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

(11) **EP 2 942 426 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.11.2015 Bulletin 2015/46

(21) Application number: **15001315.9**

(22) Date of filing: **04.05.2015**

(51) Int Cl.:
D02J 1/22 *(2006.01)* ***D02J 13/00*** *(2006.01)*
D01D 5/08 *(2006.01)* ***D01D 10/02*** *(2006.01)*
D01F 6/00 *(2006.01)* ***B24D 11/00*** *(2006.01)*

(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
Designated Validation States:
MA

(30) Priority: **05.05.2014 IT PD20140116**

(71) Applicant: **Filmop International s.r.l.**
35010 Villa del Conte (PD) (IT)

(72) Inventor: **Zorzo, Roberto**
I-35010 Villa del Conte (Padova) (IT)

(54) **POY YARN**

(57) This invention concerns a POY yarn and the relative fabric obtained from said POY yarn.

Fig. 6

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Description

[0001] The object of this invention concerns a fabric and how it is made. In particular it concerns a much improved way to obtain a fabric from thermoplastic fibre and the object resulting from said procedure.

State of the art

[0002] It is well known that the spinning of chemical fibres in general, and thermoplastics in particular, is generally obtained according to three categories: the wet spinning process, the dry spinning process and the melt spinning process.

[0003] These productions of chemical fibres, according to the categories set out above, have some fundamental equipment in common: the tank with the spinning material, the dosing pump, the spinneret, the fluid inside which the continuous fibres or strands form and a stretching device that draws and winds the strands produced on bobbins that are kept rotating by recoilers.

[0004] After the strands come out of the spinneret and they have solidified, these are drawn, being subjected to the action of two pairs of rotating rollers at various speeds.

[0005] It is the dimension of the holes of the spinneret, as well as the spinning and stretching conditions, which determine the final diameter of the strand.

[0006] Said strands, as they come out of the spinneret, are generally identified as POY.

[0007] POY strands are extremely elastic and only after various treatments are they suitable for feeding the various weaving machines.

[0008] During the stretching of the POY, immediately after their solidification, we obtain almost a halving of the dimensions of the yarn, for example passing from 400 Den to 200 Den, obtaining a less elastic filament, bit one that is more stable with a range of elasticity within a very tight field.

[0009] Then this drawn POY is suitable for being used in successive machining and treatments like for example texturing, twisting and braiding treatments, all of which require a yarn that can be treated in a uniform manner: these treatments provide the fabric obtained from these treated yarns, with constant mechanical properties. Another reason for stretching is justified by the fact that at the outlet of the spinneret the filament has molecular chains that cannot yet be oriented. The strand thins when drawn and the molecular chains arrange themselves in a longitudinal direction. In addition to the amorphous regions, also crystalline regions form and cross-bridges between the individual molecular chains. The molecular chains oriented in a longitudinal direction and the cross-bridges give the chemical fibres a uniform strength.

[0010] During the treated strand state, or after attaining the state of a fabric, generally it is coloured using a thermal treatment and sometimes this is carried out under pressure. During this colouration treatment of the filament or the fabric they maintain their physical-mechanical properties, which they possessed previous to the colouring treatment, without any significant modifications, and above all the fibres maintain the same position and arrangement with respect to the weft.

[0011] One type of fabric, which is especially valued in the cleaning sector, is the fabric with abrasive properties. Generally this fabric is composed of a twisted yarn, generally a spiral consisting of numerous yarns and strands, and whose terry rises upwards in the opposite direction to the weft. To obtain a significant and appreciable abrasive effect, the strand has a dimension of not less than 100 Den.

[0012] Much appreciated are composite fabrics that have distinct bands of fabric with abrasive properties, interspersed with fabric with hydrophilic properties.

[0013] To distinguish the zones with their various functions, often there is recourse to yarns with different colours. To obtain this differentiated colouration of the various zones of the same fabric, it is necessary to provide the different colours of the varying varieties of strands before weaving.

Purposes of the invention

[0014] The object of this invention concerns a new way to create a yarn that can be treated by the various weaving machines in order to obtain a fabric with uniform physical-mechanical properties.

