has in particular a density of 2800 - 3200 g/ m^2, especially of 2900 - 3100 g/ m^2.

13. The compacting felt according to one of the preceding claims, **characterized in that** the product side (P) batt fiber layer (10, 11) is provided with a surface treatment, which is chosen from an anti-adhesion coating, like a silcone- or PTFE-impregnation, a grinding of the surface or combinations thereof.

14. The compacting felt according to one of the preceding claims, **characterized in that** the batt fiber layer (10, 11) is needled to the wire link belt (6), whereas in particular the inner and/ or outer batt fiber layer (10, 11) is needled to the wire link belt (6).

15. A machine for rendering textiles shrinkproof (1), **characterized in that** a compacting felt (3) according to one of the claims 1 to 14 is used.

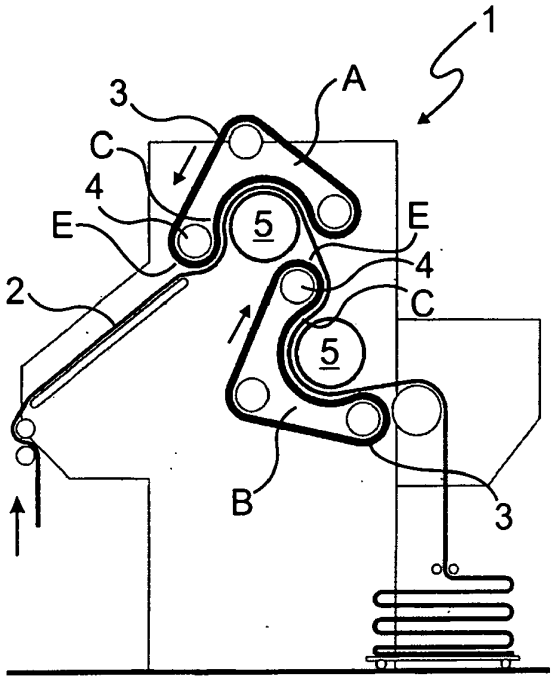

Fig. 1

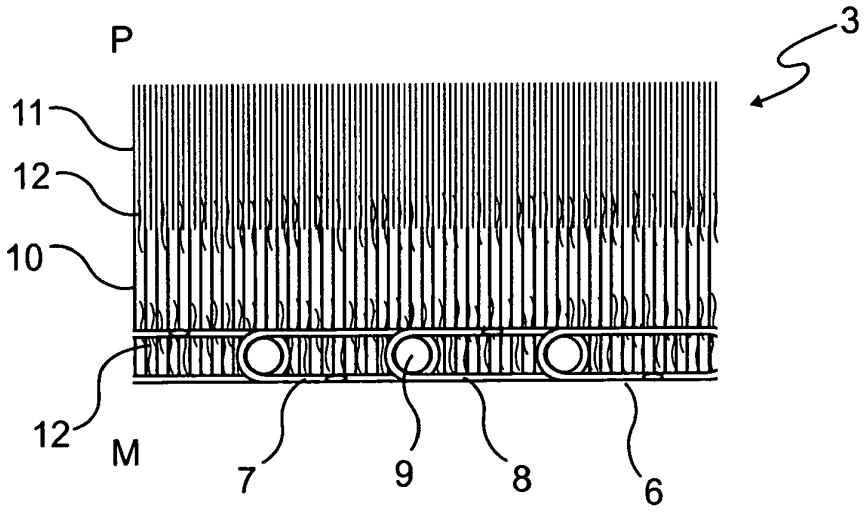

Fig. 2

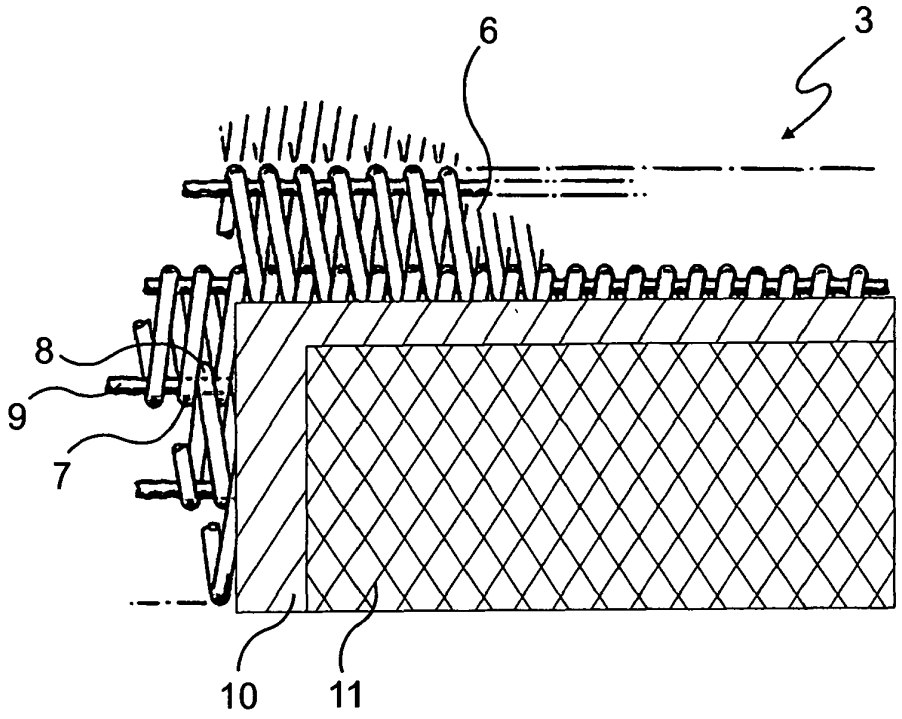

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 1330

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 November 2011	Bichi, Marco

CATEGORY OF CITED DOCUMENTS

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REFERENCES CITED IN THE DESCRIPTION

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