[0015] Another object of this invention is to make available a yarn with uniform properties that can easily be used by the various weaving machines.

[0016] Another object of this invention is to make available a fabric with abrasive properties that is made by making use of a yarn obtained according to the method set out above.

[0017] An even further object of this invention is to make available a fabric that can have various colours depending on the physical-mechanical characteristics of the yarn.

[0018] Another important object of this invention is to make available a fabric with abrasive properties that can be fully recycled.

Exposition of the invention

[0019] One or more of the characteristics mentioned above are obtained with a procedure and a yarn used in said procedure and with a fabric resulting from said procedure according to the characterising part of the independent claims.

[0020] In particular the yarn of the invention is obtained directly from a POY yarn, explicitly excluding drawing, after the solidification of the yarn extruded from the spinneret, rendered weavable using a thermal fixing treatment with at least one of the following twisting and stranding treatments.

[0021] In particular the procedure of the invention for

obtaining the fabric is characterised by its use of said POY yarn without substantial drawbacks in feeding standard weaving machines with the weavable POY.

Advantageous features of the invention

[0022] Advantageously with one or more of the above-mentioned processes the POY yarn becomes a textile yarn that is capable of providing the fabric formed from it, and obtained with a constancy of its physical-mechanical properties.

[0023] In particular the POY yarn that is the object of the invention is a yarn that has been rendered "calmed", without appreciable molecular tensions, and without the capacity to curl around itself, namely with fibres arranged longitudinally without any nonuniformity.

[0024] Very conveniently said fixing is composed of a thermal treatment from 40 to 100 degrees centigrade, and preferably from 50 to 70 degrees, for a time varying from a few dozen minutes up to a few hours.

[0025] Preferably said thermal treatment takes place using gradual increases in temperatures and keeping it there for a substantial period of time; basically one hour at 50° centigrade and one hour at 70° centigrade, for a cone of 3 kg., and in proportion to the various quantities.

[0026] Advantageously said yarn, after the above-mentioned thermal treatment, can be worked directly.

[0027] Conveniently the thermal treatment has the strong point of reducing the "nervousness" of the yarn, and increasing the count. Beneficially said calmed, and in particular stabilised, POY yarn is used twisted with numerous strands, without any difficulty or drawback in feeding any weaving loom.

[0028] After the fabric has been made with this yarn (with any loom suitable for the purpose) we can proceed with an additional thermal treatment.

[0029] It should be noted that also the fabric with the POY fabric yarn is uniform with a smooth, flat yarn, namely a fabric that is uniform with a smooth yarn with a flat appearance, namely a fabric with a uniform and flat composition of the "calmed" yarn.

[0030] Nevertheless, the fixing does not completely eliminate the molecular tensions of the POY yarn and in no way orients the fibres in a longitudinal direction definitively, since it maintains a considerable latent "nervousness".

[0031] With the above-mentioned thermal treatment, the POY yarn reacquires the initial latent nervousness, curling and shortening, creating a series of twisted curls that remain stable even after the end of the thermal treatment.

[0032] A further and/or different successive thermal stress does not affect the definitive structure acquired by the POY yarn, a sign of the definitive crystallised form acquired, without other latent aspects of structural tensions both molecular as well as the performance of the thermally treated POY textile yarns.

[0033] This thermal treatment can more or less be associated with the colouration and takes place at a temperature between 100 and 200 degrees centigrade, and preferably between 130° and 150° degrees centigrade.

[0034] With the above-mentioned thermal treatment, with colouration or not, the POY yarn fabric creates a renewal of the consistency, curling the twisting and increasing the toughness, giving the fabric a very strong, coarse, and compact appearance.

[0035] Precisely this coarse and compact aspect has an excellent abrasive effect for cleaning surfaces.

[0036] It should be noted that the yarn count, due to the effect of the final thermal treatment, increases with respect to the weavable POY yarn.

[0037] Therefore an abrasive fabric is obtained with the use of a yarn with a modest starting count, all to the advantage of easy weaving.

[0038] A further characteristic is obtained by carrying out the thermal colouring treatment with a fabric having separate parts with the POY yarn and with a traditional yarn, of the same or different composition.

[0039] During colouration, the POY yarn acquires a different colour with respect to the adjacent part of the yarn (with the same or different count) of the same fabric, thereby indicating the different structure and function of the various parts and their position on the fabric. So, with a single pass and a single treatment we can obtain the desired different colouration for these types of cleaning cloths. The fact that such an abrasive fabric created according to the above-mentioned methods can be 100 per cent recyclable is very important, since both the thermally treated POY yarn as well as the rest of the fabric and the other regions of the same fabric are all obtained starting from the same chemical composition.

[0040] Stages of the procedure for obtaining the weavable POY:

- The creation of the yarn from a spinneret, with the eventual addition of the master colorant (if you want a complete colouring of the POY);
- Solidification of the yarn;
- Treatment of the POY yarn with a thermal fixing treatment together with at least one phase of braiding or twisting, explicitly excluding drawing.

[0041] Stages of the procedure for creating a fabric using a weavable POY:

- Obtaining the weavable POY.
- Feeding any weaving loom suitable for the purpose of said weavable POY.

[0042] Stages of the procedure for making an abrasive fabric using the weavable POY:

- Creation of the fabric
- Thermal treatment, eventually with colorants suitable for the yarn, at a temperature between 100 and 200 degrees centigrade, and preferably between

130° and 150° degrees centigrade.

Brief description of the drawings

[0043]

Fig. 1 shows an example of the prior art for obtaining weavable yarn according to a damp spinning procedure.

Fig. 2 shows an example of the prior art for obtaining weavable yarn according to a dry spinning procedure.

Fig. 3 shows an example of the prior art for obtaining weavable yarn according to a melt spinning procedure

Fig. 4 shows a schematic example of an example of the drawing of a strand composed of various strands, as they exit from the spinneret.

Fig. 5 shows an example of the effects of drawing on a filament and/or on a strand, and in particular on the interior of the same filament/strand at the level of molecular chains.

Fig. 6 shows an example of fabric with a weavable POY fibre strand.

Fig. 7 shows an example of an abrasive fabric with a thermally treated POY fibre.

Fig. 8 shows an example of fabric made with discrete zones that have different functions, with at least one abrasive zone made with a POY fibre that has been given a different colour to that of adjacent zones.

Detailed description of an example of a preferred embodiment

[0044] With reference to the prior art the drawings in figs. 1 to 3 show three of the most common and well-known ways for spinning chemical fibres.

[0045] Both in the wet spinning process, shown in fig. 1, as well as in the dry spinning process shown in fig. 2 and also in the melt spinning process shown in fig. 3, we start with a raw material that is loosened and melted 1, 6, 11 to supply, pushed by a dosing pump 2, 7, 12, a spinneret 3, 8, 13.

[0046] There are various ways to solidify the strands 16 as soon as they have come out of the spinneret 3, 8, 13, but common to all the procedures is the necessary passage of drawing 4, 9, 14 before being able to wind the yarn on a spool 5, 10, 15 made to rotate by a winding reel.

[0047] In fact, as is well-known, the strand 16 that has just come out of the spinneret 3, 8, 13 and has been solidified cannot be treated and managed in any way given its "nervousness", and also because of the inconsistency of it physical properties, including principally the low degree of toughness, the excessive volatility of the elastic module, which in any event is always excessive for being feed into any loom.

[0048] For this reason, as shown in fig, 4 the drawing 4, 9, 14 carried out by a pair of rollers 18, 19 at varying speeds, allows you to reduce the count of the yarn 17, generally half compared to that of the spinneret 3, 8, 13, and above all causing a molecular modification that orients the molecular chains in a longitudinal direction. There remain many cross-bridges between the individual molecular chains that are further consolidated.

[0049] Both the molecular chains oriented in a longitudinal direction as well as the cross-bridges confer the necessary strength to the chemical fibres.

[0050] In the object of the invention you can expressly do without the drawing 4, 9, 14 of the strand 16.

[0051] Nevertheless, in order to be able to feed any loom without any problems, since the feeding of the untreated POY would be impossible, there is a thermal treatment passage that does not completely eliminate the structural tensions, but calms the yarn and fixes its arrangement sufficiently so that it can be fed through a loom.

[0052] This fixing of the POY yarn 20 consists of a thermal treatment, extended over time and at variable temperatures.

[0053] In particular the treatments consists of keeping it for a few dozen minutes up to an hour at a temperature between 40° and 100° degrees centigrade, and preferably at an increasing temperature.

[0054] In particular, for polyester fibres with a count of 400 Den, it has been found that the most effective thermal treatment is about an hour at a temperature of 50° centigrade and an hour at 70° centigrade, for a spool of 3 Kg.

[0055] Once said POY yarn 20 is obtained, which can be used after braiding and/or twisting work, it can easily be fed into a loom for obtaining the relative fabric 21. As can be seen in fig. 6 the POY strand 20, even if woven, lifts from the weft 22 in a linear and continuous manner without any warping and nervousness, shown by the fact that the longitudinal structural tensions of the various strands that make it up are not evident but soothed and latent. After the thermal treatment of the fabric rendered evident, as set out in fig. 7 the return to, and the restoration of, the nervousness conditions of the POY yarn 20, which crystallise in the evident warping and curling of the yarn 20 with a hardening of the fibre and with an upwards tendency, in the opposite direction to the weft 22.

[0056] Precisely this hardening together with the curling provides the abrasion effect of the fabric formed by the weavable POY strand 20, even if the individual strands or fibres originally have a low count.

[0057] In fig. 8 we can see the different colour taken by the region 24 of the POY strand 20 compared to the adjacent and contiguous region 23, even if it can be made with the same material, after the thermal treatment of the fabric 21 carried out with a colorant.

Claims

1. POY yarn **characterised by** the fact that it is obtained directly from a POY yarn, explicitly excluding drawing, after the solidification of the yarn extruded from the spinneret, and by the fact that it is treated with a thermal fixing treatment associated with at least one of the following folding or twisting processes before it can be used to feed a weaving loom.

2. Procedure for obtaining a fabric **characterised by** the fact that it uses a POY yarn claimed in claim 1.

3. POY yarn according to claim 1 **characterised by** the fact that it is rendered "stabilised", without appreciable molecular tensions, and without the capacity to fold back on itself, namely with fibres arranged without longitudinal nonuniformity.

4. POY yarn according to claim 1 **characterised by** the fact that said fixing is a thermal treatment carried out on the yarn itself that consists of bringing the POY yarn to a temperature between 40 and 100 degrees centigrade for a time between a few dozen minutes up to a few hours.

5. POY yarn according to the previous claim **characterised by** the fact that the thermal fixing treatment is carried out in a temperature range between 50° and 70° centigrade.

6. POY yarn according to claim 4 or 5 **characterised by** the fact that said thermal fixing treatment for the POY yarn takes place with increasing temperatures, with a gradual increasing of the temperature and its maintenance for a substantial period of time.

7. POY yarn according to one of the claims from 4 to 6 **characterised by** the fact that the thermal fixing treatment of the POY yarn consists of bringing the POY yarn to the temperature of 50° for an hour and to 70° centigrade for an hour, with reference to a 3kg reel.

8. Fabric created with said POY yarn according to one or more of the previous claims, **characterised by** the fact that it is treated with a thermal treatment at a temperature between 100° and 200° to obtain an abrasive fabric.

9. Fabric created with said POY yarn according to the previous claim **characterised by** the fact that said thermal treatment for obtaining an abrasive fabric takes place at a temperature between 130° and 150° centigrade.

10. Fabric created with said POY yarn according to claim 8 or 9 **characterised by** the fact that said thermal treatment for obtaining an abrasive fabric is related to and contemporaneous to the phase for colouring the POY yarn.

11. Fabric created with said POY yarn according to the previous claim **characterised by** the fact that it is arranged in distinct areas interspaced with zones that have other and/or different yarn, possibly even hydrophilic, to assume, during the colouring phase itself, a different colour indicative of the function carried out in that particular region of the fabric.

Fig. 3

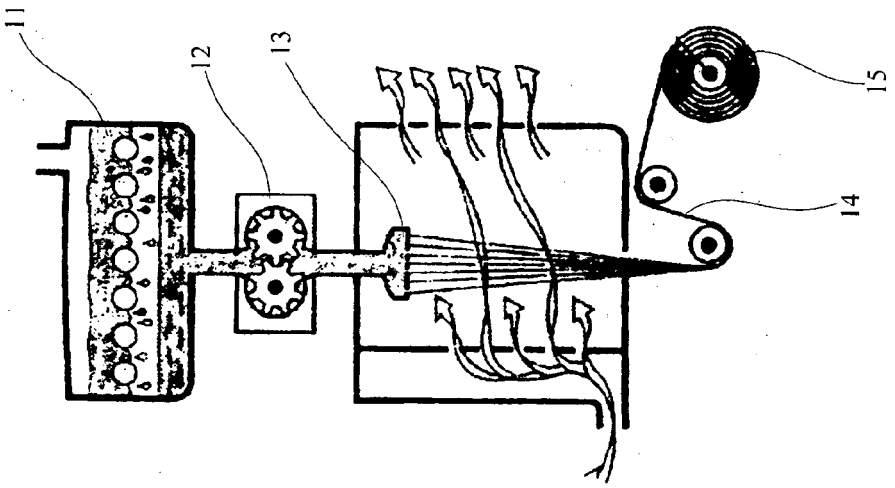


Fig. 2

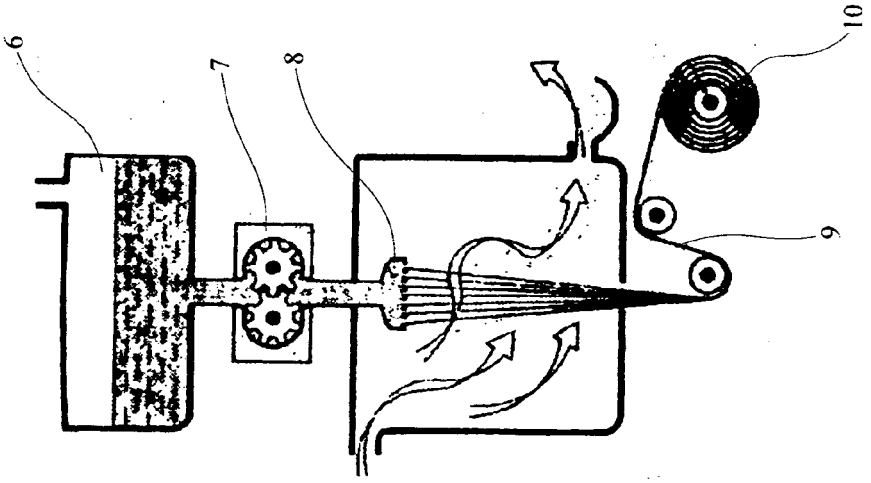


Fig. 1

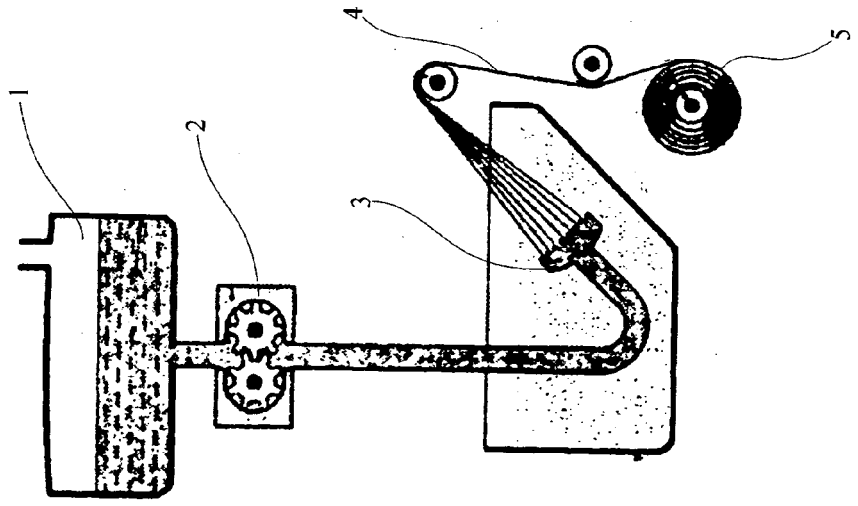


Fig. 5

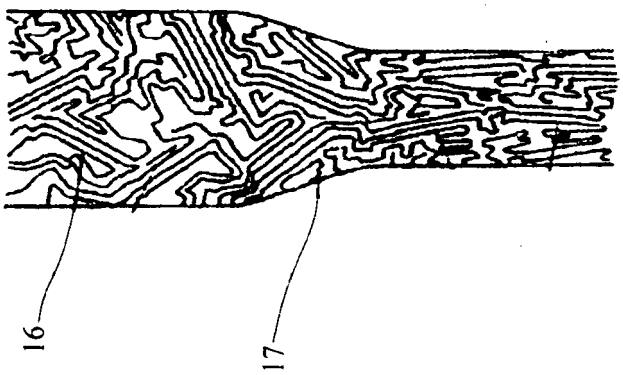


Fig. 4

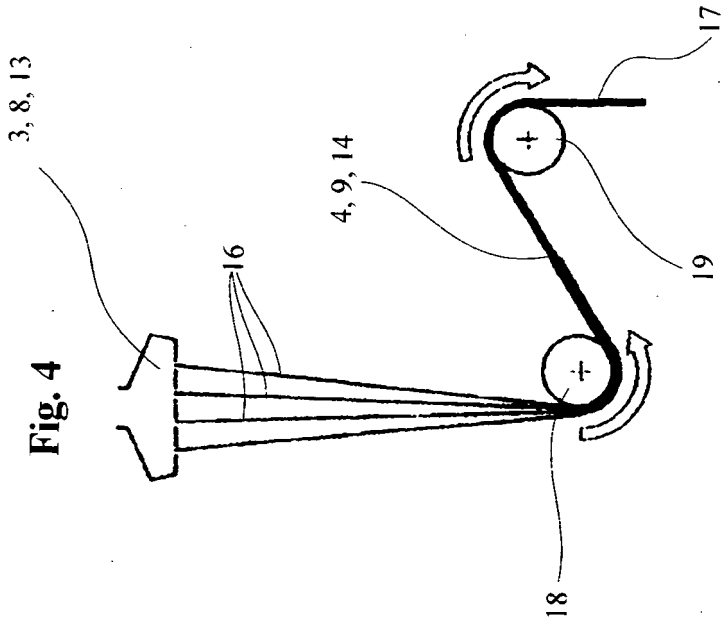


Fig. 6

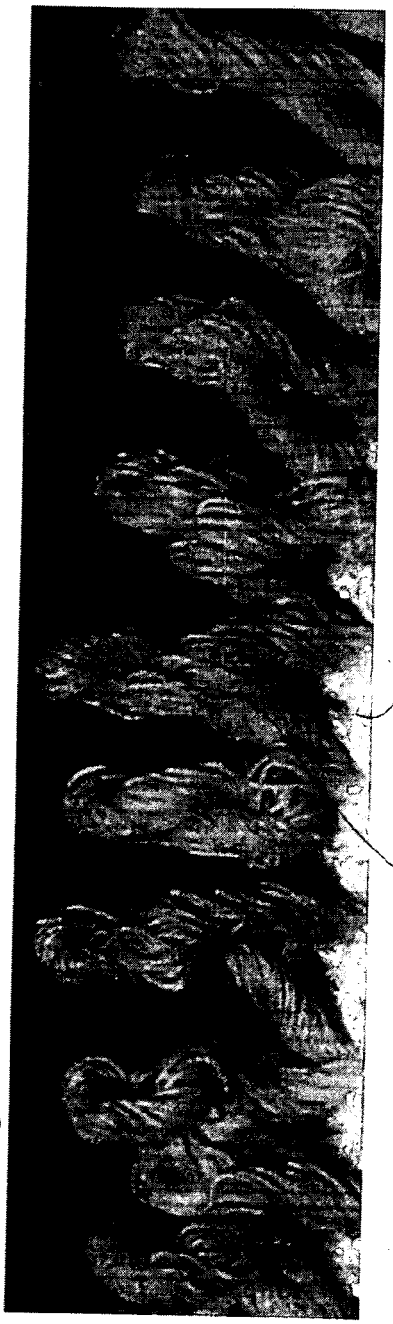
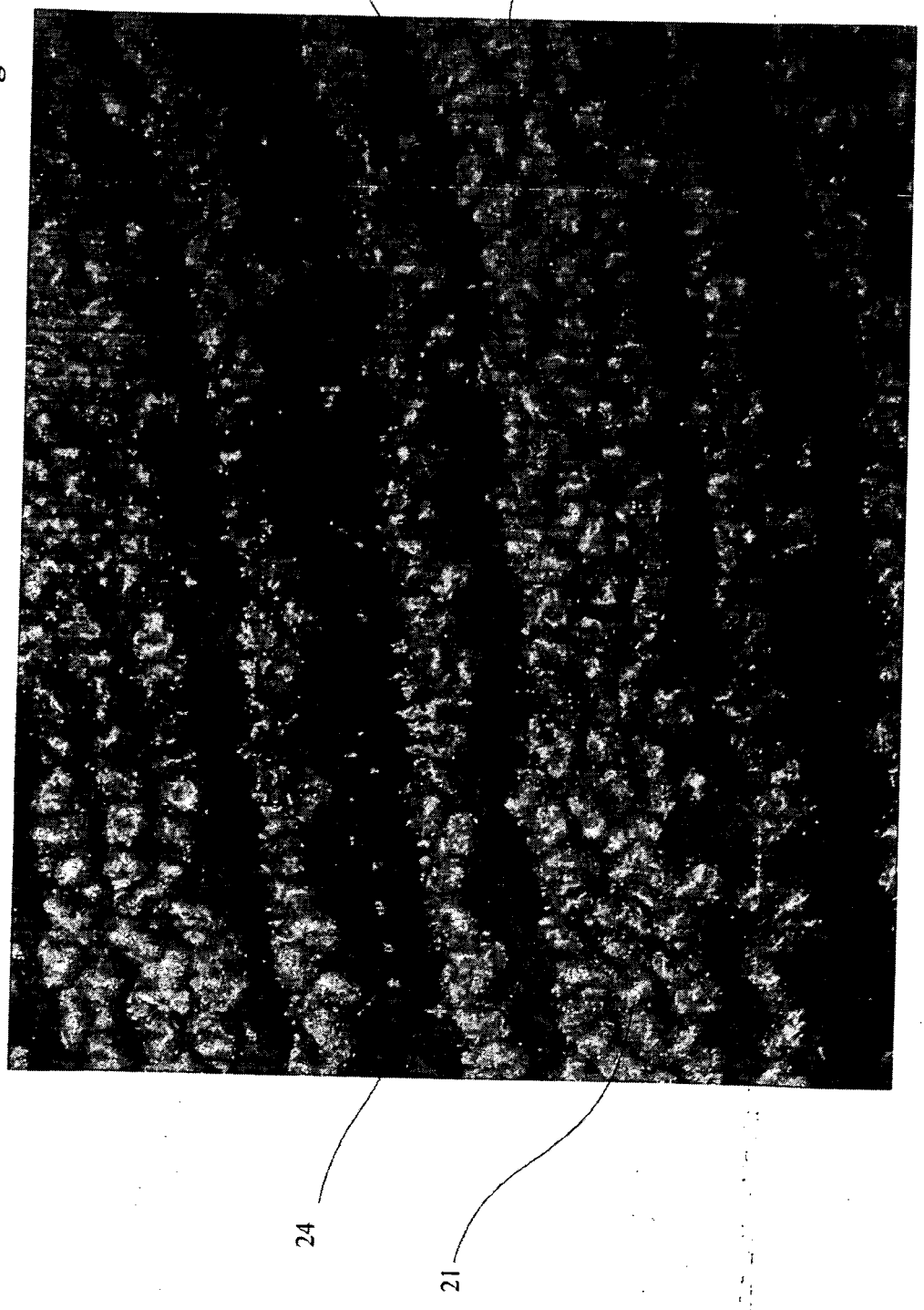


Fig. 7

Fig. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 15 00 1315

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D01D
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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
The Hague	26 August 2015	Van Beurden-Hopkins

CATEGORY OF CITED DOCUMENTS

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